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OFFICE OF THE MAYOR

Ke'ena O Ka Meia
COUNTY OF MAUI – Kalana O Maui

August 7, 2013

FILE COPY

AUG 23 2013

Director
Office of Environmental Quality Control
Department of Health, State of Hawai'i
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813

RE: Filing of Draft Integrated Feasibility Report and Environmental Assessment, with Anticipated Finding of No Significant Impact for the Mokuhinia Ecosystem Restoration Project (Tax Map Key [TMK] (2) 4-6-007:002, (2) 4-6-007:001, (2) 4-6-007:036, (2) 4-6-007:037 and (2) 4-6-007:038)

Dear Director:

With this letter, the County of Maui hereby transmits the Draft Integrated Feasibility Report and Environmental Assessment, with an Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Mokuhinia Ecosystem Restoration Project. The proposed project is situated within TMKs (2) 4-6-007:002, (2) 4-6-007:001, (2) 4-6-007:036, (2) 4-6-007:037 and (2) 4-6-007:038, in the Lahaina District on the island of Maui. We are requesting publication in the August 23rd edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact Zeke Kalua at the County of Maui (808)270-7855, or Lisa Kettley at CH2M HILL (808)440-0275.

'13 AUG 12 P4:29
OFC. OF ENVIRONMENTAL QUALITY CONTROL
RECEIVED

Sincerely,

Zeke Kalua
Executive Assistant
Office of the Mayor
County of Maui

Enclosures

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)

Project Name: Mokuhinia Ecosystem Restoration Project

Island: Maui

District: Lahaina

TMK: (2) 4-6-007:002, (2) 4-6-007:001, (2) 4-6-007:036, (2) 4-6-007:037 and (2) 4-6-007:038

Permits: Endangered Species Act (ESA) Section 7 Compliance, National Environmental Policy Act (NEPA) Compliance, National Historic Preservation Act (NHPA) Section 106 Compliance, Hawai`i Revised Statutes (HRS) Chapter 343 Compliance, Coastal Zone Management Act (CZMA) Federal Consistency Determination, HRS Chapter 6E Compliance (State Historic Preservation Division [SHPD] Review), National Pollutant Discharge Elimination System (NPDES) Permit, Well Construction/Pump Installation Permit, Community Noise Permit, Special Management Area (SMA) Use Permit, Historic District Approval, Flood Hazard Area Development Permit, Construction Permits

Proposing Agency: County of Maui
200 South High Street
Wailuku, Hawaii 96793
Mr. Zeke Kalua, Executive Assistant, Office of the Mayor
(808)270-7855

Consultant: CH2M HILL
1132 Bishop Street, Suite 1100
Honolulu, HI 96813
Ms. Lisa Kettley
(808) 440-0275

Status: Anticipated Finding of No Significant Impact

RECEIVED
'13 AUG 12 P4:30
OFC. OF ENVIRONMENTAL QUALITY CONTROL

Summary:
The County of Maui and the U.S. Army Corps of Engineers are conducting a feasibility study for the proposed Mokuhinia Ecosystem Restoration Project in the town of Lahaina on the island of Maui, Hawaii. The purpose of the project is to restore a portion of Loko o Mokuhinia, the former wetland that surrounded the ancient island of Moku`ula. Specifically, the project includes restoration of foraging habitat for the endangered Hawaiian stilt (*ae`o*, *Himantopus mexicanus knudseni*), Hawaiian coot (*'alae ke oke'o*, *Fulica alai*), and migratory waterfowl and shorebird species.

Specific components of the proposed action include: (1) excavation to intercept the existing groundwater, (2) grading to provide shallow wetland slopes and microtopographic variation, (3) installation of a groundwater well and pump to supplement groundwater levels, (4) installation of an outlet to an adjacent ditch, (5) planting native wetland vegetation, and (6) installation of a perimeter fence to provide predator control. If approved and funded, it is currently anticipated that construction of the project would be completed in 2018, following which post-construction performance monitoring would be conducted for up to 10 years. Long-term operations and maintenance activities would be performed by the County of Maui. As part of project implementation, best management practices would be implemented, such that the proposed action is not anticipated to result in significant impacts to environmental resources.

The public is invited to attend a public meeting for the project on Thursday, September 5, 2013 from 6:30 p.m. to 8:30 p.m. at the Lahaina Civic Center (1840 Honoapiilani Hwy, Lahaina, Maui, HI 96761).

DRAFT

Integrated Feasibility Report and Environmental Assessment

Mokuhinia Ecosystem Restoration Project

Contract No. W9128A-08-D-0007, Task Order 0005

Prepared for

U.S. Army Corps of Engineers, Honolulu District

and the County of Maui

August 2013

CH2MHILL®

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SUMMARY OF PROPOSED PROJECT	
Project	Mokuhinia Ecosystem Restoration Project
Project Sponsors	U.S. Army Corps of Engineers and the County of Maui
Proposing Agency[1]	County of Maui
Proposed Action	The proposed action is to restore a portion of the aquatic ecosystem that historically occurred within Loko o Mokuhinia. Specific activities would include excavation (approximately 3.5 to 4.5 feet of material, primarily fill), grading to establish wetland slopes and microtopography, installation of a groundwater well and pump to supplement groundwater levels, installation of native wetland vegetation, and installation of a perimeter fence to provide predator control.
Authority	Section 206, Aquatic Ecosystem Restoration, Water Resources Development Act of 1996 (PL 104-303), as amended
Location	Lāhainā, Island of Maui, Hawai`i
Land Ownership	State of Hawai`i (assigned via State Executive Order to the County of Maui); Salvation Army
Tax Map Key	(2) 4-6-007:002, (2) 4-6-007:001, (2) 4-6-007:036, (2) 4-6-007:037 and (2) 4-6-007:038
Project Footprint	Approximately 8.5 acres
State Land Use District	Urban
County Zoning	Historic District (Historic District Number [No.] 1)
Special Designations	Lāhainā Historic District (National Historic Landmark; National and State Register of Historic Places) King Kamehameha III's Royal Residential Complex (National and State Register of Historic Places) Special Management Area (SMA)

SUMMARY OF PROPOSED PROJECT	
Required Permits & Approvals	• Endangered Species Act, Section 7 Compliance • National Environmental Policy Act (NEPA) Compliance • National Historic Preservation Act, Section 106 Compliance • Hawai`i Revised Statutes (HRS) Chapter 343 Compliance • Coastal Zone Management Act (CZMA) Federal Consistency Determination • HRS Chapter 6E Compliance (State Historic Preservation Division [SHPD] Review) • National Pollutant Discharge Elimination System (NPDES) Permit • Well Construction/Pump Installation Permit • Community Noise Permit • SMA Use Permit • Historic District Approval • Flood Hazard Area Development Permit • Construction Permits
Actions Potentially Requiring Environmental Review Under HRS Chapter 343	Use of state land, use of county funds, use within historic site as designated in the National Register and Hawai`i Register
Approving Agency for HRS Chapter 343	County of Maui, Mayor's Office
Anticipated Determination	Finding of No Significant Impact (FONSI)
Consulted Parties	• U.S. Fish and Wildlife Service • Advisory Council on Historic Preservation • State Historic Preservation Division • Office of Hawaiian Affairs • County of Maui • Maui/Lanai Islands Burial Council • Maui County Cultural Resource Commission • Friends of Moku`ula • Na Kupuna o Maui • Na `Aikane o Maui • Waiola Church • Community members
Consultant	CH2M HILL, Inc. 1132 Bishop Street, Suite 1100 Honolulu, HI 96813 (808) 943-1133

NOTES:

[1] The County of Maui is the proposing agency for the purposes of compliance with HRS Chapter 343.

Executive Summary

At the request of the County of Maui, and in coordination with the Friends of Moku`ula, the U.S. Army Corps of Engineers (USACE) is investigating the Mokuhinia Ecosystem Restoration Project (project) in the town of Lāhainā on the island of Maui, Hawai`i. The project is being conducted under the Continuing Authorities Program (CAP) authority of Section 206 of the Water Resources Development Act (WRDA) of 1996, as amended, and is currently in the feasibility study phase of the USACE planning process, which involves evaluation of aquatic ecosystem restoration opportunities, consistent with the project goal and objectives and within the authority of the USACE Civil Works Program. This document presents the results of this process.

Background and History

Historically, Loko o Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the shoreline of West Maui. These wetlands served as habitat for a variety of valued wetland species, including Hawaiian waterbirds, migratory water fowl, and shorebird species. Within the pond was the island of Moku`ula, which was the preferred residence of high ranking *ali`i* (chiefs) through the mid-1800s. This area also had great religious and cultural significance as the residence of Kihawahine, a *mo`o akua* (lizard-like goddess) and spiritual guardian of the royal family. Over time, alterations to the hydrologic regime resulted in stagnation of the pond, and, in 1914, the pond was filled for hygienic and development purposes. A 1918 State Executive Order turned the area over to the County of Maui for the establishment of Malu`ulu o Lele Park. Mokuhinia and Moku`ula currently lie approximately 2 to 3 feet under the ground surface of the park.

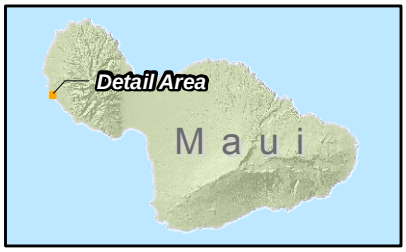
In an effort to preserve and restore the overall site, the County of Maui and the Friends of Moku`ula partnered together and articulated three components: (1) restoration of the aquatic ecosystem features of Loko o Mokuhinia, (2) revitalization/preservation of the historic and archaeological features of Moku`ula, and (3) the establishment of an area reserved for future use by Friends of Moku`ula. The location of each of these components is shown in Figure ES-1.

The overall coordination and execution of these efforts is being led by the County of Maui and the Friends of Moku`ula. Seeking technical support for the restoration of Mokuhinia, the County of Maui identified the USACE as a potential partner in ecosystem restoration; the USACE's role as the federal sponsor of the Mokuhinia Ecosystem Restoration Project was formalized through a signed agreement with the County of Maui in 2003. The USACE does not have the authority to direct the design or implementation of the other two activities; however, restoration of Mokuhinia is being considered within the context of the overall effort by the County of Maui and Friends of Moku`ula.

Purpose and Need

A large network of coastal wetlands historically occurred throughout West Maui (and more broadly, throughout the Hawaiian Islands), but has been substantially reduced over time because of development within the coastal plain. These wetlands provide important hydrologic and biogeochemical functions, as well as habitat for wetland dependent species, including Hawaiian waterbirds, migratory waterfowl and shorebird species. Hawaiian waterbird species, including the Hawaiian stilt (*ae`o*, *Himantopus mexicanus knudseni*) and Hawaiian coot (*'alae ke oke'o*, *Fulica alai*) are listed as endangered under the Endangered Species Act (ESA); habitat loss has been identified as a primary cause of decline and a key factor limiting recovery of these species (Reed et al., 2011).

VICINITY MAP



LEGEND

- Moku'ula/Mokuhinia Site
- Mokuhinia Ecosystem Restoration Project Site
- Moku'ula
- Area Reserved for the Friends of Moku'ula

Notes:
The boundaries of Moku`ula and the adjacent southern pond are based on the boundaries shown in the Hawaiian Government Survey of the Town of Lāhainā (S.E. Bishop, 1884); the northern pond was added at the request of Friends of Moku`ula based on historical documents. A 10-meter (approx. 32.8 foot) buffer has been included around the perimeter of the island and adjacent ponds.

0 70 140 Feet

1 inch = 150 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE ES-1
Overview of Project Site
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

CH2MHILL

\\NALA\PROJ\USARMYCORPSOFENGINEE\427511MOKUHINIA\15_GIS\MAPFILES\COPY_OF_FIGURE4_PROJECTSITE.MXD RMANGAN 7/25/2013 2:37:12 PM

Mokuhinia was part of the network of coastal wetlands in the Lāhainā area but was filled in the early 20th century for health and development purposes, then converted to a recreational park. In addition to providing important wetland habitat functions, Mokuhinia was also religiously and culturally significant as the home to the spiritual guardian of Maui's royal family. It also contained the island of Moku`ula, which served as the residence of the king of Hawai`i and other high ranking royalty in the mid-19th century.

The purpose of the project is to restore the aquatic ecosystem functions and processes of Mokuhinia to the extent feasible, given the current development and alteration in the project area. The proposed project would restore scarce wetland habitat for native vegetation and wildlife species in an area where it historically existed as part of a larger network of coastal wetlands.

Project Goal and Objectives

Overall, the goal of the project is to restore a portion of the pond and associated wetland of Loko o Mokuhinia to provide aquatic ecosystem functions and values, with consideration given to the subsequent cultural revitalization of Moku`ula by the native Hawaiian community. Based on this goal, the planning objectives are as follows:

- Re-establish wetland functions and values associated with Loko o Mokuhinia.
- Maximize foraging habitat for the endangered Hawaiian stilt and coot throughout the year.
- Provide habitat for migratory waterfowl and shorebird species.

In addition to these objectives, several planning constraints were identified; these relate to avoiding conflicts with adjacent urban development, archaeological and historic resources, cultural uses and endangered species. The project goal and objectives were iteratively refined to reflect these constraints. In particular, based on the extent of adjacent urban development, the goal was refined to specify restoration of a portion of the pond and associated wetland. To avoid archaeological and historic resources associated with Moku`ula, a 10-meter (32.8-foot) buffer has been accommodated around the island, as shown in Figure ES-1. With respect to endangered species and the potential for predation, the planning objectives are focused on providing suitable foraging habitat, so as to minimize the predation threats associated with nesting.

Plan Formulation and Evaluation

Plan formulation, evaluation, and comparison were conducted in accordance with the USACE six-step planning process. Restoration measures and alternative plans were developed and evaluated in order to select a preferred plan that is complete, acceptable, efficient, and effective in accomplishing the project goal and objectives.

Plan formulation focused on measures that are important components of wetland functions and values, particularly as related to providing foraging habitat for Hawaiian stilt and coot, as well as migratory waterfowl and shorebird species. Specific measures were defined within the following categories, which were based on the wetland habitat that previously occurred at Loko o Mokuhinia, as well as current restoration techniques and wetland management practices in Hawai`i: (1) excavation, (2) grading, (3) hydrologic input, (4) water circulation, (5) surface water outlet, (6) wetland vegetation, and (7) predator control. The measures were then screened against project-specific criteria, with particular consideration given to input from the non-federal sponsor, U.S. Fish and Wildlife Service (USFWS), and other project stakeholders.

The measures that passed screening were grouped into preliminary alternatives; these alternatives were iteratively reformulated to incorporate stakeholder input and accommodate specific project considerations. Through this process, a final array of three alternatives was identified. Given the focused planning objectives and constraints, the alternatives are relatively similar, in that all three entail restoration of the same type of wetland habitat within the project site. The three alternatives differ primarily in the approach to achieving the desired water depths, as follows:

- Alternative 4 includes excavation as needed to achieve the maximum suitable water depth, based on summer groundwater levels; in the winter, an outlet would be used to manage water levels at approximately the same depth.
- Alternative 8A includes excavation as needed to achieve the maximum suitable water depth, based on winter groundwater levels; water depths would be supplemented with a groundwater pump, as needed (for example, during summer conditions).
- Alternative 8B includes only enough excavation to accommodate the maximum suitable water depth, with wetland hydrology primarily supplied via groundwater pump. Since this alternative would use a pump to maintain water levels above the groundwater level throughout the year, it includes an impervious liner to increase retention of surface water within the wetland.

To establish the basis for the evaluation of alternatives, a conceptual design was developed for each of the alternative plans in the final array; these incorporated specific parameters based on species habitat requirements (developed in close coordination with the USFWS), historic site conditions, and cultural considerations. Figure ES-2 illustrates the conceptual site plan for all three alternatives, acknowledging some variation in the exact location of the respective contours based on the excavation approach. Using the conceptual design information, preliminary costs were developed for each alternative plan.

To quantify outputs, an ecosystem output model was developed to quantify habitat benefits (habitat units) for this project. Specifically, a custom spreadsheet model was developed based on the wetland functions that are anticipated for the range of alternative plans, particularly as related to providing suitable foraging habitat for Hawaiian stilt and coot and migratory/shorebird species. Model variables were identified that relate these functions to habitat characteristics; the variables also incorporate components of long-term site management (such as vegetation management and predator control), as these activities are recognized as key to maintaining suitable habitat for endangered waterbird species (USFWS, 2011a). For each alternative plan, the variable scores were averaged, then multiplied by wetland size (to normalize the output), resulting in an overall score of habitat benefits (habitat units).

Based on the costs and outputs, the final array of alternative plans was evaluated using a cost effectiveness and incremental cost analysis (CE/ICA). Inputs to the CE/ICA included average annual habitat units, which were calculated based on the results of the ecosystem output model, and estimated average annual costs, which were calculated based on the preliminary cost estimates. The cost effectiveness analysis was conducted to identify if any alternative plans have output levels that cannot be produced more cost effectively by another plan; no alternative plans were dismissed as a result of this analysis. The plans were then assessed through the ICA to identify the “best buy plans,” or those that provide the greatest increase in output for the least increase in cost; Alternatives 8A and 8B and the No Action Alternative were identified as best buy plans. The best buy plans were then assessed based on the evaluation criteria (acceptability, completeness, efficiency and effectiveness), which provided the basis for identification of Alternative 8A as the tentatively selected plan for implementation.

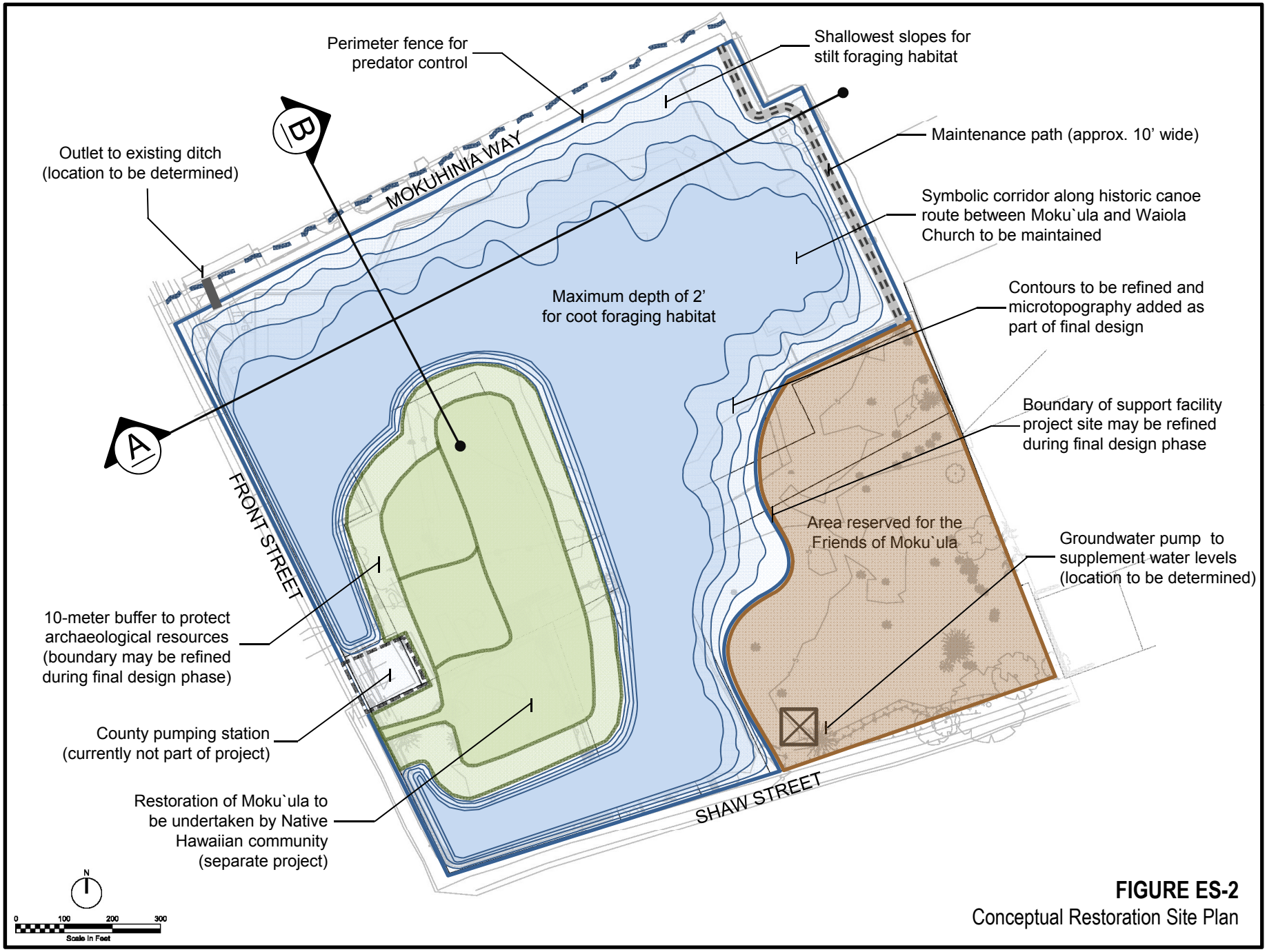


FIGURE ES-2
Conceptual Restoration Site Plan

Tentatively Selected Plan

Following identification of Alternative 8A as the tentatively selected plan, feasibility-level design drawings were developed (the site plan is provided as Figure ES-3). Specific design components of the plan are as follows:

- Excavation to intercept the existing groundwater, as needed to achieve a maximum water depth of approximately 2 feet, based on average groundwater levels in winter
- Grading to provide shallow wetland slopes (with target slopes of 18:1 and maximum slopes of 3:1) and microtopographic variation throughout the wetland
- Installation of a groundwater well and pump to supplement groundwater levels, as needed to maintain desired water levels (particularly during drier months of the year)
- Installation of an outlet into an adjacent ditch (which runs along the northern edge of the project site and flows to the ocean) to promote internal water circulation and accommodate surface water overflow
- Planting of wetland vegetation species including *kaluha* (*Bolboschoenus maritimus*), *makaloa* (*Cyperus laevigatus*), *ahuawa* (*Cyperus javanicus*), *akulikuli* (*Sesuvium portulacastrum*), *ae'ae* (*Bacopa monnieri*), *akiaki* (*Sporobolus virginicus*) and *ohelo kai* (*Lycium sandwicense*)
- Installation of a perimeter fence to provide predator control

If approved, it is currently anticipated that construction of the project would be completed in 2018, following which post-construction performance monitoring would be conducted for up to 10 years. During this period, the need for adaptive management would be considered, based on whether the success criteria are achieved for the project. Consistent with USACE regulations, an adaptive management plan has been prepared. The plan is scoped appropriately to the scale of the project, and identifies adjustments that are anticipated due to uncertainty in achieving the desired outputs/results. Long-term operations and maintenance (O&M) activities would be performed by the County of Maui. Specific O&M activities would be specified in an O&M plan prepared by the USACE, and are expected to include basic site maintenance (for example, trash removal, inspection and repair of the perimeter fence), water level monitoring, pump operations and maintenance, vegetation management, and predator control efforts (for example, trapping).

Environmental Compliance

In compliance with the National Environmental Policy Act of 1969, as amended (NEPA) and Hawai`i Revised Statutes (HRS) Chapter 343, an Environmental Assessment is integrated as part of the feasibility report. It describes existing environmental conditions in the study area, the proposed action and alternatives, potential environmental impacts of the proposed project, and measures to minimize environmental impacts. No significant impacts have been identified. The document also includes an assessment of compliance with other federal, state, and local regulations and policies, and identifies the anticipated permit requirements.

Implementation Costs and Cost-Sharing Requirements

The total project cost (fully funded) is estimated at $11,465,000; the project first costs are $9,443,000 (based on an effective price level date of October 1, 2014, escalated to program year 2015). Under the cost-share agreement for this project, the non-federal sponsor is responsible for all lands, easements, rights-of-way, relocations, and disposal areas (LERRDs); 100 percent of O&M; and cash to equal not less than 35 percent of the total project cost. However, the federal participation limit for projects authorized under Section 206 is $5 million per project. As the project costs exceed the federal participation limit for

projects authorized under Section 206 (based on federal participation limits and the cost-share percentages for this project), costs beyond the federal participation limit will also be the non-federal sponsor's responsibility. The non-federal cost share totals $6,465,000, which equates to the value of the LERRDs and $4,678,000 in any in-kind services and cash. A policy waiver to that effect has been requested; approval of the final feasibility report will be subject to obtaining this waiver.

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FIGURE ES-3
Preliminary Site Plan for Tentatively Selected Plan

SITE PLAN

NOTES:
1. THE PROJECT WILL INCLUDE A PERMANENT FENCE AROUND THE PERIMETER OF THE PROJECT AREA, AS NEEDED TO PROVIDE PREDATOR CONTROL. THE SPECIFIC DESIGN OF THE FENCE WILL BE DETERMINED DURING FINAL DESIGN PHASE, WITH CONSIDERATION GIVEN TO THE DESIGN STANDARDS FOR THE LAHAINA HISTORIC DISTRICT.
2. THE LOCATION OF THE GROUNDWATER WELL AND PUMP IS CONCEPTUAL, AND WILL BE REFINED IN THE FINAL DESIGN PHASE, IN COORDINATION WITH THE DESIGN EFFORT FOR THE FRIENDS OF MOKUULA SUPPORT FACILITIES.
3. THE SPECIFIC LOCATION OF COUNTY OF MAUI UTILITY LINES LOCATED WITHIN THE FRONT STREET RIGHT-OF-WAY (ROW) WILL BE DETERMINED AS PART OF THE NEXT PHASE; THE LOCATION OF THESE UTILITIES AND ANY ASSOCIATED SETBACK WILL BE REFLECTED IN THE FINAL DESIGN.
4. ALL UNITS ARE IN FEET.

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DATE: 04/12/2013
DWN BY: GFB
CKD BY: LSK
SOLICITATION NO.: TASK NO.: 005
SUBMITTED BY: L. KETTLEY
CONTRACT NO.: W912BA-08-D-A07
PLOT SCALE: AS NOTED
PLOT DATE: 04/12/2013
FILE NUMBER: MMR-MA-003
SIZE: ANSI D
FILE NAME: C-01.dgn

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

SITE PLAN

SHEET IDENTIFICATION
C-01
SHEET 3 OF 10

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Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
AFB	Alternatives Formulation Briefing
Amfac, Inc.	American Factors
amsl	above mean sea level
ATR	Agency Technical Review
bgs	below ground surface
CAP	Continuing Authorities Program
CDP	census-designated place
CE/ICA	cost-effectiveness and incremental cost analyses
CFR	*Code of Federal Regulations*
CIP	capital improvement program
CO-OPS	(NOAA) Center for Operational Oceanographic Products and Services
CWA	Clean Water Act
CWRM	Commission on Water Resource Management
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DAGS	Department of Accounting and General Services
DLNR	(State of Hawai`i) Division of Land and Natural Resources
DOFAW	(DLNR) Division of Forestry and Wildlife
DOH	Department of Health
DQC	District Quality Control/Quality Assurance
EA	Environmental Assessment
EaA	Ewa Silty Clay Loam
EAL	environmental action limit
EC	Engineer Circular
ENSO	El-Nino Southern Oscillation
EPA	U.S. Environmental Protection Agency
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act

ET	evapotranspiration
FAR	Federal Acquisition Regulation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
ft/day	feet per day
ft^3/day	cubic feet per day
FWCA	Fish and Wildlife Coordination Act
GAP	Gap Analysis Program
gpm	gallons per minute
gallons/day	gallons per day
HAAQS	Hawai`i Ambient Air Quality Standards
HAR	Hawai`i Administrative Rules
HDPE	high density polyethylene
HRS	Hawai`i Revised Statutes
HTRW	hazardous, toxic and radioactive waste
HQUSACE	Headquarters, U.S. Army Corps of Engineers
I	infiltration
ICAP	Center for Island Climate Adaptation and Policy
IEPR	Independent External Peer Review
IPCC	Intergovernmental Panel on Climate Change
IWR	Institute for Water Resources
K	hydraulic conductivity
KH	Kihei Station
LCA	Land Commission Award
LERRD	lands, easements, rights-of-way, relocations, and disposal areas
MESHH	Managing Endangered Species Habitat in Hawai`i
mgd	million gallons per day
mg/kg	milligrams per kilogram
mm/yr	millimeters per year
mS/cm	milliSeimens per centimeter
MSC	Major Subordinate Command
MSFA	Magnuson-Stevens Fishery Conservation and Management Act
MTBA	Migratory Bird Treaty Act
MW	monitoring well
N/A	not applicable
NAAQS	National Ambient Air Quality Standards

NEPA	National Environmental Policy Act
NED	National Economic Development
NER	National Ecosystem Restoration
NHO	native Hawaiian organization
NHPA	National Historic Preservation Act
No.	number
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NRCS	(USDA) Natural Resource Conservation Service
O&M	operations and maintenance
OASA(CW)	Office of the Assistant Secretary of the Army (Civil Works)
OMRR&R	operations, maintenance, repair, rehabilitation and replacement
ORMP	Ocean Resources Management Plan
OSE	Other Social Effects
P	rainfall
P&G	Principles and Guidelines
PCJV	Pacific Coast Joint Venture
PDT	project delivery team
PED	Preconstruction Engineering and Design
PICCC	Pacific Islands Climate Change Cooperative
PIP	Public Involvement Plan
PM	particulate matter
PMP	Project Management Plan
POD	(USACE) Pacific Ocean Division
POH	(USACE) Honolulu District
PPA	Project Partnership Agreement
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PRiMO	Pacific Risk Management Ohana
project	Mokuhinia Ecosystem Restoration Project
PRP	Preliminary Restoration Plan
RED	Regional Economic Development
RO	runoff
ROI	region of influence

SHPD	(DLNR) State Historic Preservation Division
SMA	Special Management Area
T	transmissivity
TAC	technical advice and coordination
TMK	tax map key
UBC	Uniform Building Code
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
WRDA	Water Resources Development Act
WRPP	Water Resource Protection Plan

Glossary of Hawaiian Words

`aumakua mo`o	guardian spirit in the form of a lizard
`aumakua	guardian spirit
ahupua`a	land division, usually extending from the mountains to the sea
ali`i nui	royalty
ali`i	Hawaiian chief
kalo	taro, the traditional Hawaiian staple crop
kapu	forbidden or restricted
kūpuna	elders
limu	seaweed
lo`i	Irrigated terrace, especially for taro, but also for rice
loko	pond
Māhele	The distribution of Hawaiian lands, which introduced the concept of private land ownership into Hawaiian society; lands were divided between the monarchy, the ali'i, and the common people.
maka`ainana	commoner
makai	toward the ocean
mana	supernatural or divine power
mana`o	thoughts and opinions
mauka	toward the mountain
mo`o akua	lizard-like goddess
mo`o	lizard spirit
mo`olelo	traditional stories
pi`o	high ranking marriage
piko	navel
pono	righteousness
wahi pana	place names

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1.0 Introduction

At the request of the County of Maui, and in coordination with the Friends of Moku`ula, the U.S. Army Corps of Engineers (USACE) is investigating the Mokuhinia Ecosystem Restoration Project (project) in the town of Lāhainā on the island of Maui, Hawai`i (Figure 1). The project is currently in the feasibility study phase of the USACE planning process, which involves evaluation of aquatic ecosystem restoration opportunities, consistent with the project goal and objectives and within the authority of the USACE Civil Works Program.

This integrated Feasibility Report and environmental assessment (EA) presents the results of the feasibility study process, including identification of the problems and opportunities for ecosystem restoration, articulation of the desired outcomes and planning objectives, formulation and evaluation of alternative restoration plans, and selection of a recommended plan for implementation. The document also addresses environmental review requirements in compliance with the National Environmental Policy Act of 1969, as amended (NEPA) and Hawai`i Revised Statutes (HRS) Chapter 343.

Following completion of the feasibility study and environmental compliance review processes, the recommended plan will be presented for USACE approval and funding; if approved and funded, the project would proceed to final design and construction.

1.1 Study Authority

The project is being investigated under the authority of Section 206 of the Water Resources Development Act (WRDA) of 1996, as amended. Section 206 authorizes the Secretary of the Army to carry out "an aquatic ecosystem restoration and protection project if the Secretary determines that the project (1) will improve the quality of the environment and is in the public interest; and (2) is cost-effective." This authority is primarily used for manipulation of the hydrology in and along bodies of water, including wetlands and riparian areas. It is a Continuing Authorities Program (CAP), which focuses on water-resource-related projects that are relatively small in terms of scope, cost and complexity. Traditional USACE Civil Works projects typically have a broader scope and level of complexity, and are specifically authorized by Congress. The CAP is a delegated authority to plan, design, and construct certain types of water resource and environmental restoration projects without specific Congressional authorization.

1.2 Study Sponsor

In a letter dated April 22, 2003, the County of Maui Department of Planning requested the assistance of the USACE with the restoration of Mokuhinia. A Preliminary Restoration Plan (PRP) was prepared to assess the federal interest in the project, based on the anticipated costs and benefits associated with the proposed restoration concept. The PRP was approved by USACE Pacific Ocean Division (POD) on September 22, 2004, allowing the project to proceed to a feasibility study.

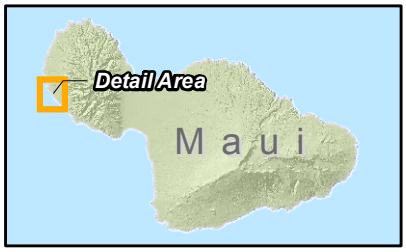
Projects conducted under the Section 206 program require a non-federal sponsor, with the USACE and non-federal sponsor sharing the study and implementation costs. For this project, the County of Maui is the non-federal sponsor. The County of Maui has an agreement with the Friends of Moku`ula, a local non-profit organization, and as such the USACE is also coordinating with them in planning and implementation of the project.

VICINITY MAP

LEGEND

Moku'ula/Mokuhina Site

Mokuhinia Ecosystem Restoration Project Site



0 1,500 3,000 Feet

1 inch = 3,000 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 1
Project Vicinity
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

CH2MHILL

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As the sponsors for the project, the USACE and County of Maui are also responsible for the environmental compliance process. In this capacity, the USACE is the lead agency for NEPA compliance and the County of Maui Mayor's Office is the proposing agency for HRS Chapter 343 compliance.

1.3 Study Purpose

Historically, Hawai`i supported nearly 60,000 acres of wetlands; however, more than 12 percent of this area, including more than over 30 percent of lowland wetlands, have been eliminated across the state over time (Dahl, 1990; PCJV, 2006). Generally speaking, the conditions along the western shoreline of Maui reflect this trend, with a once broad network of coastal wetlands now reduced to isolated pockets of wetland habitat. Loko o Mokuhinia[1] was an approximately 17-acre pond, which previously existed as part of this network of coastal wetlands along the West Maui shoreline. These wetlands served as habitat for a variety of valued wetland species, including Hawaiian waterbirds and migratory bird species. Within the pond was the island of Moku`ula, which was the preferred residence of high ranking *ali`i* (chiefs) through the mid-1800s. This area also had great religious and cultural significance as the residence of Kihawahine, a *mo`o akua* (lizard-like goddess) and spiritual guardian of the royal family. Over time, alterations to the hydrologic regime resulted in stagnation of the pond and, in 1914, the pond was filled for hygienic and development purposes. A 1918 State Executive Order turned the area over to the County of Maui for the establishment of Malu`ulu o Lele Park. Mokuhinia and Moku`ula currently lie approximately two to three feet under the ground surface of the park. This study specifically addresses the feasibility of restoring the aquatic ecosystem functions and processes of Mokuhinia.

1.3.1 Purpose and Need

NEPA specifies that a statement should be developed for federal actions that briefly describes the underlying purpose and need to which the federal agency is responding (40 *Code of Federal Regulations* [CFR] 1502.13). The purpose and need statement establishes why the agency is proposing an action and drives alternatives consideration, analysis, and selection of the preferred alternative through the NEPA process. The purpose and need statement for the project is as follows.

A large network of coastal wetlands historically occurred throughout West Maui (and more broadly, throughout the Hawaiian Islands), but has been substantially reduced over time because of development within the coastal plain. These wetlands provide important hydrologic and biogeochemical functions, as well as habitat for wetland dependent species, including Hawaiian waterbirds and migratory waterfowl species. Hawaiian waterbird species, including the Hawaiian stilt (*ae`o*, *Himantopus mexicanus knudseni*) and Hawaiian coot (*'alae ke oke'o*, *Fulica alai*) are listed as endangered under the Endangered Species Act (ESA); habitat loss has been identified as a primary cause of decline and a key factor limiting recovery of these species (Reed et al., 2011).

Mokuhinia was part of the network of coastal wetlands in the Lāhainā area but was filled in the early 20th century for health and development purposes, then converted to a recreational park. In addition to providing important wetland habitat functions, Mokuhinia was also religiously and culturally significant as the home to the spiritual guardian of Maui's royal family. It also contained the island of Moku`ula, which served as the residence of the king of Hawai`i and other high ranking royalty in the mid-19th century. The purpose of the project is to restore the aquatic ecosystem functions and processes of Mokuhinia to the extent feasible, given the current development and alteration in the project area. The proposed project would restore scarce wetland habitat for native vegetation and wildlife species in an area where it historically existed as part of a larger network of coastal wetlands.

[1] Traditionally, the *loko* (pond) was called "Loko o Mokuhinia," but is often simply referred to as "Mokuhinia." For the purposes of this report, the terms 'Loko o Mokuhinia' and 'Mokuhinia' are used interchangeably.

1.4 Scope of Study

The proposed project is one component of a larger effort by the County of Maui and the Friends of Moku`ula to preserve and restore the overall Moku`ula/Mokuhinia site. The Friends of Moku`ula is a non-profit organization whose purpose and mission includes "initiate the process of restoring, protecting and preserving historically significant sites including the Hawaiian island and pond at Lāhainā known as Moku`ula and Mokuhinia." Efforts to restore the Moku`ula/Mokuhinia site would generally occur within Malu`ulu o Lele Park, which based on the 1918 State Executive Order, is assigned to the County of Maui.[2]

The restoration of the site has long been a goal of the community and the County of Maui. At the request of the Friends of Moku`ula, the County of Maui granted use of a portion of the area to the Friends of Moku`ula through a lease and License to Occupy (dated January 2002).[3] In further pursuing restoration and preservation of the site, the Friends of Moku`ula and the County of Maui articulated three primary components:

- Restoration of the aquatic ecosystem features of Mokuhinia
- Revitalization/preservation of the historic and archaeological features of Moku`ula
- Establishment of an area reserved for the Friends of Moku`ula

The overall coordination and execution of these efforts is being led by the County of Maui and the Friends of Moku`ula. Seeking technical support for the restoration of Mokuhinia, the County of Maui identified the USACE as a potential partner in ecosystem restoration; the USACE's role as the federal sponsor of the Mokuhinia Ecosystem Restoration Project was formalized through a signed agreement with the County of Maui in 2003.

The vision for the revitalization and preservation of Moku`ula will be defined by the Friends of Moku`ula, in concert with the native Hawaiian community.[4] The specific nature of activities (and associated facilities, if any) that would be conducted within the remaining area reserved for the Friends of Moku`ula are being determined in coordination with the County of Maui. The USACE does not have the authority to direct the design or implementation of these other two activities; however, restoration of Mokuhinia is being considered within the context of the overall effort by the County and Maui and the Friends of Moku`ula for the Moku`ula/ Mokuhinia site. The activities being pursued for the site are shown in Figure 2; the location of each is shown in Figure 3.

Consistent with the information shown in Figure 2, this document specifically addresses the feasibility of restoring Loko o Mokuhinia. As the feasibility study is proposing a federal action, it requires NEPA compliance; this is addressed through the EA component of the document. The NEPA analysis will consider the other site restoration activities, which are not federal actions, to the extent they would contribute to cumulative impacts.

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[2] Portions of the Moku`ula/Mokuhinia site that are not owned by the County of Maui include two parcels on the south side of the project area. These two parcels are currently owned by the Salvation Army; the County of Maui is working with the Salvation Army to acquire these parcels.

[3] The lease has a term of 35 years, and the license has a term of 20 years.

[4] It is understood that construction of the support facilities is the Friends of Moku`ula's current focus, in addition to providing support for the Mokuhinia Ecosystem Restoration Project. Revitalization/preservation of Moku`ula will require significant outreach and engagement with the native Hawaiian community; the Friends of Moku`ula has expressed their intent to initiate these efforts.

FIGURE 2
Activities Planned Within Moku`ula/Mokuhinia Site

In addition, the County of Maui is required to comply with HRS Chapter 343, as it is proposing an action that involves the use of state land, county funds and work within an historic district. A Final Environmental Assessment was previously completed in compliance with HRS Chapter 343 for a possible support facility project within the area reserved for the Friends of Moku`ula (Munekiyo and Hiraga, 2003). This document referenced the three components of the overall site restoration, based on the limited information that was available at the time; the future applicability of the analysis will be assessed by the Friends of Moku`ula, based upon the activities/facilities that they ultimately define for this area. No further information is currently available relative to the future restoration of Moku`ula; it is assumed that environmental review compliance, if required, will be fulfilled when the project is better defined in the future.

1.5 Project Location

The project site is within the County of Maui's Malu`ulu o Lele Park, which is located on the border of the Waine`e and Waiokama *ahupua`a* (traditional division of land, normally extending from mountain to sea), within the Lāhainā District of Maui Island. The project site also includes three adjacent parcels: one operated as a commercial parking lot and two owned by the Salvation Army. It is bounded on the *makai* (ocean-ward) side by Front Street; by privately owned properties along Waine`e Street on the *mauka* (mountain-ward) side; by Shaw Street on its southerly edge; and by Mokuhinia Way and an open ditch along its northerly boundary. The site includes portions of the following tax map keys (TMK): (2) 4-6-007:002, (2) 4-6-007:001, (2) 4-6-007:036, (2) 4-6-007:037 and (2) 4-6-007:038.

Figure 3 shows the boundaries of the project site and its relationship to the overall Moku`ula/Mokuhinia site-restoration area.

1.6 Evaluation of Federal Interest

Because the benefits of an ecosystem restoration project cannot be measured in monetary terms, other information must be considered in the evaluation of projects that address these resources, as needed to determine federal interest. As such, USACE regulations require that significant ecosystem resources be

identified, with statements of significance providing qualitative information to help decision-makers determine whether the value of the resources is worth the cost incurred to produce them.

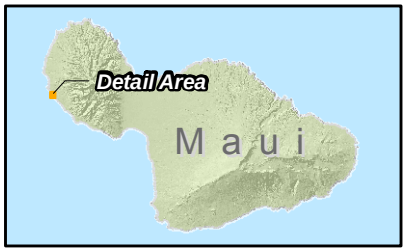
Potentially significant resources are defined as those resources that are directly associated with the ecosystem within a study area, and are likely to be significant based on institutional, public or technical recognition (Apogee Research, 1997). As described in Engineer Regulation (ER) 1105-2-100, significance based on institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Public recognition means that some segment of the general public recognizes the importance of an environmental resource, as evidenced by people engaged in activities that reflect an interest or concern for that particular resource. Technical recognition means that the resource qualifies as significant based on scientific knowledge or judgment of critical resource characteristics.

The proposed project would restore coastal wetland habitat in an area that historically supported a large network of coastal wetlands. The restored wetlands would provide habitat for native vegetation and wildlife species, many of which have very little suitable habitat remaining. In particular, the site would provide foraging habitat for the Hawaiian stilt and coot, as well as other migratory waterfowl and shorebird species. The Hawaiian stilt and coot are both listed as endangered, with species recovery limited by availability of suitable habitat. Stilt and coot are known to readily disperse between areas of suitable habitat within and amongst the islands, presumably in response to available foraging resources (Reed et al., 1998a; Engilis and Pratt, 1993); the restored wetland would provide valuable habitat in an area that is transited by these species, yet has very limited wetland habitat resources available. The significance of these resources is summarized as follows:

- Wetland habitat has institutional, public, and technical significance
  - Wetlands are a scarce resource both locally and regionally; more than 12 percent of the state's wetland area has been eliminated, including more than 30 percent of the lowland coastal wetlands (Pacific Coast Joint Venture [PCJV], 2006; Dahl, 1990; U.S. Fish and Wildlife Service [USFWS], 2011a). The remaining habitat is heavily fragmented and degraded, and is threatened by urban encroachment (Griffin et al., 1989; USFWS, 2011a).
  - Wetlands are required habitat for endemic Hawaiian waterbird species, all of which are listed as endangered under the Endangered Species Act (ESA) and HRS Chapter 195D; loss of wetland habitat has been cited as a primary cause of decline in these populations (USFWS, 2011a).[5]
  - Wetlands are protected under the Clean Water Act (CWA), Executive Order Number (No.) 11990 (Protection of Wetlands) and State Water Code (HRS Chapter 174C).
  - Restoration of wetland habitat is part of the vision of the 1999 Hawai`i Wetlands Management Policy (State of Hawai`i, 2003) and is listed as a primary goal in the Strategic Plan for the Pacific Coast Joint Venture for Hawai`i (PCJV, 2006).
  - Restoration of Mokuhinia is a central component of Friends of Moku`ula's mission.
  - Mokuhinia has cultural significance as the residence of the *mo`o akua,* Kihawahine.

[5] The other primary cause that has been cited in the decline of Hawaiian waterbird species is predation by introduced animals. Other factors include alteration of hydrology, invasive non-native plants, and disease (USFWS, 2011a).

VICINITY MAP



LEGEND

- Moku'ula/Mokuhinia Site
- Mokuhinia Ecosystem Restoration Project Site
- Moku'ula
- Area Reserved for the Friends of Moku'ula

Notes:
The boundaries of Moku`ula and the adjacent southern pond are based on the boundaries shown in the Hawaiian Government Survey of the Town of Lāhainā (S.E. Bishop, 1884); the northern pond was added at the request of Friends of Moku`ula based on historical documents. A 10-meter (approx. 32.8 foot) buffer has been included around the perimeter of the island and adjacent ponds.

0 70 140 Feet

1 inch = 150 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 3
Overview of Project Site
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

CH2MHILL

\\NALA\PROJ\USARMYCORPSOFENGINEE\427511MOKUHINIA\15_GIS\MAPFILES\COPY_OF_FIGURE4_PROJECTSITE.MXD RMANGAN 7/25/2013 2:37:12 PM

- Native wetland vegetation has institutional and public significance
  - Native wetland vegetation provides important habitat structure for endemic waterbirds, all of which are federally and state listed as endangered.
  - Restoration of native species and habitats is identified as a Statewide Conservation Objective (Meadows et al., 2005).
  - Native wetland vegetation is culturally important; for example, *makaloa* (smooth flatsedge [*Cyperus laevigatus*]) was used for weaving mats, such as the sleeping mats used by the *ali`i*.
- Habitat to support populations of Hawaiian stilt and Hawaiian coot has institutional significance
  - Hawaiian stilt and Hawaiian coot are federally and state-listed as endangered, and are addressed in the Recovery Plan for Hawaiian Waterbirds (USFWS, 2011a). Population counts indicate that numbers of stilts and coots have increased in recent years, but are subject to fluctuations and remain below recovery goals (Reed et al., 2011).
  - Habitat availability is a limiting factor in recovery of these species; wetland restoration as a component of an overall effort to establish and manage a network of core and supporting habitat is the key element in the recovery strategy for these species (USFWS, 2011a). Long-term population trends suggest that increased wetland habitat availability, particularly on Maui, would likely contribute to population gains, increasing the potential for achieving recovery goals for these species (Reed et al., 2011).
  - Hawaiian stilt and Hawaiian coot are recognized by the State of Hawai`i as indigenous species (Hawai`i Administrative Rules [HAR] Chapter 124), and have been identified as two of the Species of Greatest Conservation Need (Meadows et al., 2005).
- Habitat to support populations of migratory bird species has institutional significance
  - Migratory species are protected under the Migratory Bird Treaty Act (MBTA).
  - Wetlands provide essential habitat for migratory waterfowl.

Based on these factors, the ecosystem resources that would be provided through restoration of Mokuhinia are believed to have institutional, public, and technical significance, thus providing the basis for justification of the proposed project, as addressed in this feasibility analysis. Consistent with USACE regulations, ecosystem resource significance is considered in the evaluation of alternative plans, along with other factors, as further addressed in Section 5.

1.7 USACE Planning Process

Projects investigated under Section 206 of WRDA are typically initiated at the request of a non-federal agency (which thereby becomes the non-federal sponsor). As part of a reconnaissance phase, a PRP is prepared to assess the federal interest in the project, based on the anticipated costs and benefits associated with the restoration concept; if approved, the project proceeds to a feasibility study phase. The feasibility study phase is comprised of a detailed planning process in which alternative restoration plans are evaluated, resulting in selection of a recommended plan. If it is determined that there is still federal interest in the project, the USACE can continue to provide assistance through final design and construction; operations and maintenance are the responsibility of the non-federal sponsor.

The project is currently in the feasibility study phase. The requirements for completing the feasibility study phase are based on a process outlined in the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (Principles and Guidelines [P&G]) (U.S. Water

Resources Council, 1983), with which compliance is required for all federal water resource projects. The P&G have been incorporated into USACE planning regulations and guidance, as documented in Engineer Regulation (ER) 1105-2-100 "Planning Guidance Notebook" (USACE, 2000). The process identifies and responds to problems and opportunities associated with the federal objective, as well as specified state and local concerns. The process provides a flexible, systematic, and rational framework to make determinations and decisions at each step. This allows the interested public and decision makers to be fully aware of the basic assumptions that have been applied; the data and information used for the analysis; the areas of risk and uncertainty; and the significant implications of each alternative plan.

The USACE planning process is comprised of six steps, as described in ER 1105-2-100. These are shown in Figure 4 and are described below:

1. Specify Problems and Opportunities. The specific problems and opportunities to be addressed by the study are identified, and the causes of the problems are discussed and documented. In addition, the planning objectives and constraints are identified.

2. Inventory and Forecast Conditions. The existing conditions and the future without-project conditions (that is, the "No Action" alternative) are characterized for the project area. This provides the basis for evaluation of various alternative plans and their impacts.

3. Formulate Alternative Plans. Potential restoration measures are developed to meet the planning objectives and avoid the planning constraints. These measures are formulated into alternatives plans through a systematic and iterative process.

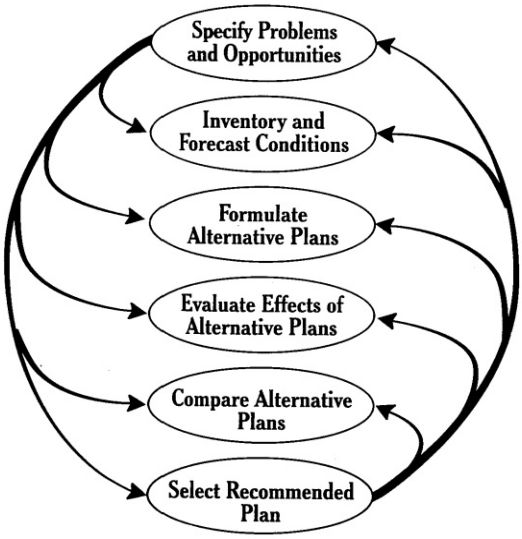


FIGURE 4
USACE Six-Step Planning Process

4. Evaluate Alternative Plans. Each alternative plan is first screened to determine the degree to which it meets the planning objectives and constraints, then evaluated for completeness, effectiveness, efficiency and acceptability. The evaluation is based on an assessment of the difference between the with-project and without-project condition for each alternative plan. A key component of the evaluation step is a cost-effectiveness and incremental cost analysis (CE/ICA), which results in identification of "best buy" plans (that is, the plans that provide the greatest increase in benefits for the least increase in cost).

5. Compare Alternative Plans. Alternative plans are compared to one another, focusing on the differences between the plans (including the "No Action" alternative). As part of this step, the alternative plans are ranked, which provides the basis for selection and recommendation of a plan for implementation.

6. Select Alternative Plan. The final step of the planning process involves selection of an alternative plan which reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the federal objective; this plan is referred to as the National Ecosystem Restoration (NER) plan.

This process is reiterated in greater detail in the USACE regulations and guidance documents, including ER 1105-2-100 (USACE, 2000) and the USACE Institute for Water Resources (IWR) Planning Manual, Report 96-R-21 (Yoe and Orth, 1996). In addition to these regulations, USACE planning studies must also comply with NEPA, and the P&G and USACE planning regulations specify that NEPA compliance should be integrated with the six-step process. The State of Hawai`i has also adopted a law that establishes requirements for an environmental review process, similar to NEPA. HRS Chapter 343 lists a series of conditions that trigger the requirement for compliance; in the case of this project, the applicable triggers

are the proposed use within any historic site as designated in the National or Hawai`i Register of Historic Places, and use of county lands/funds. HRS Chapter 343 specifies that, to the fullest extent possible, the federal and state requirements should be addressed through a joint document.

1.7.1 Review Process

The WRDA of 2007 mandated that the USACE incorporate additional technical review requirements into the project development process to ensure the quality and credibility of the USACE decision-making process, implementation, and operations and maintenance documents and work products. The review procedures are defined in Engineer Circular (EC) 1165-2-214, "Civil Works Review Policy" (USACE, 2012). The EC outlines four general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. In compliance with EC 1165-2-214, the Review Plan for this project is provided on the USACE Honolulu District (POH) website:
http://www.poh.usace.army.mil/Portals/10/docs/projectreviewplans/Maui_Mokuhinia_ReviewPlan.pdf.

1.8 Stakeholder Involvement

As the federal sponsor for the project, the USACE and its consultant team are responsible for the technical development of all planning-related information for the feasibility study phase of the project, with input from the non-federal sponsor (the County of Maui, in cooperation with the Friends of Moku`ula) and other entities, as appropriate. To assist with this effort, the USACE formed a project development team (PDT) and technical advice and coordination (TAC) team. The PDT is responsible for overseeing the project development process, and consists of the project sponsors and the consultant team. The TAC team is a working group for specific technical issues related to wetland habitat restoration. In addition to the USACE staff and consultants, members of the TAC team include representatives from the USFWS, as the USACE identified the USFWS as a primary technical resource for this project.[6] In addition to these study participants, a variety of stakeholders have been consulted in the planning process. Stakeholders include various federal, state, and county governmental and resource agencies, elected officials, Lāhainā businesses, native Hawaiian organizations (NHOs), cultural practitioners, and other members of the public. Stakeholder engagement efforts have been conducted to comprehensively address both the USACE policies for public involvement, as well as specific regulatory requirements for stakeholder consultation. In particular, NEPA and HRS Chapter 343 require public involvement as part of the environmental review process. In addition, Section 106 of the National Historic Preservation Act (NHPA) requires consultation with interested parties and NHOs as part of a federal agency's consideration of the effects of their proposed undertaking on historic properties. The general approach and specific efforts related to stakeholder involvement are discussed below.

1.8.1 Stakeholder Involvement Approach

Recognizing the importance of involving the public in the planning process, the USACE guidance specifies that open channels of communication should be developed and maintained with the public in order to give full consideration of public views and information throughout the project. Critical components of the public involvement effort should include (1) disseminating project-related information, (2) understanding the public's desires, needs, and concerns, (3) providing for consultation with the public before decisions are reached, and (4) taking into account the public's views (USACE, 2000). To identify the most effective

[6] The Federal Advisory Committee Act (FACA, Public Law 92-463) establishes approval and other requirements for advisory committees, task forces, and other similar groups formed in the interest of obtaining advice or recommendations. As described in ER 1105-2-100 (Appendix B), groups that are comprised of federal employees are exempt from these requirements. As the TAC is comprised of USACE and USFWS staff, it is considered to be exempt from FACA requirements.

way to engage the public and other stakeholders in the project development process, a Public Involvement Plan (PIP) was prepared. As part of the PIP, the following objectives were developed and served as guiding principles for the stakeholder involvement effort:

- Educate the community about the proposed project
- Communicate early and regularly
- Engage many stakeholders in culturally appropriate forums
- Build stakeholder base/consensus
- Develop plan that reflects stakeholder input

Given its history, Moku`ula/Mokuhinia is considered to be a sacred cultural site and continues to be part of the Hawaiian community's living culture; Klieger (1998) equated it to the "spiritual piko [navel] of the Hawaiian Kingdom." As such, many native Hawaiians have a strong cultural connection to the site that must be respected and honored. Accordingly, the stakeholder involvement approach focused on achieving the objectives through effective and culturally appropriate communication with the community, in particular the native Hawaiian community.

Based on the stakeholder involvement objectives, the range of project stakeholders, and their anticipated areas of interest or concern, an implementation plan was developed for the stakeholder involvement component of the project. The plan incorporated a variety of techniques, with consideration given to culturally appropriate forms of communication, resulting in an overall approach of starting stakeholder dialogues in small-group settings and moving toward larger community and public meetings over the course of the planning process. Specific techniques include small-group meetings and interviews, non-federal sponsor meetings, community briefings, agency meetings, briefings to key decision-makers, public meetings, and a project website. Table 1 provides an overview of the approach that was developed to guide the stakeholder engagement efforts for the feasibility planning process.

1.8.2 Summary of Stakeholder Input

Based on the approach described above, extensive stakeholder engagement efforts have been conducted to date, resulting in a range of input from project stakeholders. This input addresses a range of topics relating specifically to the proposed project, as well as more broadly to the overall Moku`ula/Mokuhinia site restoration effort. Input that specifically relates to the proposed project, and was used to help inform and guide the planning process and design of the wetland restoration plan includes the following:

- There is a strong desire for the site to support water throughout the majority of the year, such that it is not characterized by exposed, dry soils for extended periods of time.
- Some stakeholders expressed the desire for the site to function as a traditional working fishpond.
- The restoration plan needs to ensure proper water circulation with an outlet to the ocean.
- The project needs to include long-term maintenance; stakeholders expressed concern about the funding and responsibility for the long-term site maintenance effort.
- The site should not be used as a sediment detention basin, as this would be considered desecration of a sacred cultural site; however, there is recognition that wetland habitat naturally provides some degree of sediment retention.
- There is a strong desire for native vegetation to be planted and maintained at the site.
- Stakeholders expressed the need for more community education and involvement, particularly as related to providing cultural oversight for any work related to the overall Moku`ula/Mokuhinia site.

- Stakeholders expressed a strong desire for the County of Maui pump station to be removed, as it overlaps with portions of both Moku`ula and Mokuhinia.
- The restored wetland should follow the natural contour of the land below the fill.
- In general, there is great support for the restoration of Mokuhinia, as long as it is done in a culturally appropriate way.

To the extent possible, this input has been incorporated into the planning process and is reflected in the results of alternative plan development and evaluation. As noted above, some stakeholders expressed the desire for the site to function as a working fishpond, which would presumably include the construction of hand-stacked rock walls and other culturally-important features associated with traditional fishponds. There is evidence that such conditions may have historically occurred at the site, where native Hawaiians made modifications to assist with raising fish and/or taro. However, as described above, the USACE's authority for ecosystem restoration relates specifically to restoring degraded ecosystem functions and processes to a more natural condition, particularly those that would occur in the absence of human changes to the landscape. Such projects must be justified in terms of significant ecosystem resources, such as those described in Section 1.6. Furthermore, the USACE's regulations specifically state that projects implemented under their ecosystem restoration policies are not intended to restore cultural and historic resources (ER 1105-2-100 and ER 1165-2-501). These regulations do not preclude the County of Maui and native Hawaiian community from pursuing the restoration of a working fishpond at the project site, but restrict the USACE's authority to be involved in such an endeavor. Given the focus of the USACE's authority specific to ecosystem restoration, this feasibility study is focused on restoration of wetland functions and values, including habitat for endangered waterbirds and migratory/shorebird species. However, to the extent possible, this effort is being conducted in the context of the cultural uses and values associated with the site, so as to not preclude future actions by others relative to the cultural revitalization of the site.

In response to the stakeholder request for the existing pump station to be removed, the County of Maui is exploring various alternative options for relocation of the pump station; for the purposes of this project, this area has been excluded from the project site, as there is currently not a clear path forward for removal of the pump station.

A detailed list of the specific engagement effort conducted to date is provided in Section 9. Stakeholder engagement efforts are ongoing, and are expected to be conducted through the final design and construction phases of the project.

1.9 Prior and Ongoing Actions

The following sections provide a short summary of past and ongoing efforts conducted by federal and non-federal entities and agencies in the project vicinity. These efforts were reviewed and considered as part of the feasibility planning process, as appropriate.

1.9.1 Prior and Ongoing USACE Actions

The only previous USACE-sponsored study in West Maui is the Kahoma Stream Flood Control Project, which was constructed in 1996. The project was authorized under Section 201 of the Flood Control Act of 1965 (Public Law 89-298), as amended, as it involved the construction of a 5,415-foot concrete channel above the town of Lāhainā to address stream-related flooding. The project also included a debris basin, offshore rubble apron, three pre-stressed concrete bridges, and related utility relocations.

TABLE 1
Stakeholder Involvement Implementation Plan

	USACE 6-Step Planning Process	Identify Problems and Opportunities (Step 1)	Inventory and Forecast Conditions (Step 2)	Formulate Alternatives (Step 3)	Evaluate Alternatives (Step 4)	Compare Alternatives (Step 5)	Select Recommended Plan (Step 6)	*Proceed to Design Phase* --------→
Stakeholder Involvement Method	**Non-Federal Sponsor Meetings**	**County of Maui / Friends of Moku`ula** * *Seek input on the vision and strategy for restoration of overall site; reach consensus on project goals and objectives*		**County of Maui / Friends of Moku`ula** * *Seek input and consensus on the basis for conceptual design and range of alternatives*				
	Small-Group Meetings	**Knowledgeable Individuals** * *Seek input on the stakeholder involvement process and strategy for overall restoration*	**Native Hawaiian/Cultural Practitioners** * *Provide information on project goal/ objectives and planning process; seek input on stakeholder needs and desires*				**Knowledgeble Individuals** * *Seek input on project development tasks, as needed in preparation for the public hearing*	
	Briefings to Decision-Makers	**County of Maui, Mayor** * *Provide update on project status and planning process*		**County of Maui Planning Commission** * *Provide update on project status and planning process; discuss Chapter 343 and permit requirements*		**County of Maui, Mayor** * *Provide update on conceptual design of alternatives and status of planning process*		
	Agency/Commission Meetings [1]		**Maui Burial Council, Cultural Resource Commission** * *Provide update on project status and planning process; provide results of site investigations to date*			**Maui Burial Council, Cultural Resource Commission** * *Provide update on project status and planning process; obtain input on conceptual design and alternatives*		
	Community Updates		**Native Hawaiian Community** * *Provide update on project status and planning process; seek input on stakeholder needs and desires*	**Businesses in Lahaina Community** * *Provide update on project status and planning process; seek input on stakeholder needs and desires*				
	Public Meetings				**Scoping Meeting** * *Facilitate public scoping process for Feasibility Report/EA through which significant project-related issues can be identified*		**Public Meeting** * *Present results of Feasibility Report/EA and seek stakeholder comments*	
	Project Website	**All Stakeholders** →						

NOTES:
[1] In addition to these agency meetings, a series of meetings will be held with agencies that have specific technical expertise that is needed for conceptual project design and alternatives development. Specifically, staff from the U.S. Fish and Wildlife Service (USFWS) will be consulted through a series of Technical Advice and Coordination (TAC) meetings.

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The USACE recently initiated the West Maui Watershed Plan with the State of Hawai`i under Section 729 of WRDA 1986. The study entered the feasibility phase in September 2010, and is seeking to address problems related to impacts to stream resources, impacts to groundwater quality and quantity, watershed degradation, impacts to coral reef/nearshore waters, flooding and sedimentation, and general concerns associated with climate change, land ownership, transparency of regulations, and education and outreach. The West Maui Watershed study area is north of Lāhainā, extending from Kā`anapali to Honolua.

1.9.2 Other Prior and Ongoing Actions

Other prior studies and actions in the Lāhainā region include the following:

- Lāhainā Bypass Highway (State of Hawai`i, Department of Transportation), which involves the realignment of Honoapi`ilani Highway through Lāhainā; construction on the second phase of the project began in October 2010.
- Lāhainā Watershed Flood Control Project (NRCS, West Maui Soil and Water Conservation District, and the County of Maui), which involves construction of a floodwater diversion system above Lāhainā town to reduce flooding and erosion; construction of the project began in January 2010.
- Lāhainā Town Drainage Master Plan (County of Maui), which addresses systematic improvements to Lāhainā's storm drain system; the schedule for construction of this project is not known.
- Lāhainā Recreation Center Expansion (County of Maui), which involved the construction of additional fields and a restroom facility; the project was recently completed.
- West Maui Mountains Watershed Management Plan (West Maui Mountains Watershed Partnership), which describes current watershed management programs and activities occurring in the West Maui Mountains, and projects future programs in each of six areas of management priority: feral animal control, weed control, human activities management, public education and awareness, water and watershed monitoring, and management coordination improvements.

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2.0 Objectives and Constraints

This section presents the results of the first step of the planning process, the specification of the problems and opportunities associated with the federal objective and state and local concerns (U.S. Water Resources Council, 1983).[7] Problems and opportunities are those conditions that can be addressed through water-resource and related-land-resource management within a study area, and serve as the foundation for the remainder of the planning process. Objectives and constraints are established from the problems and opportunities, and provide the framework within which alternative plans for ecosystem restoration are formulated and evaluated.

For the purposes of this project, the USACE feasibility planning process focused specifically on restoration of wetland habitat within Loko o Mokuhinia, as established during the reconnaissance phase. Based on a landscape perspective, there is considerable ecological value associated with wetland restoration at this site. It is located in an area that historically supported coastal wetlands, which extended through portions of West Maui. These coastal wetlands provided a network of habitat for a variety of native vegetation and wildlife species, including waterbird species such as the Hawaiian stilt and coot. However, over the course of the last century, agricultural and urban development dramatically altered the landscape, with extensive filling of wetland habitat and other modifications to surface and groundwater hydrology. Although very little suitable wetland habitat is available, Hawaiian stilt and coot still transit this area, as they are known to disperse between areas that support suitable wetland habitat within and amongst the neighboring islands (Reed et al., 1998a; Engilis and Pratt, 1993). Within and surrounding the Lāhainā area, these species have been observed in low-lying, undeveloped areas, particularly during periods when these sites are temporarily ponded. Limited by habitat availability, the long-term viability of these species is dependent on establishing and managing a network of suitable habitat (USFWS, 2011a); however, in the Lāhainā area, opportunities to restore former wetland habitat are severely limited by the extent of urbanization and development. Very little undeveloped land remains in the Lāhainā area, such that Loko o Mokuhinia is believed to be one of the few remaining locations that historically supported wetland habitat, and is still both undeveloped and available for restoration. For these reasons, and at the County of Maui's request, this feasibility study focuses specifically on the restoration of Loko o Mokuhinia.

2.1 Problems and Opportunities

As emphasized in the IWR Planning Manual (Yoe and Orth, 1996), proper identification of problems and opportunities is a critical step in the planning process, as it provides the basis for the project objectives. Problem and opportunity statements should be simple statements, but should be further defined to identify the nature, cause, location, dimension, origin, timeframe, and importance of the problem.

Specific to the Mokuhinia Ecosystem Restoration Project, the following problems were identified by the PDT:

- **Loss of wetland habitat:** Loko o Mokuhinia was historically comprised of an approximately 17-acre pond, one in a series of coastal wetlands located along the western shoreline of Maui. These wetlands provided important hydrologic and biogeochemical functions, as well as habitat for a variety of valued wetland species, including Hawaiian waterbirds and migratory bird species. Over time, alterations to the hydrologic regime resulted in stagnation of Loko o Mokuhinia, and, in 1914, the site was filled for hygienic and development purposes; it remains covered by approximately 2 to 3 feet of fill. The loss of

[7] The federal objective of water and related land resources planning is to contribute to national economic development (and national ecosystem restoration), consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other federal planning requirements (U.S. Water Resources Council, 1983; USACE, 2000).

Loko o Mokuhinia, as well as other similar habitat in the region, has resulted in very little remaining coastal wetland habitat in West Maui. Decreased habitat availability has affected a variety of wetland-dependent species, including the endangered Hawaiian stilt and coot, for which habitat loss has been identified as a key cause of decline and a limiting factor in their recovery (USFWS, 2011a; Reed et al., 2011).

- **Impacts to important cultural site**: Historically, Loko o Mokuhinia supported Moku`ula, an approximately 1-acre island, which was the preferred residence of King Kamehameha III when he ruled the Hawaiian kingdom from Lāhainā in the mid-nineteenth century. The site was also sacred to the worship of Kihawahine, the spiritual guardian of the royal family. Given its history, Mokuhinia/ Moku`ula is considered to be a sacred cultural site and is part of the Hawaiian community's living culture. Both Loko o Mokuhinia and Moku`ula were buried when the site was filled in 1914. Although the historic and archaeological features are still present below the ground surface, the placement of fill impacted the cultural use and values associated with the site. Revitalization of the archaeological and cultural resources cannot be directly addressed by the project, as it is not within the USACE's authority; however, inasmuch as restoration of the habitat associated with Mokuhinia provides for use and revitalization of these resources, this problem may be indirectly addressed by the project.

Given these problems, there are opportunities to do the following:

- **Restore the wetland habitat associated with Loko o Mokuhinia:** The pond and associated wetland that previously existed within Loko o Mokuhinia may be restored to provide aquatic habitat functions and values, including habitat for the endangered Hawaiian stilt and coot and migratory bird species.
- **Provide a foundation for the cultural revitalization of Moku`ula:** Through restoration of the pond and associated wetland that previously existed within Loko o Mokuhinia, there is an opportunity to provide a tangible connection to the site's history, thus contributing to the subsequent revitalization of the cultural and archaeological resources by the native Hawaiian community.

2.2 Objectives and Constraints

As specified in the P&G (U.S. Water Resources Council, 1983), all water- and related-land-resource implementation studies should consider the federal objective as part of the project planning process. The objective of USACE ecosystem restoration efforts is to "restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition. Restored ecosystems should mimic, as closely as possible, conditions which would occur in the area in the absence of human changes to the landscape and hydrology" (USACE, 2000). Restoration of ecosystem functions and processes at Mokuhinia is consistent with this federal objective for ecosystem restoration.

2.2.1 Planning Objectives and Constraints

Specific planning objectives should be defined based upon the problems and opportunities identified for a study area (Yoe and Orth, 1996). Consistent with ER 1105-2-100, project-specific planning objectives are "statements that describe the desired results of the planning process," and are specific to the problems and opportunities identified for the project site. In addition to guiding the plan formulation and evaluation process, the planning objectives are used to provide measures of success for project implementation, and are incorporated into the performance monitoring plan. Project-specific constraints are items or conditions that the alternative plans should avoid; they can be related to legal, policy or resource limitations. Objectives and constraints should be developed to be specific, flexible, measurable, realistic, attainable and acceptable.

Overall, the goal of the project is to restore a portion of the pond and associated wetlands of Loko o Mokuhinia to provide aquatic ecosystem functions and values, with consideration given to the subsequent

cultural revitalization of Moku`ula by the native Hawaiian community. Based on this goal, and given the identified problems and opportunities, the planning objectives were developed and subsequently refined based on input from the non-federal sponsor and project stakeholders. The planning objectives are defined as follows:

- Re-establish wetland functions and values associated with Loko o Mokuhinia
- Maximize foraging habitat for the endangered Hawaiian stilt and coot throughout the year
- Provide habitat for migratory waterfowl and shorebird species

The planning constraints that were identified to date include the following:

- Avoid conflicts with existing and planned development and land uses (including those associated with Moku`ula and the area reserved for Friends of Moku`ula)
- Avoid creation of a "sink" for endangered species as a result of predation
- Avoid conflicts with land use restrictions/zoning standards within the historic district
- Avoid and/or minimize impacts to extant archaeological features within the project site
- Avoid conflicts with protection and use of cultural resources within the project site

Consistent with the intent of the USACE planning process, the goal and objectives were iteratively refined in response to the constraints. For example, the goal calls for restoration of a *portion* of the pond and associated wetland, which is based on the planning constraint that directs the project to avoid conflicts with existing and planned development and land uses. The project site is heavily constrained by adjacent urban development, some of which falls within the historic boundaries of Loko o Mokuhinia. Restoration of the entire wetland habitat was determined to be beyond the scope of the project, and is reflected in the goal statement.

Given the habitat conditions that previously occurred within Loko o Mokuhinia, and with consideration given to species habitat requirements, the planning objectives were focused on providing habitat for the endangered Hawaiian stilt and coot, as well as migratory waterfowl and shorebird species.[8] In response to the planning constraint associated with creation of a "sink" for endangered species, the objectives were refined in close coordination with USFWS to specifically focus on foraging habitat, rather than nesting habitat. Predation is widely recognized to be a significant threat to Hawaiian stilt and coot, with predators including both introduced species (such as dogs, cats, mongoose, rats, cattle egret, barn owls, and bullfrogs) and native species (such as the Hawaiian short eared owl [*pueo*]). The constraint reflects the concern that predation and human interaction associated with the urbanized surroundings could lead to non-productivity because of failed nests. Although stilts and coots using foraging habitat may be affected by these threats, eggs and chicks in nesting areas are considered to be particularly vulnerable. Therefore, the planning objectives are focused on providing suitable habitat for the species, while reducing the greatest predation threats; additional measures to further address predation were incorporated into the plan formulation process, as discussed in Section 5.0.

[8] Although the Hawaiian moorhen once occurred on Maui, its current range is restricted to O`ahu and Kaua`i. Similarly, the Hawaiian Duck has been extirpated from all islands except Kaua`i. The species was re-introduced to Maui, but breeding with feral mallard ducks has resulted in a hybrid population (Reed et al., 2011).

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3.0 Affected Environment

Chapter 3 provides an assessment of the historical, existing, and future without-project conditions within the affected study area environment. This chapter corresponds to step two in the planning process: inventorying and forecasting resources relevant to the problems and opportunities under consideration. This information helps to further clarify the problems and opportunities, while also providing the foundation for alternative plan formulation and evaluation. The historical conditions are presented as a point of reference and help to document the aquatic ecosystem functions and values that previously existed within the study area; specifically, the description of historical conditions addresses site conditions before western contact (pre-Contact) and subsequent changes through the 20th century. The description of existing conditions summarizes the conditions that currently exist for resources within and surrounding the study area. The description of the future without-project conditions identifies the conditions that are most likely to occur in the future if the project is not implemented; this information will serve as the basis for comparison of alternatives. In addition to addressing these feasibility study requirements, this chapter also describes aspects of the affected environment in accordance with NEPA and HRS Chapter 343.

The level of detail for each resource is generally based on the relevance to the project objectives and constraints and is commensurate with the scale of the project. Particular emphasis is placed on those aspects of the environment that most closely relate to the planning objectives and constraints, including hydrology, biological resources, and cultural resources.

3.1 Historic Conditions

As previously described, Mokuhinia was historically a coastal wetland, located within a larger network of wetlands along the western shoreline of Maui (Figure 5). Data obtained through archaeological investigations indicate that it was a naturally occurring pond, perhaps as large as 17 acres, within which a mud bar formed from alluvial deposits. Groundwater springs were the primary source of water, although it is thought that surface flow may have supplemented water volumes (Klieger, 1995; Klieger, 1998).

FIGURE 5
Loko o Mokuhinia (with Moku`ula in center ground), circa 1893 (Source: Horner, Bishop Museum; from Klieger, 1998)

Pollen analyses from soil cores collected during archaeological investigations of the site indicate an abundance of sedges (Cyperacaea), and the wetland appears to have been represented by a vegetation community described by Wagner et al. (1990) as Coastal Wet Sedgeland. It likely supported a complex of species including *`aka`akai* (*Schoenoplectus* sp.), *kaluha* (*Bolboschoenus* sp.), and *makaloa* (*Cyperus* sp.). Within the surrounding upland areas, the pollen analyses indicated the presence of *loulu* palms (*Pritchardia hillebrandii*), and following Polynesian arrival, the introduction of native Hawaiian heritage crops, (plants that were brought during Polynesian migration to the Hawaiian Archipelago) such as *niu* (*Cocos nucifera*) and *kalo* (*Colocasia esculenta*) (Klieger, 1998). The vegetation within and surrounding the pond in the late 19th century is generally shown in Figure 5.

Archaeological research indicates a continual deposition of alluvial material into the pond over time, with the rate of deposition accelerating, particularly in association with human habitation of the area. The native Hawaiians enhanced this accretion by constructing a stone retaining wall around the silt bar and depositing pond sediments and other material within the enclosure (Klieger, 1995; Klieger, 1998). This created the island of Moku`ula in the southwestern portion of the pond (Figure 6).

FIGURE 6
Mokuhinia and Moku`ula, circa 1851 (Source: Watercolor by James Gay Sawkins. Rex Nan Kivell Collection, NK6298/68, National Library of Australia; from Klieger, 1998)

Modifications were made to the pond and island, particularly during the 1830s, when the island served as the primary residence of King Kamehameha III. At that time, the island was approximately 1 acre in size, with two holding ponds located along the western edge of the island. Documents suggest that these ponds were located atop the freshwater springs that were the main source of water to Loko o Mokuhinia; the ponds were likely used for collecting water, bathing and/or keeping fish (Boundary Commission Award of 1879; from Klieger, 1998). The general configuration of Mokuhinia and Moku`ula at this time is shown in a sketch by Monsarrat, dated from the late 1840s (Figure 7).

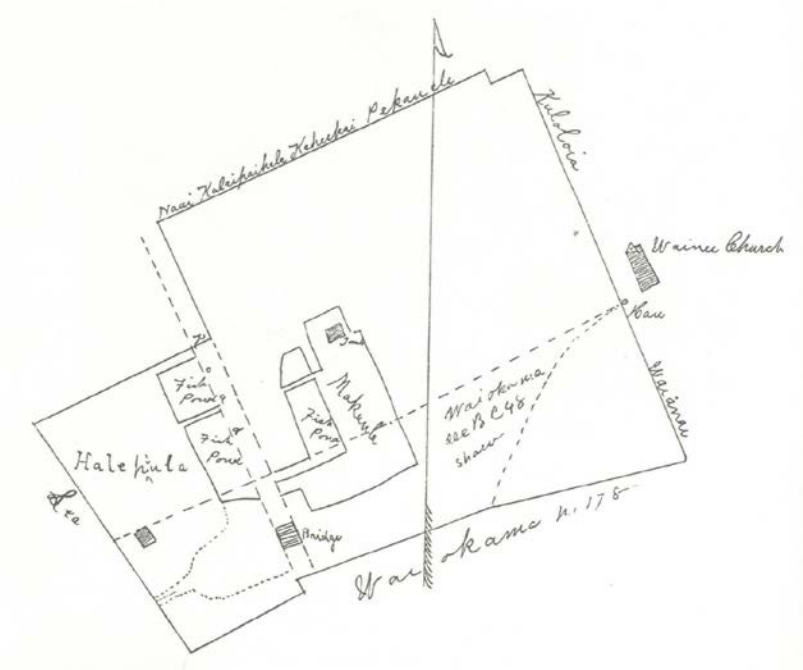

FIGURE 7
Sketch of Mokuhinia and Moku`ula by Monsarrat, circa late 1840s (From Klieger, 1998)

Subsequent documentation suggests the dimensions and configuration of the pond and island may have continued to be modified over time. Figure 8 shows an excerpt of a Hawai`i Government Survey by S.E. Bishop in 1884.

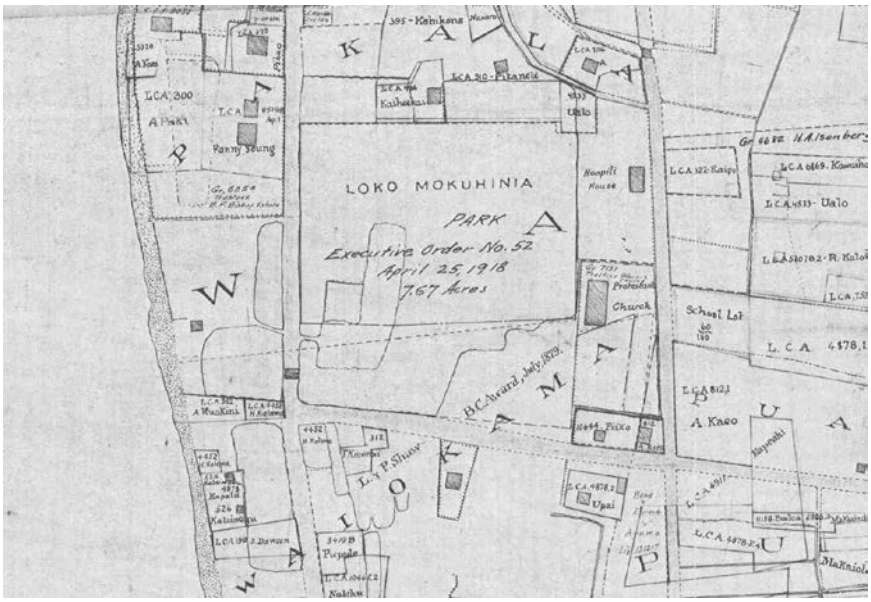

FIGURE 8
Excerpt from Hawaiian Government Survey of the Town of Lāhainā, Maui (S.E. Bishop), 1884

By the early 20th century, conditions at the site had deteriorated and, in 1914, the pond was filled for hygienic and development purposes. Subsequently, a 1918 State Executive Order turned the area over to the County of Maui for the establishment of Malu`ulu o Lele Park. The site continues to be managed as a park by the County of Maui.

3.2 Existing Conditions

The following section summarizes the conditions that currently exist for resources within and surrounding the project site. These include both resources that are (1) directly relevant to the planning objectives and constraints and are considered as part of the evaluation of alternatives and (2) for which potential impacts are assessed in compliance with NEPA and HRS Chapter 343. These include a range of social, environmental, and cultural resources, including the following:

- Climate
- Land Use
- Geology and Soils
- Hydrology and Water Resources
- Biological Resources
- Archaeological, Historic, and Cultural Resources
- Recreation
- Visual and Scenic Resources
- Hazardous, Toxic, and Radioactive Waste
- Air Quality
- Noise
- Transportation and Traffic
- Public Utilities
- Health and Human Safety
- Socioeconomic and Environmental Justice

For most resources, the study area considered in the assessment is limited to the project site, as shown in Figure 3. For some resources, conditions at the project site must be considered within the context of the surrounding area: for example, land use, aesthetics, noise, traffic, and socioeconomics. The study area considered for the assessment of these resources includes the surrounding parcels. Similarly, the conditions relative to resources that occur across a broader area – climate, geology, and air quality – were considered at a regional scale.

3.2.1 Climate

Hawai`i's subtropical climate is governed by easterly trade winds that regulate weather patterns as part of the North Pacific high pressure anticyclone. The 'Pacific High,' and with it the trade wind zone, moves north and south with the sun, so that it reaches its northern-most position in the summer half-year. This brings the heart of the trade winds across Hawai`i during the period May through September, resulting in trades that are prevalent 80 to 95 percent of the time. From October through April, the trade winds move to the south, resulting in decreased frequency of the trades.

A notable feature of Hawai`i's climatic regime is the small annual temperature range. The annual difference in the range of monthly average maximum temperature and monthly average minimum temperatures is less than 7 degrees Fahrenheit (°F) over the course of the year, as shown in Table 2.

TABLE 2
Monthly and Annual Average Temperature and Precipitation

Climate Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (°F) [1]	81.4	81.4	82.3	83.5	84.7	86.3	87.4	88.1	88.2	87.3	85.2	82.8	84.9
Average Min. Temperature (°F) [1]	63.3	63.0	63.8	64.8	66.4	67.7	69.0	69.7	69.4	68.5	66.8	64.5	66.4
Average Total Precipitation (inches) [2]	2.57	1.72	1.14	0.50	0.41	0.20	0.19	0.20	0.22	0.61	1.80	2.77	12.32

Notes:

[1] **The temperature data is that collected from the National Weather Service Climate Station Lāhainā 361 (515177) for the period between 1949 and 2001 (National Oceanographic and Atmospheric Administration [NOAA] Western Region Climate Center).**

[2] **The precipitation data for the project site was derived from the Rainfall Atlas of Hawai`i (Giambelluca et al., 2011).**

Giambelluca et al. (2011) published a series of maps showing mean annual rainfall across the State of Hawai`i; the map for the islands of Molokai, Lāna`i, Maui and Kahoolawe is shown in Figure 9. The project site is on the leeward side of the West Maui, bounded to the east by Pu`u Kukui, which rises to an elevation of 5,788 feet above sea level (amsl). The combination of mountains and trade winds result in a steep rainfall gradient above the project site. The estimated annual precipitation at the mountain crest is approximately 365 inches and the annual precipitation for the project site is approximately 12.3 inches, which equates to a gradient of approximately 58 inches per mile. Within the coastal plain, the rainfall gradient is significantly less, although one still exists. As noted in Table 2, the majority of the rainfall at the project site occurs between October and March (inclusive).

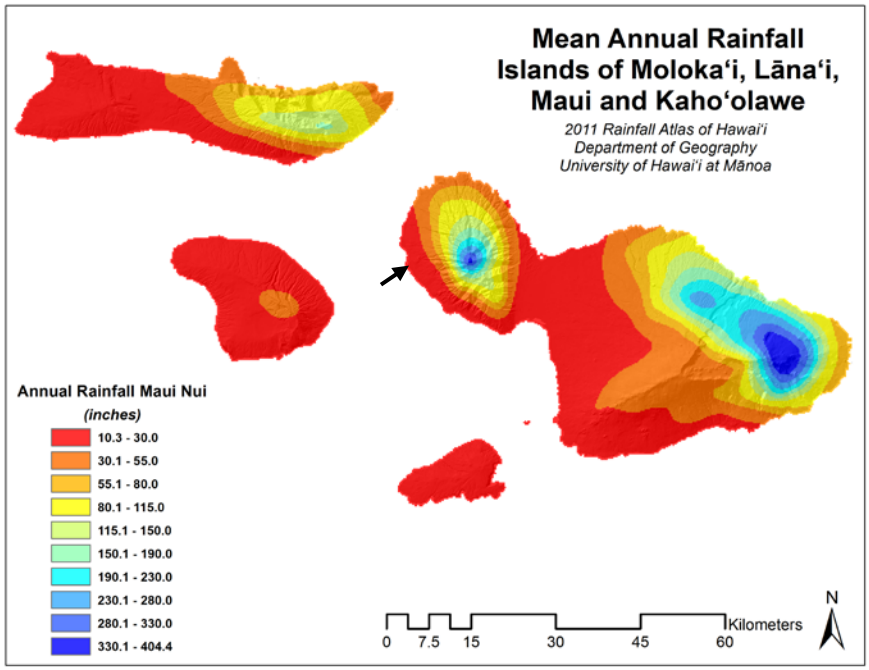

FIGURE 9
Mean Annual Rainfall for the Islands of Molokai, Lāna`i, Maui and Kaho`olawe (Giambelluca et al., 2011); the approximate location of the project site is indicated by the black arrow

The warm temperatures, solar radiation, constant trade winds, and seasonally dry humidity contribute to high rates of evaporation in the project area. Pan evaporation data were collected as part of a study by Engott and Vana (2007) to assess the effects of agricultural land use and changes in rainfall on groundwater recharge in Central and West Maui. As shown in Figure 10, pan evaporation in the project area is between 80 and 90 inches per year, exceeding rainfall by approximately 65 to 75 inches annually.

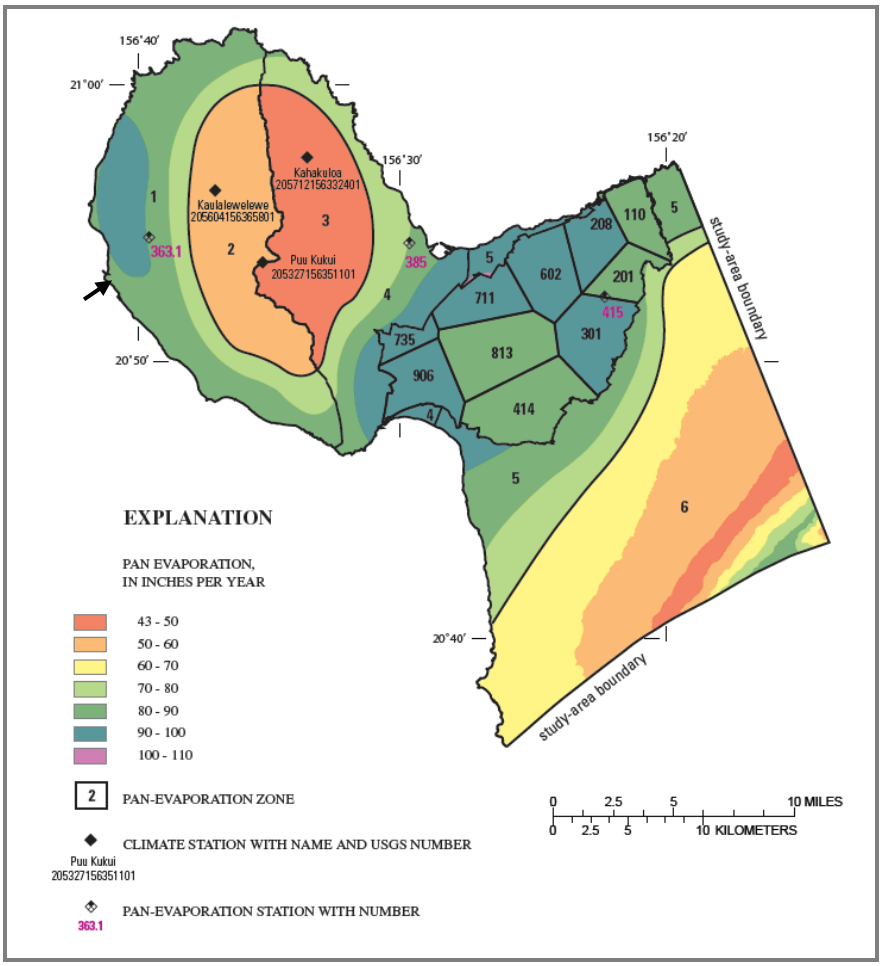

FIGURE 10
Mean Annual Pan Evaporation and Pan Evaporation Zones (from Engott and Vana [2007]); the approximate location of the project site is indicated by the black arrow

3.2.2 Land Use

Land use is typically defined to reflect either natural or human activities that occur, or could occur, at a given location. In general, land uses are controlled by state land use designations and by county zoning boundaries. Under HRS Chapter 205-2, the State Land Use Commission has the authority to designate all land within the state as one of four districts—urban, rural, agricultural, or conservation—based on the general activities and uses of the land. Land use is further regulated by the County of Maui through zoning boundaries, within which development standards are specified for various activities. In addition to the zoning boundaries, there are additional zoning designations that are subject to additional regulation. In particular, the Special Management Area (SMA) is regulated by the County under Hawai`i's Coastal Zone Management (CZM) program. Following is a discussion of the existing land uses within and surrounding the site, followed by a discussion of the applicable state land use and county zoning designations.

3.2.2.1 Existing Land Use

The majority of the project site is currently used for Malu`ulu o Lele Park, which was created in 1918 through the placement of fill over Moku`ula and Loko o Mokuhinia. The park is comprised of a relatively flat field, with recreational facilities including tennis courts, basketball courts, and a baseball/softball field, and parking lots. The park and its facilities are not heavily used, and as further described in Section 7.7,

the County of Maui has been actively replacing these facilities elsewhere in Lāhainā in anticipation of the site restoration. Immediately adjacent to the park, in the southern portion of the project site, the Salvation Army operates its Lāhainā Outpost, providing services to needy individuals and families.[9] A County wastewater pump station is located along the western edge of the project site; as described in Section 1.8.2, this facility is not part of the project area. The TMK parcels within the project site are listed in Table 3 and are shown in Figure 11.

TABLE 3
Tax Map Key (TMK) Parcels and Land Ownership

Tax Map Key (TMK) Parcel	Current Use	Land Owner
(2)4-6-007:001	Malu`ulu o Lele Park (vacant)	State of Hawai`i (Assigned to the County of Maui by State Executive Order No. 3430 [1989])
(2)4-6-007:002	Malu`ulu o Lele Park	State of Hawai`i (Assigned to the County of Maui by State Executive Order No. 52 [1918])
(2)4-6-007:036	Friends of Moku`ula Parking Lot	State of Hawai`i (Assigned to the County of Maui by State Executive Order No. 02889 [1978])
(2)4-6-007:037	Salvation Army, Lāhainā Outpost	Salvation Army[1]
(2)4-6-007:038	Salvation Army, Lāhainā Outpost	Salvation Army[1]

NOTES:
[1] Through direct coordination with the Salvation Army, the County of Maui is working to acquire these parcels. The Salvation Army operations would be relocated to a new, undetermined location.

The site is bounded to the south by Shaw Street, which intersects with Honoapi`ilani Highway, and to the west by Front Street, the principle two-lane road serving downtown Lāhainā. Front Street was recently named one of America's "Top Ten Greatest Streets" by the American Planning Association, a designation which recognizes the visual, cultural, and economic attributes of an area, as well as its accessibility to the community. Mokuhinia Way runs along the north side of the property, ending at a small parking lot (approximately 32 parking spots) behind the baseball/softball field located in the northeast corner of the property. In addition, a ditch that drains the areas above Honoapi`ilani Highway down to the ocean is located along the northern edge of Mokuhinia Way (Belt Collins, 2005).

The areas surrounding the project site are comprised of a variety of residential, recreational, religious, and commercial uses (Figure 11). To the south, across Shaw Street, is a series of residential homes. Adjacent uses along the *mauka* side of the project site include Waiola Congregational Church (and its associated graveyard) and the Lāhainā Hongwanji Mission. Adjacent to the northern boundary of the project site, across Mokuhinia Way, is the Alano Club (a sober community meeting space), Na `Aikane o Maui (a cultural resource center), a residence, and a vacant lot. Adjacent uses along the *makai* (ocean-ward) boundary, across Front Street, include The Shops at 505 (a tourist-oriented shopping center), Kamehameha Iki Park (Hale Piula Shoreline Park), Hui o Wa`a Kaulua (an organization focused on traditional Hawaiian navigation and cultural education), and a small cluster of residential structures.

9 Through direct coordination with the Salvation Army, the County of Maui is working to acquire the parcels. The Salvation Army operations would be relocated to a new, undetermined location.

3.2.2.2 Zoning and Land Use Designations

Land uses in Hawai`i are generally controlled by state land use designations, and further by county zoning designations. The project site, along with the rest of Lāhainā town, falls entirely within the state Urban district. Regulation of land use within the state Urban district is delegated to the County.

The County has zoned a portion of Lāhainā town, including the project site, as a Historic District (HD1); land use regulations within this district are specified in the Maui County Code (Section 19.52). Other designations recognizing the historical significance of Lāhainā town in general, and the project site in particular, are further discussed in Section 3.2.6.

In addition to the zoning boundaries, the County also regulates activities in the SMA, within which additional development standards and restrictions apply. The SMA is intended to facilitate compliance with the objectives of the State's CZM program, and generally extends from the shoreline inland (ranging from 100 yards to several miles in width). In this area, the SMA extends up to Honoapi`ilani Highway, such that the project site falls entirely within the SMA (Figure 11).

3.2.3 Geology and Soils

3.2.3.1 Geology

The island of Maui was formed by two overlapping shield volcanoes: West Maui Volcano (Mauna Kahalawai), which rises to an altitude of 5,788 feet at Pu`u Kukui; and East Maui Volcano (Haleakala), which rises to an altitude of 10,023 feet at Pu`u `Ula`ula. The project site is located on the west flank of the West Maui Volcano. Four individual rift zones are identified for West Maui, which are much less well defined than are those of most Hawaiian volcanoes. It has been noted that dikes tend to radiate in all directions from the summit of West Maui, and that this radial arrangement of the eruptive fissures and vents is responsible for the nearly circular form of the volcano (MacDonald et al., 1983).

The geologic substrate of West Maui includes volcanic features associated with several stages of volcanism, including the Wailuku Volcanic Series, the Honolua Volcanic Series, and the Lāhainā Volcanic Series (Figure 12). The oldest, and most widespread lavas are associated the Wailuku Volcanic Series, and consist primarily of primitive basalt and olivine basalt lavas, with an average age of 1.32 million years (Langenheim and Clague, 1987). Typically the Wailuku Volcanics occur as thinly bedded *a`a* and *pahoehoe* flows; however, in some parts of West Maui, volcanic dikes associated with the Wailuku eruptions extend to the coast. In many areas, the Wailuku lavas are overlain by andesitic-trachytic rocks of the Honolua Volcanic series, post-shield stage lavas erupted after a period of quiescence during which limited weathering and erosion of Wailuku basalts occurred. Still later in the volcano's history, the Lāhainā Volcanic Series eruptions occurred, forming cinder cones and lava flows in a relatively small geographic area generally located between Olowalu and Lāhainā (MacDonald et al., 1983).

In the Lāhainā area, terrigenous and marine sedimentary deposits cover the Wailuku Volcanics in a relatively thin wedge-shaped deposit near the coast. Near the shoreline, drilling logs show that the sediments are as much as several tens of feet thick. An existing well located about 0.5 mile northwest of the project site and approximately 700 feet from the coast is 78 feet deep and extends through the sediments into Wailuku Basalt (Oceanit, 2009).The sediments and weathered top portion of Wailuku Basalt may act as an aquitard to the basal aquifer within Wailuku flank lavas, somewhat impeding upward movement of the deeper basal groundwater.

VICINITY MAP

LEGEND

- Moku'ula/Mokuhina Site
- Mokuhinia Ecosystem Restoration Project Site
- Special Management Area
- TMK Boundary

0 125 250 Feet

1 inch = 250 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 11
Land Use
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

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\\NALA\PROJ\USARMYCORPSOFENGINEE\427511MOKUHINIA\15_GIS\MAPFILES\FIGURE12_LANDUSE.MXD ACOSS 2/20/2013 12:03:24 PM

The project site is located on this thin wedge of alluvium (Figure 12). An outcrop of Honolua Volcanics occurs approximately 1.7 miles northeast of the project site, and an outcrop of Lāhainā Volcanics occurs about 1 mile north of the project site. Although these occur in the vicinity of project, they are unlikely to affect the local hydrogeology.

3.2.3.2 Seismicity

In Hawai`i, seismicity is associated with volcanism and earth movement along faults; earthquakes are typically more concentrated in volcanically active areas, primarily around the island of Hawai`i. Although Maui's Haleakala Volcano is also a source of potential seismicity, much of the seismicity on Maui is related to earth movement along localized faults, and seafloor fractures and faults. One of the largest in the area, the Molokai Fracture Zone is an extension of a transform fault from the East Pacific Rise that reaches from Molokai to the Gulf of California (Furumoto et al., 1990; Fletcher et al., 2002). Two known earthquakes have occurred along the fracture, in 1871 (magnitude 7.0) and 1938 (magnitude 6.7 to 6.9), leading to designation of this area as the Molokai Seismic Zone (Furumoto, 1980).

Based on studies of the seismic history over the last two decades, the seismic risk in the main Hawaiian Islands, including Maui, is believed to be greater than generally perceived by the public (Fletcher et al., 2002). In 1994, Maui County upgraded the Uniform Building Code (UBC) seismic risk ranking for Maui Island from 2 to 2B, reflecting this higher risk.[10] In the *Atlas of Natural Hazards in the Hawaiian Coastal Zone*, Fletcher et al. (2002) ranked the seismic hazard along the Lāhainā coast as moderately high (Zone 2).[11]

3.2.3.3 Topography and Soils

The project site is relatively flat, with only about 20 to 30 centimeters of elevational change across the site (Klieger, 1998). Ground surface elevations range from approximately 5 to 7 feet amsl (Oceanit, 2009).

Based on the soil classification system used by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS), the soils of the Lāhainā plain are within the Pulehu-Ewa-Jaucas association. These soils are generally level to moderately sloping, well-drained to excessively drained, have a moderately textured to coarse-textured subsoil or underlying material, and are generally developed as alluvium weathered from basalt and/or calcareous material. The predominant soil type at the project site is classified as Ewa Silty Clay Loam (EaA). This soil type is within the mollisol soil order, which is typically comprised of dark colored, base-rich mineral soils that are excellent for agricultural production. These are often used in Hawai`i for sugar cane production, pasture, and wildlife habitat. Runoff is typically very slow and erosion hazard is classified as slight for this soil type (Foote et al., 1972).

[10] The UBC system classifies seismic hazards on the basis of the expected strength of ground shaking and the probability of the shaking actually occurring within a specified time. The ranking is based on six seismic zones, ranging from 0 (no chance of severe ground shaking) to 4 (10 percent chance of severe shaking in a 50-year interval).

[11] The hazard ranking accounts for variability in (1) geology, (2) UBC seismic zone factor rankings, (3) history of volcanic and seismic activity, and (4) recent scientific predictions of the probability distribution of seismic hazards in the main Hawaiian Islands (Fletcher et al., 2002).

VICINITY MAP

LEGEND

Moku'ula/Mokuhina Site

Mokuhinia Ecosystem Restoration Project Site

Geologic Units

Alluvium

Older Alluvium

Lahaina Volcanics, Basanite of Puu Laina

Honolua Volcanics

Wailuku Volcanics

0 1,500 3,000 Feet

1 inch = 3,000 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 12
Geology
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

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\\NALA\PROJ\USARMYCORPSOFENGINEE\427511MOKUHINIA\15_GIS\MAPFILES\FIGURE13_GEOLOGY.MXD ACOSS 2/20/2013 12:38:14 PM

Specific information regarding the soils within the project site was gathered through soil borings collected during a 2011 site investigation (as further described in Section 3.2.9). As part of this effort, a total of 17 soil bores were collected, with total depths ranging between 110 centimeters (3.6 feet) and 181 centimeters (5.9 feet). An archaeological monitor was present throughout the effort, providing oversight and analysis of the soil bores. The results of the analysis indicate that the upper layers of soil within the project site are comprised of fill material, with depths ranging from approximately 3.1 to 5.2 feet below ground surface (bgs). The soils encountered below these depths were identified as the historic pond sediments associated with Loko o Mokuhinia. The soils were described as clays and silty clays that are dark reddish brown (ranging from 5YR2.5/1 to 10YR2/1, per the Munsell Soil Color Chart), with a consistency ranging from massive, firm moist to sticky wet. Evidence of decomposing organic material and mottling was readily observed in the historic pond sediments. Detailed records of these logs are contained in the Arsenic Site Investigation Report (Oceanit, 2011).

3.2.4 Hydrology and Water Resources

Hydrology and water resources include both groundwater and surface water features. Groundwater refers to subsurface hydrologic resources, which often are described in terms of the characteristics of the aquifer or water table. Surface water features include intermittent or permanent bodies of water, such as streams and wetlands. As further described in the following subsections, the site does not currently support any surface water features. The proposed project would involve excavation to intercept existing groundwater, as needed to restore wetland habitat.

3.2.4.1 Groundwater

Groundwater in West Maui occurs primarily in a freshwater lens system, often referred to as basal groundwater, where lower density (lighter) fresh water floats on higher density (heavier) salt water. The fresh and salt water are separated by a mixing or transition zone where salinity gradually increases from near fresh to near sea water quality. The quantity of available fresh water is partially a function of the dynamics of the transition zone. Factors such as tides, aquifer development and pumpage, variable recharge, or low groundwater flow can result in thickening of the transition zone and a brackish lens. Groundwater field data collected at monitoring wells near the site indicate that shallow groundwater is brackish, as further discussed below. It is expected that the shallow groundwater consists of a thin basal aquifer in sediments overlying the Wailuku basalt, which may be hydraulically connected to the underlying basal aquifer within the Wailuku basalt.

Basal groundwater in West Maui occurs predominantly in Wailuku Basalt. Basal groundwater can discharge into the ocean through three different paths: (1) under the sedimentary deposits and directly into the ocean from the basalt, (2) into the sedimentary deposits and then into the ocean, or (3) into the sedimentary deposits and then into the soil or any remaining coastal wetland systems. The shallow groundwater flow gradient near the coast is often relatively flat with a net flow towards the ocean. The gradient in the shallow aquifer may be locally affected near unlined channels or streams that act as sinks.

The basal basalt aquifer is primarily recharged by rainfall in the mountainous interior of the island. To understand the groundwater recharge processes in central and West Maui, the U.S. Geological Survey (USGS) calculated groundwater recharge rates for select periods between 1926 and 2004 using a water balance approach. The resulting mean annual groundwater recharge estimates for the period between 2000 and 2004 are shown in Figure 13; the values indicated for the project site range between 0 and 10 inches.

Two separate aquifers are identified for the coastal area within the vicinity of Lāhainā and beneath the project site, including a shallow and a deeper basal aquifer. The shallow aquifer is classified as an unconfined basal aquifer within alluvial sediments that has no potential use, is neither a drinking water

source nor ecologically important, and is moderately saline, replaceable, and highly vulnerable to contamination. The deeper aquifer is classified as a basal unconfined aquifer within flank lavas that is a potential source of drinking water, slightly saline, replaceable, and moderately vulnerable to contamination.

Both shallow and basal aquifers beneath the project site are classified as being in the Launiupoko Aquifer System (60204), which is part of the larger Lāhainā Aquifer Sector (Figure 14). This Aquifer System consists of basal groundwater in both shallow sediments and the underlying Wailuku flank lavas, extending several miles inland from the coast, beyond which high-level groundwater in dike compartments is predominant (Mink and Lau, 1990). The flank lavas associated with the deeper basal aquifer are covered at the coast by a thin wedge of alluvial sediments, which may act as a leaky aquitard to upward migration of basal water. The shallow groundwater aquifer beneath the site occurs within this relatively thin layer of alluvium, and may be hydraulically connected to the deeper basal aquifer.

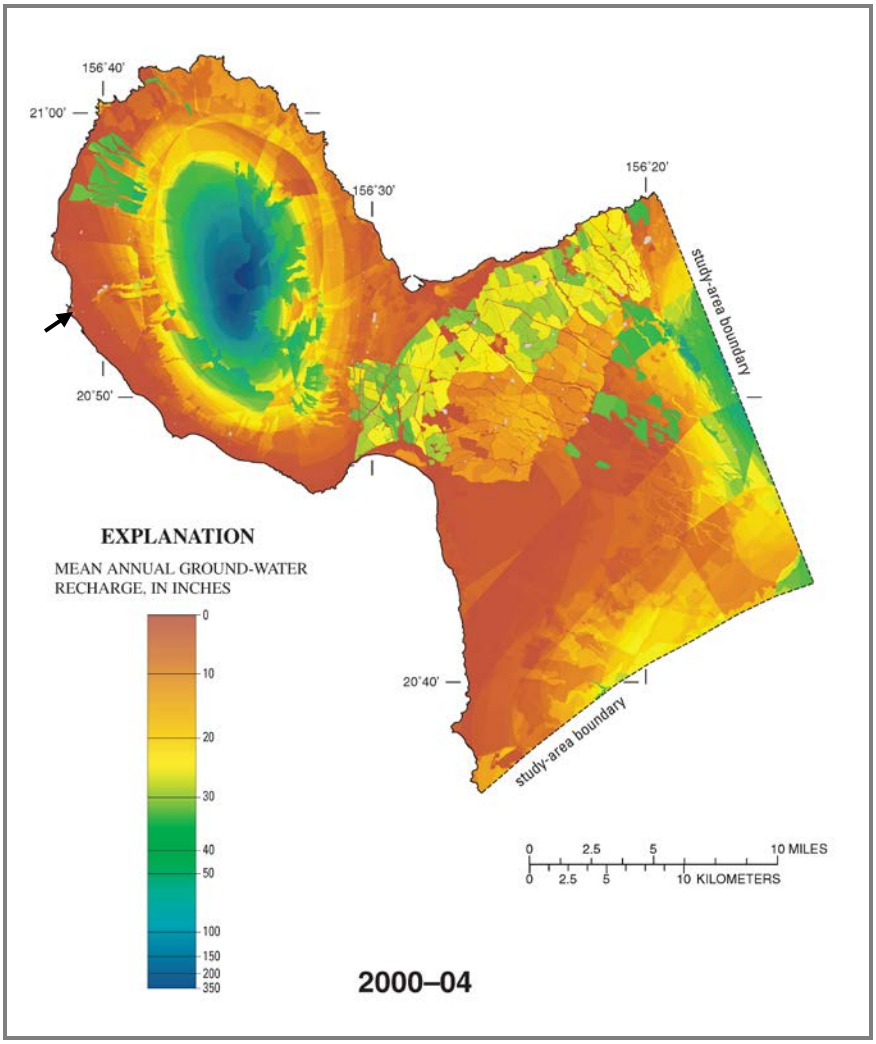


FIGURE 13
Mean Annual Groundwater Recharge Estimate (from USGS, 2007); the approximate location of the project site is indicated by the black arrow

As reported in the 1990 Water Resources Protection Plan (WRPP), the State of Hawai`i Commission on Water Resource Management (CWRM) calculated the sustainable yield of each Aquifer System, based on a simple pre-development water balance equation, as follows:

Average Rainfall (P) = Average Evapotranspiration (ET) + Average Runoff (RO) + Average Infiltration (I)

Based on this calculation, using averages from the data record (which incorporates high level and basal aquifer regions, but excludes caprock areas), the sustainable yield of the Launiupoko Aquifer System was estimated at 8 million gallons per day (mgd). The sustainable yield estimates for the Launiupoko Aquifer System are listed in Table 4. These estimates were subsequently refined as part of updates to the WRPP (based on updated modeling and data records), resulting in a revised sustainable yield of 7 mgd (CWRM, 2008).

According to the most recent reported records from the County of Maui and CWRM, the 12-month moving mean of reported pumpage in the Launiupoko Aquifer System (as of June 2010) was 0.58 mgd, a decrease of 0.14 mgd relative to the 12-month moving mean from the previous year (USGS, 2010). It is important to note that actual pumpage may actually be higher, because many water users do not report their pumpage.

TABLE 4
Sustainable Yield Estimates for Launiupoko Aquifer System Area (CWRM, 1990)

A (square miles)	P (inches/year)	RO (in/yr)	ET (in/yr)	I (in/yr)	I (mgd)	SY (mgd)
18.29	75	17	40	18	16	8 [a]

NOTE:
[a] The sustainable yield for the Launiupoko Aquifer System was subsequently updated in the 2008 WRPP to 7 mgd, but the specific components of the estimate were not reported.

To evaluate shallow groundwater conditions specific to the project site, a hydrogeologic assessment was conducted by Oceanit. Five monitoring wells were installed within the project site in August 2007; four of the wells were drilled to depths of approximately 7 feet, and one well was drilled to a depth of approximately 15.8 feet bgs. The wells were monitored for groundwater elevations over a 1-year period (August 2007 to August 2008) using dataloggers with compensation for barometric pressure. The location of these wells is shown in Figure 14.

The monitoring results indicated that during the summer, the average groundwater levels ranged from 2.91 to 2.98 amsl (approximately 2.59 to 4.02 feet bgs). During the winter, the average groundwater levels ranged from 3.16 to 4.08 amsl (approximately 1.84 to 2.34 feet bgs, with maximum water levels exceeding the ground surface at two of the five monitoring wells. The monitoring results are summarized in Table 5.

TABLE 5
Groundwater Monitoring Results (Oceanit, 2009)

Monitoring Well (MW)	Ground Elevation (feet, amsl)	Average Water Level, Summer (feet, amsl)	Average Depth to Water, Summer (feet)	Average Water Level, Winter (feet, amsl)	Average Depth to Water, Winter (feet)
1	5.5	2.91	2.59	3.16	2.34
2	5.52	2.91	2.61	3.23	2.29
3	6.97	2.95	4.02	ND	ND
4	5.92	2.98	2.94	4.08	1.84
5	5.7	2.98	2.72	3.6	2.1

Based on these monitoring results, Oceanit (2009) presented aquifer calculations to estimate groundwater flow through the project site. Aquifer transmissivity (T) and hydraulic conductivity (K) were calculated using tidal and groundwater level data from the onsite wells. Diffusivity and aquifer thickness were estimated to calculate the hydraulic conductivity from transmissivity.[12] The Dupuit Equation was then used to estimate groundwater flux, with hydraulic conductivity of 870 feet per day (ft/day) and water levels data.

The calculated summer groundwater flow though the project site was 9,569 cubic feet/day (ft^3/day) (71,578 gallons per day [gallons/day]) and the calculated winter groundwater flow was 14,212 ft^3/day (106,305 gallons/day). To evaluate the adequacy of groundwater flow to sustain the proposed wetlands, Oceanit constructed a summer and winter water balance; the water balances included precipitation, surface water flow to the site, evapotranspiration, and groundwater flow to site. Based on the year of monitoring data collected onsite and the water balance calculations, Oceanit (2009) concluded that there is adequate groundwater flow to maintain the proposed wetland.[13] A detailed discussion of these calculations is contained in the *Final Hydrogeologic Assessment Report* (Oceanit, 2009), presented in Appendix A.

3.2.4.2 Water Quality

As part of the hydrogeologic assessment, specific conductivity data were also collected from the onsite monitoring wells in January and August of 2008. In general, specific conductivity values ranged from 3 to 14 milliSeimens per centimeter (mS/cm) at elevations between 5 feet and -1 feet amsl (which equates to roughly 2.1 to 9.8 parts per thousand (ppt)); specific conductivity in the deepest well (MW 5)increased from about 10 mS/cm to 20 mS/cm at approximately -7 feet amsl. In January 2008, the average specific conductivity across the site was approximately 8 mS/cm at -1 foot amsl; water in MW 5 was increasingly brackish below about -4.5 feet amsl. In August 2008, the average specific conductivity across the site was approximately 6.2 mS/cm at -1 foot amsl; values in MW 5 increased below about -2 feet amsl. Salinity levels were consistently lower on the northwest side and higher on the southeast end of the project site (Oceanit, 2009). Groundwater pollutants, particularly arsenic, were measured as part of a site investigation, as discussed in Section 3.2.9.

3.2.4.3 Surface Water

No perennial streams occur in the immediate vicinity of the project site. Two streams flow into the ocean to the north and south of Lāhainā. Kahoma Stream flows into the ocean approximately 7,000 feet north of the project site, and Kaua`ula Stream flows into the ocean approximately 4,000 feet south of the project site. Both of these streams are perennial in *mauka* areas and become intermittent as they flow toward the shoreline. Wetlands historically occurred throughout this area, including at the project site; however, as further discussed in Section 3.2.5, they are now limited to only a few locations in the Lāhainā region.

[12] It is important to note that Oceanit did not perform a sensitivity analysis on the assumed inputs (diffusivity and aquifer thickness) to quantify the uncertainty of the hydraulic conductivity estimate. Oceanit's hydraulic conductivity estimate of 870 ft/day is outside published representative values for medium to coarse sand of 0.1 to 680 feet per day (Domenico & Schwartz, 1998).

[13] The feasibility planning process, including the development of conceptual design information is based on the groundwater monitoring data and water balance equation as presented by Oceanit. It has been strongly recommended that aquifer pump tests be conducted to validate the aquifer transmissivity and hydraulic conductivity estimates. The USACE has indicated that this work will be conducted as part of the design phase.

VICINITY MAP

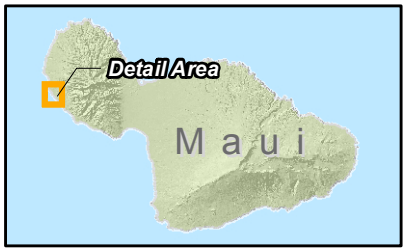
LEGEND

- Groundwater Monitoring Well
- Stream
- Moku'ula/Mokuhina Site
- Mokuhinia Ecosystem Restoration Project Site

Aquifer

- Launiupoko
- Honokowai

Sources:
Stream - DLNR Division of Aquatic Resources,2004
Aquifer - State Department of Land and Natural Resources



0 1,000 2,000 Feet

1 inch = 2,000 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 14
Water Resources
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

CH2MHILL

\\NALA\PROJ\USARMYCORPSOFENGINEE\427511MOKUHINIA\15_GIS\MAPFILES\FIGURE15_WATERRESOURCES.MXD ACOSS 2/20/2013 12:45:11 PM

As part of the National Flood Insurance Program (NFIP), the Federal Emergency Management Agency (FEMA) prepares and issues Flood Insurance Rate Maps (FIRMs) for use in setting insurance rates and defining floodplain management guidelines. The FIRMs classify land into designated zones depending on the potential for flood inundation. FIRM data shown on State of Hawai`i Flood Hazard Assessment Tool indicate that the majority of the project site is within Zone AE, with a small sliver along the eastern edge in Zone X (DLNR, 2013). Zone AE is defined as those areas subject to inundation by the 1-percent-annual-chance flood event. Zone X includes those areas that are determined to be outside the 500-year floodplain, with less than a 0.2-percent annual probability of flooding (FEMA, 2010). As the project site is primarily within Zone AE, this area is considered to be part of a floodplain, defined as "lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands; and including, at a minimum, that area subject to a one percent chance of flooding in any given year" (USACE, 1984).

A temporary diversion system was previously installed above Lāhainā to prevent overland flow and water from small unnamed drainages from flowing into the town, following flooding in 1997 (Belt Collins, 2005). This diversion channel is located approximately 3,000 feet inland of the project site. Construction is currently underway on the Lāhainā Watershed Flood Control Project, which involves the construction of a permanent diversion channel along roughly the same alignment (Belt Collins, 2005; Munekiyo & Hiraga, 2003). The channel will divert surface water to Kaua`ula Stream, south of the project site.

Localized runoff is currently collected and routed through a series of drainage ways, including the ditch that runs along the edge of Mokuhinia Way, on the northern edge of the project site. The sides and bottom of the ditch have deteriorated, resulting in ground water infiltration to the channel. Near Front Street, the ditch jogs to the north, then drains to the ocean via a box culvert that runs adjacent to Kamehameha III Elementary School. The outlet of the culvert frequently clogs with sand, restricting flow *mauka* of the outlet and resulting in standing water as far upstream as the project site (Belt Collins, 2005). The County of Maui Department of Public Works and Environmental Management recently prepared a comprehensive drainage master plan for Lāhainā town (between Kahoma Stream and Kaua`ula Stream). The plan proposes to upgrade the existing ditch to a double-box (10-foot-by-4-foot) culvert, and upgrade the culvert along the elementary school to a triple-box culvert with a flap gate at its outlet; this upgrade was listed as the top priority in the plan (Belt Collins, 2005).

As part of the master planning effort, the County of Maui and the Friends of Moku`ula agreed that runoff from the Lāhainā Town Drainage Master Plan system should be kept separate from the proposed wetland, because of concerns about the frequency, volume, and rate of flow, as well as potential pollutants (Belt Collins, 2005).

3.2.5 Biological Resources

3.2.5.1 Wetlands

As previously described, the project site was historically a coastal wetland, located within a larger network on coastal wetlands along the western Maui shoreline. In 1914, the pond was filled, and in 1918, Executive Order 52 established the site as Malu`ulu o Lele County Park. Although the site has been operated and maintained as a County park for nearly a century, some evidence of the former wetland still exists. Salt deposits, presumably associated with the brackish groundwater, are frequently present on the soil surface (USACE, 2004). In addition, ponding occasionally occurs through portions of the park (Belt Collins, 2005). To determine if any of these areas qualify as wetland habitat and are therefore subject to regulation by the USACE under the Clean Water Act, a wetland delineation was conducted within the project site. As defined in the USACE wetland delineation manual (USACE, 1987), jurisdictional wetlands require that specific criteria are met for three parameters: hydric soils, hydrophytic vegetation, and wetland hydrology (USACE, 1987). The delineation found indications of hydric vegetation and wetland hydrology (for

example, ponding during times of heavy rainfall). In addition, some evidence of hydric soils was also observed (primarily at depths greater than 18 inches). These features are relicts of the habitat that previously existed onsite as part of Loko o Mokuhinia (which, by all indications, would have met the definition of a USACE jurisdictional wetland). However, overall, the site currently does not meet the criteria for all three parameters, particularly those related to hydric soils in the upper 12 inches (NRCS, 2011). As such, it was determined that no portion of the site qualifies as a jurisdictional wetland.

As described in Section 1.3, the total area of wetland in Hawai`i has significantly decreased over time, including more than 30 percent of lowland wetlands across the state (Dahl, 1990; PCJV, 2006). The *Strategic Plan for Wetland Conservation in Hawai`i* (PCJV, 2006) presents maps that document the location of wetlands by island; the map of wetlands on Maui is shown in Figure 15. As shown in this figure, the remaining wetlands in the Lāhainā region are limited to those associated with the Lāhainā Aquatic Center (Site #23, approximately 0.25 mile northeast of the project site), Kā`anapali Golf Course Pond (Site #22, approximately 3.5 miles north of the project site), Waihukuli and Crater Reservoirs (Sites #45 and #46, approximately 1.8 miles north of the project site), Launiupoko Point Reservoir (Site #44, approximately 3.2 miles southeast of the project site), and Cut Mountain (Site #24, approximately 3.9 miles southeast of the project site). The most significant wetland resources on Maui, particularly from a wildlife perspective, are Kealia Pond (located in Kihei, approximately 14 miles southeast of the project site) and Kanaha Pond (located in Kahului, approximately 14 miles east of the project site). Kealia Pond is managed as a National Wildlife Refuge by the USFWS. Kanaha Pond is managed by the State of Hawai`i, Department of Land and Natural Resources.

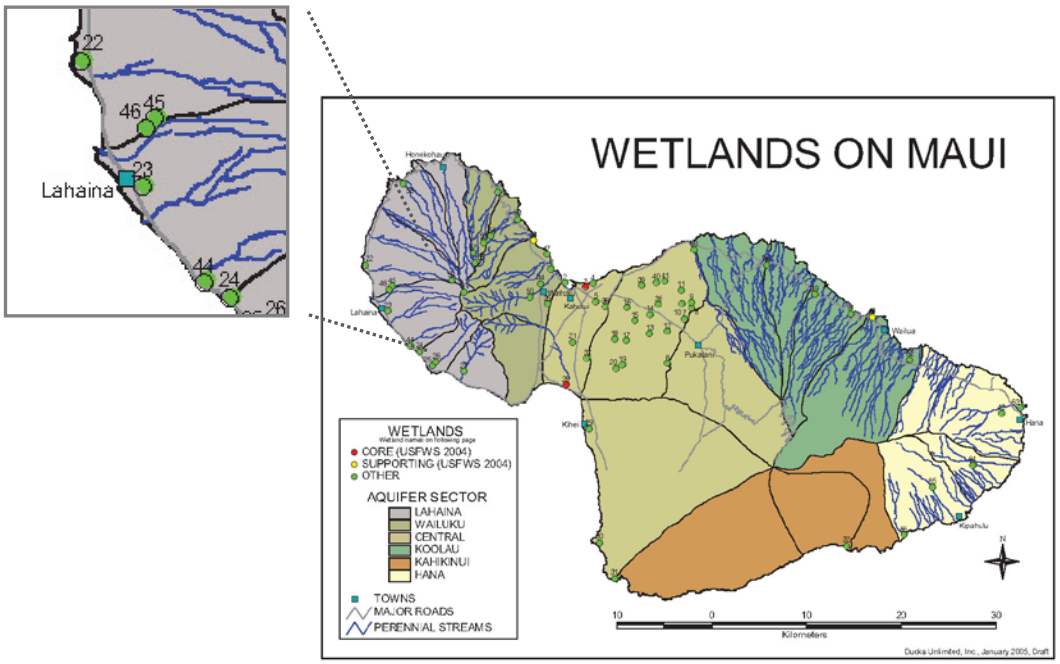


FIGURE 15
Distribution of Existing Wetlands on Maui (from PCJV, 2006)

Although these remaining wetlands represent only a small area, they provide important hydrologic and biogeochemical functions, as well as habitat for a suite of native plant and wildlife species, including endangered waterbird species (as further discussed below).

3.2.5.2 Flora and Fauna

Vegetation within the project site primarily consists of non-native species, some of which were Polynesian introductions. The majority of the park is planted with Bermuda grass (*Cynodon dactylon*), with peripheral vegetation consisting of *koa haole* (*Leucaena leucocephala*), coconut (*niu*, *Cocus nucifera*), Chinese fan palm (*Livistona chinensis*), monkeypod (*Pithecellobium saman*), *hau* (*Hibiscus tiliaceus*), breadfruit (*Artocarpus altilis*), mango (*Mangifera indica*), and *kiawe* (*Prosopis pallida*) (Figure 16). In addition to Bermuda grass, other species recorded within the interior portion of the park during the wetland delineation include *`akulikuli* (*Sesuvium portulacastrum), kipukai (Heliotropium curassavicum*), and Australian saltbush (*Atriplex semibaccata*) (NRCS, 2011; USACE, 2004).

FIGURE 16
Vegetation Within and Around the Perimeter of Malu`ulu o Lele Park

Avifauna within the project site generally includes introduced species, such as Japanese white-eye (*Zosterope japonicus japonicus*), zebra dove (*Geopelia striata*), cardinal (*Cardinalis virginianus*), spotted dove (*Streptopelia chinensis*), and common mynah (*Acridotheres tristis*), and indigenous species, such as the Pacific golden plover (*kolea*, *Pluvialis fulva*), black-crowned night heron (*aukuu*, *Nycticorax nycticorax*), and Hawaiian owl (*pueo*, *Asio flammeus sandwichensis*) (USACE, 2004; Munekiyo and Hiraga, 2003). Other animals that might occur onsite are expected to be similar to those generally found in urbanized areas, including cats (*Felix catus*), dogs (*Canis lupus familiaris*), and rats (*Rattus* spp.).

3.2.5.3 Special-Status Species

To identify any other federally threatened or endangered species or designated critical habitat that could potentially occur within the project site, a request was sent to the USFWS on March 17, 2010. The USFWS provided a response in a letter dated April 19, 2010. Copies of these letters are contained in Appendix B. The letter states that a review of USFWS files, including data compiled by the Hawai`i Biodiversity and Mapping Program and the Hawai`i Gap Analysis Program (GAP), indicates that the federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) has been observed in the vicinity of the project site. No designated critical habitat occurs at the project site.

Consistent with the information provided in the USFWS letter regarding the Hawaiian hoary bat, a summary of species records from the Hawai`i Natural Heritage Program as published in *Hawai`i's Comprehensive Wildlife Conservation Strategy* shows a single record of the Hawaiian hoary bat near Lāhainā, as well as a single record near Olowalu, approximately 6 miles south of Lāhainā; documentation of the species distribution state there is no evidence of a breeding population on Maui (Mitchell et al., 2005). Although it is possible that Hawaiian hoary bats could forage within the project site, it is highly unlikely, given the low probability of species occurrence in the project vicinity, the nature of the available habitat and the degree disturbance within and surrounding the project site.[14]

In Hawai`i, coastal wetland habitat, such as that historically within and surrounding the project site, provides important habitat for a variety of species, including endemic waterbird species, all of which are federally and state listed as endangered. These include Hawaiian stilt (*ae`o*, *Himantopus mexicanus knudseni*), Hawaiian coot (*`alae ke`oke`o*, *Fulica alai*), Hawaiian moorhen (*`alae `ula*, *Gallinula chloropus sanvicensis*), Hawaiian duck (*koloa maoli*, *Anas wyvilliana*), and Hawaiian goose (*nēnē*, *Branta sandwicensis).* None of these species occur within the project site, as suitable habitat no longer exists; however, it is anticipated that restored wetlands within the project site would provide foraging habitat for Hawaiian stilt and/or Hawaiian coot.[15] These species are briefly described below, primarily based on information presented in the *Recovery Plan for Hawaiian Waterbirds* (USFWS, 2011a).

Hawaiian Stilt

The Hawaiian stilt is a slender wading bird that is endemic to Hawai`i and was federally listed as endangered in 1970. It is primarily found in low-elevation wetlands with sparse, low-growing vegetation and water depths less than approximately 9 inches. Stilts forage for a variety of invertebrates in fresh, brackish, or saline waters. Stilts use open or sparsely vegetated flats and pasture lands for loafing, as well as other open areas with good visibility. Nesting predominantly occurs in areas with little to no cover, which most likely allows predators to be easily spotted.

Stilts historically were known to occur on all of the major islands except Lāna`i and Kaho`olawe, but were subsequently documented on Lāna`i starting in 1989 (Engilis and Pratt, 1993). Although there is no estimate of historical numbers, stilts were identified as common in the late 1800s. Population declines were documented as early as 1900, with loss of wetland habitat (including aquatic agricultural lands) identified as the primary cause of decline (USFWS, 2011a). Other contributing factors include predation by introduced species and habitat overgrowth by invasive plant species. In addition, stilts are known to have been affected by hunting; Hawaiians traditionally hunted Hawaiian stilts, and it was a popular game bird until hunting was prohibited in the late 1930s (Handy and Handy, 1972; Schwartz and Schwartz, 1949).

Biannual surveys conducted from 1998 through 2007 suggest that, on average, the population is comprised of approximately 1,500 stilts, with the population fluctuating in size between approximately 1,100 and 2,100 birds (DOFAW, 1976-2008; USFWS, 2011a). The census data indicate that the populations have been relatively stable or slightly increasing over the last 30 years (Reed and Oring, 1993). Population modeling results suggest that the stilt population will continue to increase to fill available habitat, but that available habitat is a critical limiting factor in population size.

[14] Hawaiian hoary bats occur in a range of habitats across a wide elevation gradient. They typically roost in native and nonnative vegetation, approximately 3 to 29 feet above ground level, and forage along water courses and edges (for example, coastlines and forest/pasture boundaries) (Mitchell et al., 2005).

[15] Although the Hawaiian moorhen once occurred on all the main islands, its current range is restricted to O`ahu and Kaua`i. Similarly, the Hawaiian Duck has been extirpated from all islands except Kaua`i. The species was re-introduced to Maui, but breeding with feral mallard ducks has resulted in a hybrid population (Reed et al., 2011).

On Maui, the largest numbers of stilts occur at Kanahā and Keālia Ponds. Over the past 5 years, the number of stilts of Maui has ranged between 250 and 530 birds (DOFAW, 1976-2008). In the Lāhainā region, stilts have been identified at the Cut Mountain settling ponds, Kā`anapali Golf Course Pond, Lāhainā Aquatic Center, and Olowalu Reservoir. It is believed that stilts disperse between islands, likely in response to available foraging habitat (Engilis and Pratt, 1993).

Specific recovery actions that are identified in the Recovery Plan include habitat management efforts, particularly management of water levels, vegetation management, and predator control; these efforts are thought to be critical to sustaining populations of Hawaiian stilt (Reed et al., 1998b).

Hawaiian Coot

The Hawaiian coot is an endemic, non-migratory waterbird species that is taxonomically distinct from the American coot (*Fulica americana*); it was federally listed as endangered in 1970. Coots typically use naturally occurring ponds and wetlands on the coastal plain, with emergent plant growth interspersed with open water (Brisbin et al., 2002). They also use aquatic features actively managed for taro cultivation and fish production, and are known to readily disperse between areas of suitable habitat (USFWS, 2011a; Engilis and Pratt, 1993). Primary food sources include invertebrates and aquatic vegetation, with foraging in mud/sand substrate and diving near the water surface. They nest in open freshwater and brackish ponds, constructing floating or semi-floating nests using aquatic vegetation; false nests are also constructed for use as loafing or brooding platforms (USFWS, 2011a). Habitat suitability is limited in large, deep ponds (USFWS, 2011a). Although coots may prefer freshwater for nesting, they are commonly found in brackish water (Berger, 1981), loafing on rafts of vegetation, mud bars, and false nests, as well as on open water.

Coots were historically known to occur on all of the main Hawaiian islands, except Lāna`i and Kaho`olawe, and were most numerous on O`ahu, Maui, and Kaua`i. No population estimates are available for the early 1900s, but the species' decline and potential threat of extinction was documented in the mid-1900s (Schwartz and Schwartz, 1949); the population was documented at fewer than 1,000 in the 1950 and 1960s (USFWS, 1978). Factors contributing to the declining population include predation and hunting (including egg collection) (USFWS, 2011a; Shallenberger, 1977; Henshaw, 1902).

Biannual surveys from 1997 through 2006 suggest that the coot population, on average, fluctuates between 1,500 and 2,800 birds. Approximately 80 percent of the population are from Kaua`i, O`ahu and Maui, with the Maui population varying between 200 and 600 birds (DOFAW, 1976-2008; USFWS, 2011a). Similar to the Hawaiian stilt, the coot population fluctuates each year, but the long-term trend appears to be slightly increasing.

The majority of coots on Maui occur at Kanahā and Kealia Ponds; other nearby areas with large concentrations include the sewage treatment ponds on Molokai and Lāna`i, as well as agricultural reservoirs. Population counts indicate movement of coots between these areas (USFWS, 2011a). In the Lāhainā region, a small number of coots have been identified at the Olowalu Reservoir.

Similar to those identified for Hawaiian stilt, specific recovery actions that are identified in the Recovery Plan include habitat management efforts, particularly management of water levels, vegetation management, and predator control; these efforts are thought to be critical to sustaining populations of Hawaiian coot (Reed et al., 1998b).

3.2.5.4 Protected Areas

As confirmed in the letter provided by USFWS (dated April 19, 2010), no designated critical habitat for threatened or endangered species occurs within or adjacent to the project site. The closest critical habitat to the project site is for a suite of endangered plant species, located in the West Maui Mountains approximately two miles east of the project site. A portion of the West Maui Mountains is also within the

West Maui Forest Reserve, one of nine forest reserves managed by the DLNR Division of Forestry and Wildlife (DOFAW) within Maui County. In addition, the County of Maui has designated the watershed above Lāhainā town as a Marine Resource/Watershed Zone, within which future activities should be regulated and monitored for their effect on the health of adjacent coral reef systems (County of Maui, 2009).

Other areas in the vicinity of the project site that have been designated for the protection of natural resources include the Hawaiian Islands Humpback Whale National Marine Sanctuary. The Hawaiian Islands Humpback Whale National Marine Sanctuary was established to protect humpback whales and their habitat, and is comprised of five separate areas within the relatively shallow offshore waters of the main Hawaiian Islands, including the waters surrounding Lāhainā.

3.2.6 Archaeological, Historic, and Cultural Resources

To characterize the existing archaeological, historic and cultural resources that relate to the project area, archival research was conducted by Cultural Surveys Hawai`i. Specifically, this research was conducted to identify *wahi pana* (place names),[16] *mo`olelo* (traditional stories),[17] background history, and previously recorded archaeological sites and historic properties. This effort included a review of documents from the State Historic Preservation Division (SHPD) and the Survey Office of the Department of Accounting and General Services (DAGS), as well as from the project files and other private collections; such documents included previous archaeological studies and reports, historic documents, maps and photographs, and Land Commission Awards (LCAs). The results of this research are summarized in the *Background History and Review of Historic Preservation Efforts as Moku`ula and Recommendations for the Mokuhinia/Moku`ula Ecosystem Restoration Project* prepared by Cultural Surveys Hawai`i; a copy of this report is provided in Appendix C.

In addition, a Cultural Impact Assessment (CIA) was conducted to understand the cultural resources that relate to the project site. The CIA was prepared in accordance with the provisions of HRS Chapter 343, Act 50, approved by the Governor on April 26, 2000, and the Office of Environmental Quality Control (OEQC) "Guidelines for Assessing Cultural Impact." It builds on the archival research described above, and further characterizes cultural sites, beliefs and practices based on previously recorded life histories/interviews and ethnographies that relate to the project area, as well as community consultation and interviews conducted specifically for the project. The interviews conducted in support of the CIA focused on obtaining the *mana`o* (thoughts and opinions) of individuals with specific knowledge of the cultural practices and features of the project site; these individuals include cultural practitioners, *kūpuna* (elders), and lineal descendents of the site. The synthesis of this information is presented in the *Cultural Impact Assessment for the Mokuhinia Ecosystem Restoration Project*; a copy of this report is provided in Appendix D.

Following is a summary of the existing archaeological, historic and cultural resources that relate to the project area, based on the information presented in these reports. In addition, *Moku`ula: Maui's Sacred Island* (Klieger, 1998) was also used as a primary source of information.

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[16] Place names, or *wahi pana* ("legendary place") (Pukui and Elbert, 1986), are an integral part of Hawaiian culture. "In Hawaiian culture, if a particular spot is given a name, it is because an event occurred there which has meaning for the people of that time" (McGuire, 2000). The *wahi pana* were then passed on through language and the oral tradition, thus preserving the unique significance of the place.

[17] A *mo`olelo* is a traditional Hawaiian story. Although early Hawaiian ethnographers referred to these as "legends" and "myths," Hawaiians distinguished between stories they considered based on fiction and fantasy as *ka`ao*, while a *mo`olelo* was "a narrative about a historical figure, one which is supposed to follow historical events" (Beckwith, 1970). Historical figures would include famous heroes, semi-divine men and women, and the gods themselves. As Beckwith noted, "many a so-called *mo'olelo* which a foreigner would reject as fantastic nevertheless corresponds with the Hawaiian view of the relation between nature and man."

3.2.6.1 Wahi Pana and Mo`olelo

Considered one of the great kings of Hawai`i, Pi`ilani unified the Kingdom of Maui and ruled from Lāhainā in the 16th century. Born to Pi`ilani and Queen Lā`ieloheikawai, Kalā`aiheana was the sister to the chiefly brothers of Kihaapi`ilani and Lonoapi`ilani, and sister Pi`ikea (Fornander, 1918). The *`aumakua* (guardian spirit) of Pi`ilani's family was that of the *mo`o* (lizard or water dragon) (Klieger, 1995). Kalā`aiheana was a product of a *pi`o* or high ranking marriage and double *mo`o* lineage (Klieger, 1998; McKinzie, 1986), a fact that would play significantly upon her death. Klieger (1998) explains that "the Maui royal family descended from Pi`ilani was notable in the archipelago for carefully maintaining and replicating *mana* through the *kapu* system and through brother-sister (*pi`o*) or other closely related matings, in imitation of the creative passions of Papa and Wakea…The power generated by several generations of *pi`o* matings by the sacred member of the Pi`ilani family and the restrictions associated with their *kapu* made the family's dignity, ascribed authority, and status practically unrivaled among the *ali`i nui* (royalty) of the Hawaiian Islands. The *pi`o* system served to concentrate the *mana* of the gods within the ruling class."

Kihawahine Mokuhinia Kalama`ula Kalā`aiheana was her full given name; upon her death, she was transformed into a *mo`o* and referred to as only Kihawahine Mokuhinia Kalama`ula (Klieger, 1995). In this way, Beckwith (1970) identifies Moku`ula, more specifically, Loko o Mokuhinia, as the place where Kihawahine Mokuhinia, the *mo`o* goddess, resided. This *loko,* or pond, was a part of a larger complex of ponds called Kalua o Kiha, literally "The Pit of Kiha" or dwelling place of Kiha the *mo`o* goddess. The home of the *mo`o* was *kapu* to all but her descendants.

A variety of rituals and sites were associated with the worship of Kihawahine, including taboos that were punishable by death (Kepolino, 1977). According to Kamakau, *mo`o* offerings included dogs and other things such as *`awa*, bundled in tapa, placed in spring-fed ponds.Worship of Kihawahine, and her association with the ruling *ali`i*, continued after the abolition of traditional Hawaiian religion in 1819, and was one of the longest lasting forms of Hawaiian religious expression. Some consider the site to be inhabited by an *`aumakua mo`o* (guardian spirit in the form of a lizard) to this day (Klieger, 1998).

3.2.6.2 Background History

Early Historic Period

In the late 18th century, Kamehameha I was on a quest to conquer all the Hawaiian Islands. Although he did not possess inherited *mana*, such as that of the Pi`ilani lineage, Kamehameha was able to legitimize his authority and consolidate his rule of the island by association with the sacred women of the royal Maui line. Specifically, Keōpūlani, who was among the highest royalty status in the Pi`ilani lineage, was granted to Kamehameha. As such, he also adopted the family's *mo`o akua*, Kihawahine, and it was in her name that Kamehameha pursued his conquest over the islands (Beckwith, 1970).

Following his conquests of Maui and O`ahu, Kamehameha I established his government at Lāhainā, but maintained his residence mostly either on O`ahu or Hawai`i island. In 1802, he returned to Lāhainā and built a two-story brick house, *Hale Piula*, at the Lāhainā landing (*makai* of the present-day public library, northwest of the project site). It was not generally used as a residence, but it was here that Kamehameha I declared his son, Liholiho, as his heir. The "brick palace" has been noted by many contemporary European and American explorers, as were the buildings within Loko o Mokuhinia.

King Kaumuali`i ceded his kingdom of Kaua`i and Niihau to Kamehameha I in 1810, resulting in a unified kingdom of the Hawaiian Islands. Kihawahine was "an emblem of that union and her place of deification at the fishpond of Mokuhinia at Lāhainā was significant in the ideology of the state and its claim to righteousness (*pono*)" (Klieger, 1998).

In 1812, Kamehameha I and his court returned to the island of Hawai`i, where he lived until his death in 1819. During this time, he and Keōpūolani had two more children, Kauikeaouli and Nāhi`ena`ena,

descendants of the *mo`o* Kihawahine (Kleiger, 1998). Following his installment as king, Liholiho (or Kamehameha II) resided in O`ahu, but Queen Keōpūolani and her other children, Kauikeaouli and Nāhi`ena`ena, took up residence in Lāhainā. Kamehameha II ruled until his death in 1824, following which Kauikeaouli was proclaimed Kamehameha III. Kamehameha III ruled from O`ahu until returning to Lāhainā in 1828.

Upon the death of his beloved sister Nāhi`ena`ena, Kamehameha III transformed her residence at Moku`ula into a mausoleum and subsequently transferred the bodies of his mother, Keōpūolani, and several other *ali`i nui* (Kamakau, 1992; Klieger, 1998).[18] In the following years, from 1837 to 1845, he ruled from his home on Moku`ula (Figure 17). Kamehameha III was "a traditionalist and *pono* to the ancient ways of the *ali`i nui,"* which put him in conflict with changing social and culture of Lāhainā. As described by Klieger (1998), "Moku`ula was the one place his *kapu* held, under the protection, it would seem, of his ancestress Kihawahine. Moku`ula soon to again become the cultural and spiritual *piko* of the Hawaiian people, was the last resort of the traditional Hawaiian monarchy and the ancestral home of its last divine king." In 1845, the royal court moved back to Honolulu.

Mid- to late 1800s and the Great Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Great Māhele—the division of Hawaiian lands—which introduced private property into Hawaiian society. In 1848, the crown and the *ali`i* received their land titles. Kuleana awards for individual parcels within the *ahupua`a* were subsequently granted in 1850. These awards were presented to tenants - native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners - who could prove occupancy on the parcels before 1845. Land Commission Awards (LCAs) were granted by ministers representing the Kingdom of Hawai`i`s Department of the Interior. Testimony to establish title to real property was recorded by Native Register—wherein claimants would provide traditional proof of ownership—and by Foreign Register—wherein boundary survey evidence would support traditional claims.

The lands containing Loko o Mokuhinia and Moku`ula were granted as crown lands. However, a large number of houselot LCAs were conveyed in the immediate area surrounding Loko o Mokuhinia and Moku`ula. According to Klieger (1998), the neighborhood extending out from the royal residence of Moku`ula and surrounding *loko* resembled concentric layers or bands, and where a person lived within these circles depended on ones rank and/or position in government. From Moku`ula and the King's residence as the center or *piko*, the subsequent rings were as follows: Kalua o Kiha for the government and court, Kalua`ehu for the *ali`i* and extended family, and Lāhainā for the traders and Lāhainā *maka`ainana* (Klieger, 1998).

[18] The remains of those in the mausoleum were reinterred (presumably at Waine'e [Waiola] Church) by Princess Bernice Pauahi Bishop in 1884 (Klieger, 1998).

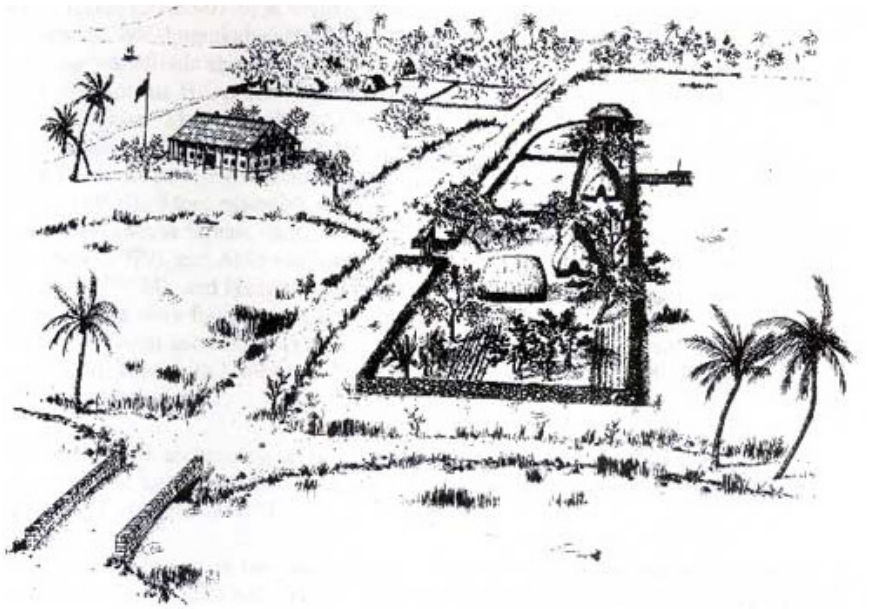


FIGURE 17
Illustration of Mokuhinia and Moku`ula in the 1830-1840s (Klieger, 1998)

1900s and Modern Land Use

By the turn of the century, following the annexation of the Hawaiian Islands to the United States of America, the lands of Loko o Mokuhinia came under scrutiny of the Commissioner of Public Lands, Edward S. Boyd (Hawai`i State Archives, 1901). In a letter written in 1901 by W.D. Aiken to Mr. Boyd, the area comprised of Mokuhinia and Moku`ula are discussed:

> The most part of last week I spent in a trip to Lāhainā to look into the matter of that land there called "Loko Mokuhinia," about which Mr. Heyselden wrote us. The claims upon this land appear to be several. There is no question about the part that lies *makai* of the Government road, where the old palace use [sic] to stand. Everybody is agreed that this belongs to the Government. But the larger part above the road is claimed by the Bishop Estate, with the Pioneer Mill Co., claiming to own all of it above water, a small neck where the old royal tomb still stands. It is a small piece, and is indicated on the map. The part mauka of the road, the Bishop Estate has advertised for sale for some time since, but the proposed sale was given up for some reason or another.
>
> The plantation claims to have a deed to the premises where the old tomb stands, but could not find it when I was there. I am going to write them to let me know the Liber and page in which it is recorded when they do find it so we can look it up. In the meantime, I think it would be well if you could see the Bishop Estate about the other part of it as to where they get a claim to it.
>
> Most of the piece above the road is a swamp, and I should say a menace to the health of the people, as it is full of filth. It would cost a good deal to fill it in but that is what should be done. If it should be Government property I would recommend that it be sold, as no one would fill it in under leasehold. The piece *makai* of the road is in fair shape, though a little filling would improve it, and it ought to be quite valuable (Hawai`i State Archives, as reported in Maly and Maly, 2007).

According to oral testimony collected by Klieger (1998), soil from Honokōwai was transported by railroad and a steam shovel was used to spread the soil over Loko o Mokuhinia in 1914. A Department of Public

Works Map, however, shows that while a portion of Loko o Mokuhinia pond was filled in by 1916, the pond waters immediately surrounding the inland island of Moku`ula were still intact. Nevertheless, it is possible that the earlier date of 1914 is a reference to the filling in of the peripheral edges of the pond. The final "reclamation of government swamp lands" in Lāhainā consisted of filling and grading approximately 11.5 acres of wetlands, including that of Loko o Mokuhinia and Moku`ula, as well as construction of drainage canals and storm sewers. According to the records of the U.S. Department of Interior, this task was completed in December of 1917 (U.S. Department of the Interior, 1918). In 1918, Executive Order 52 established the filled pond as Malu`ulu o Lele County Park.[19]

3.2.6.3 Archaeological Resources

Beginning in the late 1920s and continuing in recent decades, a variety of archaeological studies have been conducted within Lāhainā. These studies show patterns of Hawaiian activity during the pre-Contact and early post-Contact periods. The studies that have been conducted throughout the project vicinity are discussed in the *Background History and Review of Historic Preservation Efforts as Moku`ula and Recommendations for the Mokuhinia/Moku`ula Ecosystem Restoration Project*, contained in Appendix C. Those studies that directly relate to the project site are summarized below, with their approximate locations relative to the project site shown in Figure 18.

In 1989, an archaeological inventory survey was conducted over approximately 2 acres located directly adjacent and to the southeast of Malu`ulu o Lele Park, in the area reserved for the Friends of Moku`ula (Fredericksen et al., 1989). A total of 19 test trenches and 6 auger test locations were excavated during the sub-surface investigation of the parcel. Testing results led to the conclusion that the survey parcel was likely used as open space and/or lake shore when Lāhainā served as the Capitol of the Hawaiian Kingdom, and thereafter was used as open space. Pond sediments over a portion of the parcel also indicated the soils had been submerged for some time and was likely that this portion was a part of Loko Mokuhinia before the land filling activities during the turn of the century.

In 1993, an archaeological investigation of Moku`ula was conducted by the Anthropology Department of the Bernice Pauahi Bishop Museum (Klieger, 1995). The excavations confirmed the existence of the island beneath the coral and soil fill of the park, as well as several architectural features in a good state of preservation. Klieger (1995) posited that much of the island is still preserved under the overlying fill deposits. Information resulting from excavations and further research also found that the Loko o Mokuhinia that surrounded the island of Moku`ula was most likely a natural pond and that the island itself was likely a mud bar resulting from alluvial deposition that was modified significantly for habitation. During the course of this work, the stratigraphic sequence for the filling of Moku`ula and Loko o Mokuhinia was established, with a total of eight modern or recent fill components identified overlying sediments associated with the occupancy of Moku`ula. Specific to Moku`ula, two discrete cultural layers were identified beneath these fill layers, consisting of multiple sub-strata, lenses, and sub-surface features. Archaeological features included concentrations of midden and charcoal remains, as well as an *in situ* basalt boulder alignment; a possible intact human burial was also found, as described by Klieger and Clark (1995). Specific to Loko o Mokuhinia, two sediment layers were identified, with multiple sub-layers, consisting of mixed deposit of late historic era artifacts and faunal remains. A detailed description and illustrations of the sequence are provided in Appendix C.

An emergency mitigation program was conducted in 1995 at Malu`ulu o Lele Park when construction of a new backstop near the corner of Front and Shaw Streets uncovered a portion of the foundation of an early building site (Klieger and Somer, 1995). The mitigation program was implemented to assess the degree of

[19] TMK (2) 4-6-007:036 was conveyed to the State of Hawai`i in 1978 and converted for park use by the County of Maui under Executive Order 2889 (Klieger, 1998). TMK (2) 4-6-007:001 was dedicated by the State of Hawai`i to the County of Maui in 1989 as an extension of Malu'ulu o Lele Park under Executive Order 3430.

damage to the underlying historic property. The investigation found that the Moku`ula sediments had been penetrated during the excavations for the backstop, that the excavations had breached the island perimeter retaining wall, and that the excavations had possibly damaged a portion of the northern/southern holding pond. No human remains were found in the backfill of the backstop excavations and the tomb area was not disturbed.

In 1999, Klieger and Lebo revisited the Moku`ula site as part of a Phase II archaeological investigation and supplement to their 1995 report. The primary objective was to follow up on a remote-sensing experiment in order to define the outer perimeter of Moku`ula Island. This type of remote-sensing technology would prove useful in being able to "see" below the surface without physically testing at random, thus subsequently preserving the intact cultural layers below the fill. To this end, an electromagnetic survey was undertaken and a total of seven test units were excavated to ground truth the electromagnetic findings. The results indicated that, while useful for generalizing the location of the body of the island, the technique was limited in that it could not distinguish the actual perimeter walls (Klieger and Lebo, 1999).

3.2.6.4 National and State Register of Historic Place Listings and Other Designations

In 1962, the town of Lāhainā was designated as a National Historic Landmark. In 1966, it was added to the National Register of Historic Places (National Register No. 66000302), and was subsequently added to the State Register of Historic Places (SIHP 50-50-03-3001). It was listed as significant for historical events that made a significant contribution to the broad patterns of our history and because it embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction. The project site, including Loko o Mokuhinia and Moku`ula, falls within the boundaries of the designated landmark (Figure 19).

In 1967, the County of Maui passed Ordinance 514, which established County Historic Districts Nos. 1 and 2 in the town of Lāhainā. Historic District No. 1 was intended to preserve, as well as to enable the State and County to restore historic structures and sites. Historic District No. 2 was intended to preserve the charm of Lāhainā by preserving the architectural styles that are unique to Lāhainā (Maui County Code Section 19.50). Loko o Mokuhinia and Moku`ula are within County Historic District No. 1.

King Kamehameha III's Royal Residential Complex, including Moku`ula, Loko o Mokuhinia, and Hale Piula, was added to the Hawai`i State Register of Historic Places in 1994 (SIHP 50-50-03-2967), and to the National Register of Historic Places in 1997 (National Register No. 97000408).

3.2.6.5 Traditional Cultural Uses and Practices

Based on the background research, it is clear that the lands within the greater Lāhainā area were traditionally used for their resources, resulting in the continual movement of families from ocean properties to mountain properties. Evidence gathered from community consultations of past research by Dagan et al. (2009), coupled with LCA documentation, reveals the importance of continued *mauka-makai* access as part of this subsistence lifestyle. The majority of individuals interviewed for that study described their families as having properties along or near the coast to facilitate gathering ocean resources (for example, fishing, squidding, or gathering *limu*), and properties in the upper valleys for agricultural purposes (for example, farming *lo`i*) (Dagan et al., 2009). These practices were conducted by families in the vicinity of the project area, with access to coastal resources adjacent to the project site and agricultural resources in *mauka* areas including Kaua`ula Valley.

Individuals interviewed specifically for this project described *lo`i* cultivation that occurred (and continues to occur) on lands located east of the project area in the Kahoma, Kanaha and Kaua`ula Valleys, as well as in Lāhainā town. Resources gathered within the project area include *lauhala* (*Pandanus tectoris*) for mat weaving, as well as medicinal herbs such as *uhaloa* (*Waltheria indica*) and *popolo* berry (*Solanum nelsonii*).

Plants gathered in the *mauka* regions include mountain apple (*ohi`a ai*, *Syzgium malaccense*), mango (*Mangifera indica*) and guava (*Psidium guajava*). The coastal area fronting the project area is rich with marine resources and is distinguished as the traditional fishing grounds for the people of the Lāhainā District. Species that were harvested include *pipipi* (*Nerita picea*), *moi* (*Polydactylus sexfilis*), *papio* (*Caranx* sp.), *wana* (*Echinothrix* sp.), and *`oama* (*Mulloidicthys flavolineatus)*. Gathering along the coast also included a variety of *limu* species; some gathering is still conducted for subsistence purposes in select locations along the Lāhainā coastline.

Information provided as part of the community consultation and interviews referred to various cultural features, particularly those that relate to the adjacent Waiola Church and its cemetery (Waine`e Cemetery), which serves as the final resting place for prominent *ali`i* and missionaries. These features include a path along the western edge of Waine`e Cemetery (adjacent to the eastern edge of the project site), which was used for horse-drawn carriages delivering coffins to the cemetery for burial. The western edge of the Waiola Church property also included stone steps that were used as an access point by *ali`i* traveling across Mokuhinia to attend church. Individuals interviewed for the project also referenced a culturally significant grove of coconut trees located near the southeastern corner of Malu`ulu o Lele Park (within the area reserved for the Friends of Moku`ula), as well as the potential for burials in the walls surrounding Mokuhinia.

Relative to the cultural and spiritual beliefs associated with the project site, individuals interviewed for the project suggested that Moku`ula may be the most sacred site in Hawai`i and its history is of national significance. Informants explained that individuals and groups from around the world continue to visit the site to worship Kihawahine. Although Mokuhinia is filled, there are individuals who believe that Kihawahine still lives at the site; others believe that the *mo`o akua* no longer exists at the site.

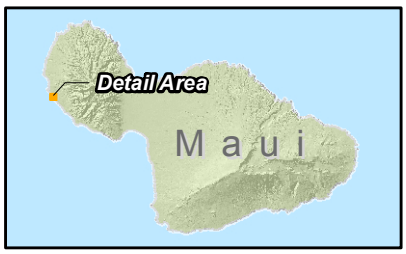
Transcripts of each interview and a detailed summary of the information compiled for the study are provided in the *Cultural Impact Assessment for the Mokuhinia Ecosystem Restoration Project*, contained in Appendix D.

3.2.7 Recreation

The project site is primarily comprised of Malu`ulu o Lele Park, which was assigned by State Executive Order to the County of Maui for use as a park. Based on a recent inventory conducted by the County of Maui, the primary recreational uses and facilities that occur within the park include the following:

- Basketball: A single basketball court is located adjacent to Front Street; until recently, this court was the only location in Lāhainā that was available for nighttime use (Z. Kalua, pers. comm., 2011).
- Baseball/Softball: A large baseball field, with an overlapping softball field is located in the northern portion of the park; according to the County Department of Parks and Recreation, the fields are not used for regularly scheduled games (Oceanit, 2011).
- Tennis: Two twin tennis courts are located within the park; one in the northwest corner and one along the eastern edge of the park. Only the courts in the northwest corner are actively used.
- Gateball: Gateball is a sport which is similar to croquet, and is occasionally played on the open field at Malu`ulu o Lele Park (Z. Kalua, pers. comm., 2011).

VICINITY MAP



LEGEND

- Moku'ula/Mokuhinia Site
- Mokuhinia Ecosystem Restoration Project Site

Previous Archaeological Investigations

- E. Fredericksen and D. Fredericksen, 2001
- W. Fredericksen et al., 1988a
- W. Fredericksen et al., 1989b
- Haun and Henry, 2001b
- Major and Klieger, 1995
- Heidel et al., 1995
- Klieger, 1995
- Klieger and Clark, 1995
- Klieger and Some, 1995
- Donham, 1993

N

0 100 200 Feet

1 inch = 200 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 18
Previous Archaeological Investigations
Mokuhinia Ecosystem Restoration Project
Lahaina, Maui, Hawaii

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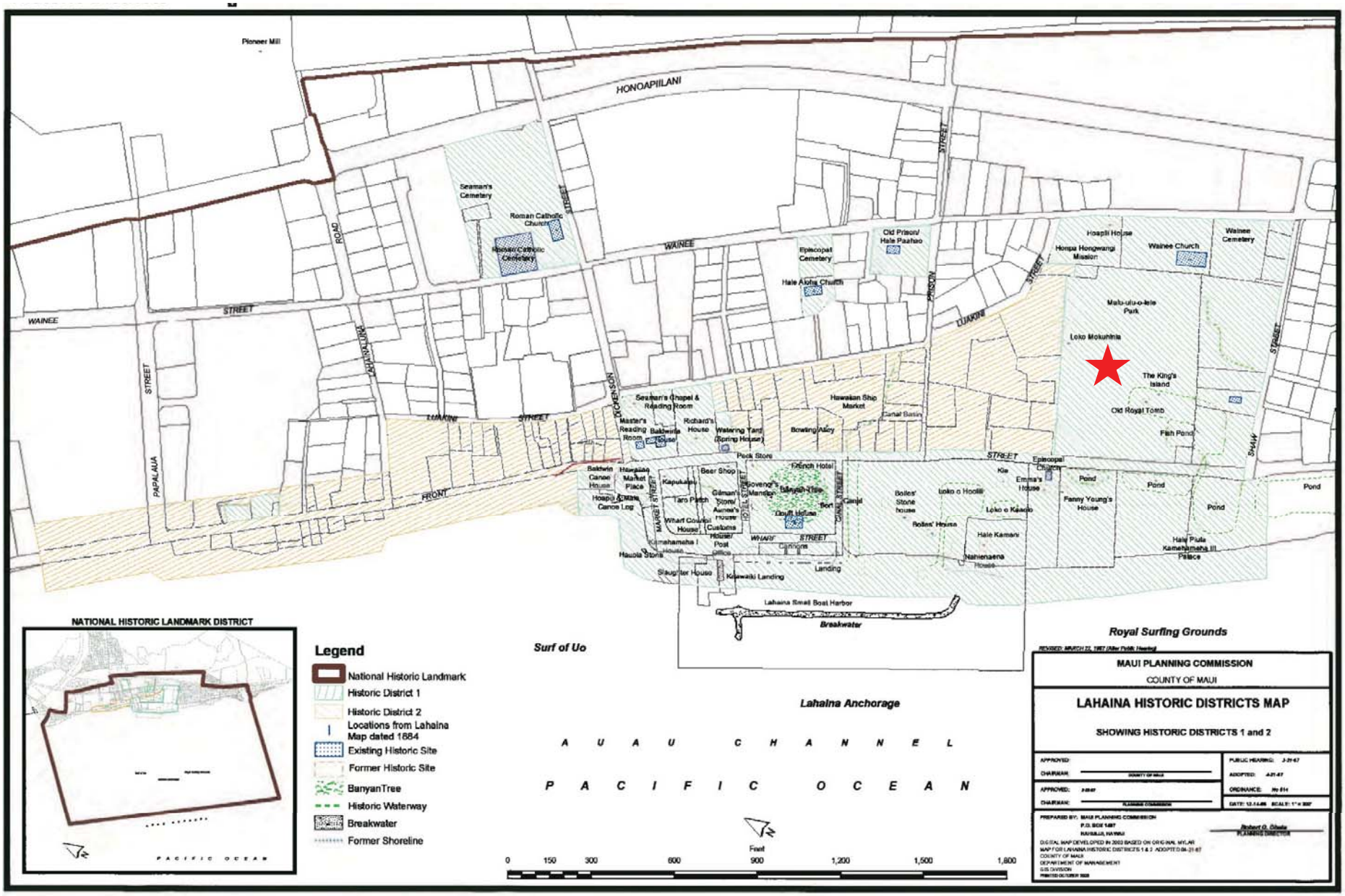


FIGURE 19
Historic Districts

Malu`ulu o Lele Park was previously used by King Kamehameha III Elementary School for physical education classes; however, the school recently received funding needed to create usable space on their property (including new play equipment), such that the park is no longer used on a regular basis (Z. Kalua, pers. comm., 2011).

In addition to these recreational uses, Mokuhinia and Moku`ula are identified as destinations along *Ala Hele Mo`olelo O Lāhainā* (Lāhainā Historic Trail), a self-guided tour focused on important historical sites throughout Lāhainā. The Lāhainā Restoration Foundation reported approximately 108,600 visitors in 2008 (County of Maui, 2011). An informational kiosk that describes Mokuhinia and Moku`ula for visitors to *Ala Hele Mo`olelo O Lāhainā* is located on the edge of the existing parking lot.

3.2.8 Visual and Scenic Resources

Overall, the visual qualities of the project site are characterized by the surrounding development associated with Lāhainā town, with views of the natural environment as a backdrop. The most prominent views from the site are of the West Maui Mountains to the east, the Pacific Ocean to the west, and the Front Street corridor to the north and south. From the site, the views of the West Maui Mountains are relatively unobstructed, and include large tracts of former agricultural lands that now function as undeveloped, open space. To the west, views of the Pacific Ocean, with Lāna`i in the background, are focused through Kamehameha Iki Park. Views along Front Street, particularly to the north, are characterized by the historical architectural style of Lāhainā town. Public views of the site are primarily from the west and south (along Front Street and Shaw Street, respectively), as the north and east sides of the site are adjacent to private properties. Specific viewpoints of the site have been established from Front and Shaw Street as part of the self-guided tour along *Ala Hele Mo`olelo O Lāhainā*. In addition to these viewpoints, stakeholders have expressed the value of the existing viewplanes from Waiola Church to Moku`ula, and beyond to the ocean.

As part of the Maui Island Plan, the County of Maui has designated Front Street as a scenic corridor of medium value (County of Maui, 2009). In addition to the policies outlined in the Maui General Plan, the visual qualities of the historic district of Lāhainā town are maintained through established standards, particularly as related to architectural styles and signage, pursuant to Title 19 of the Maui County Code.

3.2.9 Hazardous, Toxic, and Radioactive Waste

Given the past uses on the site, a series of assessments were conducted to investigate the potential for occurrence of any hazardous, toxic, and radioactive waste (HTRW) on or near the site that could affect design, construction, or operation of the project. A preliminary HTRW assessment was conducted in 2007, and included a review of existing documents and records that describe past uses of the project site and adjacent areas, coordination with government agencies to identify nearby locations where HTRW may have been released, interviews with people who are knowledgeable about the site, and a visual inspection of the site and adjacent areas. A total of 11 sites with incidents of environmental concern were identified within 0.6 mile of the project site. One involved unexploded ordinance, one involved cooking grease discharge, and eight involved minor discharges of petroleum products. These incidents are beyond the zone of influence to the project site. However, one site, located at Pioneer Mill (approximately 0.6 mile northeast of the project site), involved environmental surveys, documented spills, tank removals, and cleanup efforts. Wash water used from the mill was likely disposed of in a series of ponds upslope from the project site; soil samples from those ponds have tested positive for high levels of arsenic. Although it is also naturally occurring in soils in Hawai`i, arsenic was commonly used for cultivation of sugar cane, as well as for other purposes, resulting in areas with high concentrations (Oceanit, 2008).

In parallel with the HTRW assessment, soil samples were collected from four of the monitoring wells installed at the project site as part of the hydrologic investigation (Figure 20). Two of the four samples

were found to contain arsenic at levels above the concentration recommended by the U.S. Environmental Protection Agency (EPA) for residential areas. These results suggested that it is possible that (1) portions of fill material used at Mokuhinia consisted of plantation waste or soil containing arsenic and/or (2) soil containing arsenic was transported by blown dust and overland sheet flow, contaminating surface soils at Mokuhinia. As such, it was recommended that an additional investigation be conducted to determine the extent of potential arsenic contamination.

An arsenic site investigation was conducted within the project site in 2011, as part of which soil, sediment, and water samples were collected from the surface and subsurface soil, groundwater, and the ditch.[20] Composite surface soil samples were collected from seven delineated decision units across the project site. Soil samples were also obtained from an existing archaeological excavation. Subsurface soil samples were taken from 17 coreholes, ranging in depth from 0 to 6 feet bgs (Figure 20). Groundwater samples were collected from the five existing monitoring wells on the site. Lastly, the ditch running along the northwest side of the site was sampled; both the water and the bottom sediment in the ditch were sampled in three discrete locations.

The analytical results indicated that none of the soil samples contained concentrations of arsenic that exceed the Hawai`i Department of Health (DOH) Tier 1 environmental action limit (EAL) for arsenic in soil. The highest concentration of soil arsenic at the site was found to be 14.8 milligrams per kilogram (mg/kg) for surface soil, and 16.0 mg/kg for subsurface soil. The highest concentration of arsenic in the sediment samples taken from the ditch was 3.63 mg/kg. These reported concentrations are within the published range of background concentrations for soil arsenic in Hawai`i.

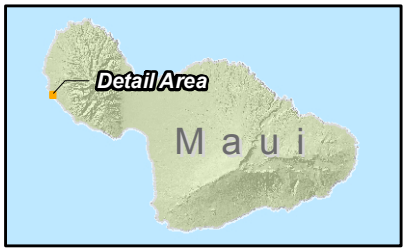
Of the water samples collected from the site, four of the five monitoring well locations and the ditch contained arsenic levels that were below the method detection limit. The level detected in the one remaining monitoring well location (MW 3) exceeded the Tier 1 EAL for arsenic in drinking water. However, the water sample was not believed to have sufficient hydraulic connectivity with the aquifer and contained a large amount of suspended sediment, which may have contributed to elevated arsenic levels in the sample. Therefore, the water sample was not believed to be representative of the groundwater at the site. Based on this information, and the fact that the proposed project does not involve the use of groundwater for drinking, the study concluded that further investigation was not warranted relative to the proposed wetland restoration effort (Oceanit, 2011).

3.2.10 Air Quality

Under the authority of the Clean Air Act, the EPA has established nationwide air quality standards to protect public health and welfare. These federal standards, known as National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations for six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, lead, and particulate matter (respirable particulate matter less than or equal to 10 micrometers in diameter [PM_{10}] and respirable particulate matter less than or equal to 2.5 micrometers in diameter [$PM_{2.5}$]). The NAAQS are based primarily on evidence of acute and chronic (or short-term and long-term) health effects, and apply to outdoor locations to which the general public has access.

[20] An archaeological monitor from Cultural Surveys Hawai`i was present at all times during the subsurface soil sampling, and for all sampling conducted near Moku`ula Island. The archaeological monitoring report concluded that although isolated faunal material and manuports were found in the fill soil, no culturally significant resources were disturbed. The culturally significant intact soils of Moku`ula Island were not encountered during soil sampling.

VICINITY MAP



LEGEND

- HTRW Soil Sample
- Arsenic Corehole
- Moku'ula/Mokuhinia Site
- Mokuhinia Ecosystem Restoration Project Site

0 75 150 Feet

1 inch = 150 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 20
Soil Sampling Locations
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

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The Clean Air Branch of the DOH is responsible for implementing air pollution control in the state and has established Hawai`i Ambient Air Quality Standards (HAAQS), which in some cases are more stringent than the comparable federal standards or else address pollutants that are not covered by the federal standards. The HAAQS are based primarily on health effects data, but also reflect other considerations, such as protection of crops, protection of materials, or avoidance of nuisance conditions (such as objectionable odors). Both the state and federal ambient air quality standards are listed in Table 6.

Based on measurements of ambient criteria pollutant data, the EPA designates areas of the United States as having air quality equal to or better than NAAQS (attainment) or worse than NAAQS (non-attainment). The general conformity rule requires federal agencies to ensure that actions they undertake in nonattainment and maintenance areas are consistent with air quality management plans for those areas. Because Hawai`i is, and always has been, in attainment for all pollutants, conformity analysis procedures do not apply to this project.

TABLE 6
Federal and State Ambient Air Quality Standards

Air Pollutant	Averaging Time	Ambient Air Quality Standards	
		Hawai`i State Standard	Federal Primary Standard
Carbon Monoxide	1-Hour	9 ppm	35 ppm
	8-Hour	4.4 ppm	9 ppm
Nitrogen Dioxide	1-Hour	—	100 ppb
	Annual	0.04 ppm	0.053 ppm
Sulfur Dioxide	1-Hour	—	75 ppb
	3-Hour	0.5 ppm	—
	24-Hour	0.14 ppm	0.14 ppm
	Annual	0.03 ppm	0.03 ppm
Ozone	8-Hour	0.08 ppm	0.075 ppm
PM_{10}	24-Hour	150 µg/m³	150 µg/m³
	Annual	50 µg/m³	—
$PM_{2.5}$	24-Hour	—	35 µg/m³
	Annual	—	15 µg/m³
Lead	Calendar Quarter	1.5 µg/m³	0.15 µg/m³
Hydrogen Sulfide	1-Hour	0.025 ppm	—

SOURCE: HAR Chapter 59 and CFR Title 40, Part 50
NOTES:
µg/m³ = micrograms per cubic meter
ppb = parts per billion
ppm = parts per million

In general, air quality in the State of Hawai`i is some of the best in the nation, primarily because of consistent trade winds and limited emission sources. DOH and EPA maintain a network of air quality monitoring stations throughout the islands. The closest air quality monitoring station to the project site is the Kihei Station (KH), located at Hale Pi`ilani Park, approximately 15 miles southeast of the project site. It is located in a residential community park, adjacent to agricultural land. This station is intended to provide data relative to agricultural sources, and collects measurements for $PM_{2.5}$.

The most recent measurements reported by DOH were recorded in 2010 (DOH, 2011). The annual mean 24-hour $PM_{2.5}$ reading was 4.8 µg/m³, with a maximum reading of 23.5 µg/m³. These measurements do not exceed the federal and state standards. As such, the area is currently in attainment of all criteria pollutants established by the Clean Air Act and the HAAQSs (DOH, 2011).

3.2.11 Noise

Ambient noise levels generally vary with land use throughout Lāhainā. The project site and adjacent areas are characterized by moderate density, mixed-use development, including commercial activities, residential areas, schools, churches and recreational areas. Ambient noise associated with these uses is typically related to human use. The most prominent source of ambient noise is vehicles; vehicular noise is principally attributed to traffic along Honoapi`ilani Highway, and local roadways such as Front Street and Shaw Street.

Although these adjacent uses contribute to ambient noise levels, many of the areas around the project site are also considered to be sensitive to high levels of ambient noise. Noise-sensitive receptors in the project vicinity include schools (for example, King Kamehameha III Elementary School), churches (for example, the Lāhainā Hongwanji Mission Buddhist Temple and Waiola Church), and residences.

3.2.12 Transportation and Traffic

Honoapi`ilani Highway (Route 30) is the primary roadway serving Lāhainā, and runs along the entire western portion of West Maui. It is a two-lane highway, with the exception of a four-lane segment north of Lāhainā. Honoapi`ilani Highway passes approximately 0.1 mile east of the project site and intersects with several connector roads that feed into the town of Lāhainā, including Shaw Street. Front Street, a two-lane County road, runs parallel to Honoapi`ilani Highway and is the main thoroughfare through Lāhainā town. The project site is bounded to the south by Shaw Street and to the west by Front Street (Figure 11). Mokuhinia Way, a single-lane, dead-end road, runs along the northern boundary of the site; this road provides access to four privately owned properties. Other roads that are proximate to the project site include Waine`e Street (running parallel to Front Street, east of the project site), Prison Street (running parallel to Shaw Street, north of the project site), and Luakini Street (forming a diagonal between Prison and Waine`e Streets).

As one of Maui's top destinations, Lāhainā attracts a large number of visitors, most of who stay elsewhere and travel to Lāhainā for the day (Lāhainā Interpretive Planning Team, 2000). These visitors typically use parking lots around the periphery of the town (or arrive via cruise ship), and access the historic district in downtown Lāhainā by foot. The parking lot located on the corner of Shaw and Front Street, operated by the Friends of Moku`ula, is available for this use.

In the vicinity of the project site, Front Street has sidewalks on either side of the roadway; Shaw Street only has a sidewalk along the portion immediately adjacent to the parking lot. The designated route for the self-guided tour of the *Ala Hele Mo`olelo O Lāhainā* includes Front Street (to provide views of Mokuhinia and Moku`ula) and Shaw Street (to provide views of Waiola Congregational Church). Improvements were completed along the Front Street corridor, from Shaw Street north to Baker Street, to improve traffic and pedestrian movement. The County is currently contemplating similar improvements along the segment of Front Street south of Shaw Street.

3.2.13 Public Utilities

Public utilities available within the town of Lāhainā include electricity, telecommunications, water, stormwater drainage, and wastewater services. Under the existing conditions, electrical service is provided to the project site for lighting of the recreational facilities, as well as for operation of the Salvation Army facilities. A main electrical line is located underground within the Front Street rights-of-way, with a service connection to the project site provided along its western boundary (Belt Collins, 2005).

Water and wastewater service is provided for the public restrooms at the park, as well as for the Salvation Army operations. Water and sewer lines are located within both the Front Street and/or Shaw Street rights-of-way; in addition, a force mainline is located along Front Street and connects with a County

wastewater pump station (Number 5), which is located along the western edge of the park, directly adjacent to Front Street (Wilson Okamoto & Associates, 2003). This is one of 16 County pump stations that serve to transport wastewater to the Lāhainā Wastewater Reclamation Facility, located along Honoapi`ilani Highway north of Lāhainā. As noted in Section 1.8.2, the pump station is not part of the project site (Figure 3).

No drainage facilities are present within the boundaries of the project site; however, as described in Section 3.2.4, a ditch runs along the northern edge of Mokuhinia Way, immediately adjacent to the project site. This channel collects runoff from areas *mauka* of the project site and drains to the ocean. Other drainage facilities in the vicinity of the project site include drain lines that run from Front Street along the northern edge of Kamehameha Iki Park and along the southern edge of 505 Front Street, both of which discharge to the ocean. Upgrades to these facilities were identified as part of the Lāhainā Town Drainage Master Plan (Belt Collins, 2005).

3.2.14 Health and Human Safety

Under the existing condition, the majority of the project site is used as a county park; the southern portion of the site serves as the Lāhainā Outpost for the Salvation Army. There are no site conditions directly associated with these current uses that substantially jeopardize human health or safety. Relative to previous land uses within and surrounding the site, the site was investigated for the presence of HTRW, with further investigation of the presence of arsenic, as described in Section 3.2.9. The results of these investigations indicated that arsenic levels generally do not exceed the DOH Tier 1 EALs, such that further investigation is not warranted.

Potential flood hazards are assessed by FEMA, the results of which are mapped on FIRMs. The maps classify land into designated zones depending on the potential for flood inundation. FIRM data shown on State of Hawai`i Flood Hazard Assessment Tool indicate that the majority of the project site is within Zone AE, with a small sliver along the eastern edge in Zone X (DLNR, 2013). Zone AE is defined as those areas subject to inundation by the 1-percent-annual-chance flood event. Zone X includes those areas that are determined to be outside the 500-year floodplain, with less than a 0.2-percent annual probability of flooding (FEMA, 2010).

3.2.15 Socioeconomics and Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. It would be achieved when everyone enjoys the same degree of protection from environmental and health hazards, equal access to the decision-making process, and the opportunity to have a healthy environment in which to live, learn, and work. Demographic and economic variables can be used to define the socioeconomic conditions within a study area, thus providing a baseline that can be used to evaluate whether a proposed project would have a large or disproportionate impact on any one social or economical class of the population.

In general, it is expected that the area most directly affected by the project would be those areas directly adjacent to the project site and more broadly within Lāhainā, although it is possible that some indirect impacts could extend beyond Lāhainā to the entire island, state, or even the nation. Following is a basic overview of the existing demographic and socioeconomic conditions relative to the project site, based on 2010 census data and associated survey data (U.S. Census Bureau, 2010). The project site is within Census Tract 314.04 in the Lāhainā Census Designated Place (CDP).[21]

[21] Census Tract 314.04 generally includes the portion of Lāhainā town from Puamana Park north to Keawe Street, and makai of Honoapi`ilani Highway.

3.2.15.1 Population Statistics

As the largest CDP in West Maui, Lāhainā (CDP 42950) has a resident population of approximately 11,704 people, which represents approximately 8 percent of the population of Maui County (U.S. Census Bureau, 2010). This population represents a total of approximately 3,198 households. However, at any given time, the number of tourists in Lāhainā may result in a far larger population, with an average visitor census of more than 20,000 people (County of Maui, 2006). Table 7 provides an overview of the population within the Lāhainā CDP (and more specifically within Census Tract 314.04), in comparison to the rest of the County of Maui and State of Hawai`i. As shown in Table 8, the population within the Lāhainā CDP has grown by approximately 28 percent in the last 10 years, which is significantly greater than the population increases seen at the County, State, and national levels.

TABLE 7
Population within Census Tract 314.04 and Lāhainā Census Designated Place (CDP)

Area	Year		Percent Change (2000-2010)
	2000	2010	
Census Tract (314.04) [1]	N/A [2]	3,250	N/A
Lāhainā (CDP 42950)	9,118	11,704	28.4%
County of Maui	128,094	154,834	20.9%
State of Hawai`i	1,211,537	1,360,301	12.3%
United States	281,421,908	308,745,538	9.7%

NOTES:
[1] Census Tract 314.04 generally includes the portion of Lāhainā town from Puamana Park north to Keawe Street, and *makai* of Honoapi`ilani Highway.
[2] Population estimates are not available for previous years because of redistricting of census boundaries.

Within Census Tract 314.04, the median age of the resident population is approximately 37.8 years old, and approximately 10.6 percent of the population is over 65 years old. These values are generally comparable with those for the population within the Lāhainā CDP (37.3 years; approximately 12 percent), the County of Maui (39.6 years; approximately 13 percent), and the State of Hawai`i (38.6 years; approximately 14 percent).

Approximately 84 percent of the population in Census Tract 314.04 is of a single race: approximately 50 percent is Caucasian, approximately 17 percent is Asian, approximately 9 percent is native Hawaiian or Pacific Islander, and approximately 9 percent is of another race. The remaining population is reported to be of two or more races. The percentage of each race (alone or in combination with one or more other races) represented in the population of the census tract, as compared to those in the Lāhainā CDP, County of Maui, and State of Hawai`i, is listed in Table 8. In general, these values indicate that the population is comprised of a larger percentage of Caucasians and a small percentage of Asians than the surrounding areas of the Lāhainā CDP, Maui County and the State of Hawai`i. The percentage of the population comprised of native Hawaiians is comparable to that within these larger areas.

TABLE 8
Representation of Race in Census Tract 314.04 and Lāhainā CDP

Category	Census Tract (314.04)		Lāhainā (CDP 42950)		County of Maui		State of Hawai`i	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Caucasian	1,993	61%	4,581	39%	78,090	50%	564,323	42%
African American	59	2%	134	1%	2,276	2%	38,820	3%
American Indian	103	3%	239	2%	3,902	3%	33,470	3%
Asian	904	28%	6,342	54%	72,810	47%	780,968	57%
Native Hawaiian and Other Pacific Islander	601	19%	2,611	22%	42,264	27%	355,816	26%
Other	294	9%	704	6%	5,259	3%	34,199	3%

NOTE: The percentage of each race includes both those persons who reported a single race and those who reported a combination with one or more other races.

Of the population within Census Tract 314.04 that is 16 years and older (approximately 2,271 people), approximately 74 percent is in the labor force; approximately 10 percent is unemployed. These values are commensurate with those for the population within the Lāhainā CDP (71 percent; 7 percent), County of Maui (71 percent; 8 percent), and State of Hawai`i (67 percent; 6 percent).

The median household income in the census tract is approximately $48,204, and per capita income is approximately $26,102. Compared to values at the CDP, county, and state levels, median household incomes are lower ($54,182; $64,583; and $67,116; respectively). Per capita incomes are lower than those at the county and state levels ($29,654; and $29,203; respectively), but higher than those in the Lāhainā CDP ($23,801). Approximately 10 percent of the population has an income below the poverty level, which is generally the same as compared to the in the Lāhainā CDP (9 percent), the County of Maui (9 percent), and the State of Hawai`i (10 percent).

The Salvation Army's Lāhainā Outpost, which is located within the project area, serves low-income residents in Lāhainā and throughout West Maui. This facility offers a range of services, including emergency assistance with food, rent, and utilities to needy families. It also includes the Hale Palekana Homeless Drop-In Center, which provides basic services such as meals, showers, laundry facilities and substance abuse counseling for displaced and homeless individuals and families.

There are a total of five public and private schools located within Lāhainā, serving a total of approximately 3,225 children between the ages of prekindergarten and 12th grade (County of Maui, 2011). In addition to these schools, there are other organizations in Lāhainā that provide childcare, such as day care facilities. Schools and day care facilities that are located in the immediate vicinity of the project site include King Kamehameha III Elementary (on Front Street, approximately 0.1 mile northwest of the project site), Holy Innocents Preschool (on Front Street, near the northwest corner of the project site), and Kama`aina Kids Lāhainā Preschool (on Wainee Street, near the northeastern corner of the project site).

Approximately 91 percent of the population within the census tract has graduated from high school; approximately 26 percent has obtained a college degree. In comparison, with the Lāhainā CDP, approximately 85 percent has graduated from high school and 19 percent has obtained a college degree. At the County and State levels, 89 percent and 90 percent of population has graduated from high school, respectively; approximately 26 percent and 30 percent has obtained a college degree, respectively.

4.0 Future Without-Project Conditions (No Action Alternative)

The future without-project condition is defined as the most likely condition expected to exist in the future in the absence of the project, and serves as the benchmark against which alternative plans will be evaluated (USACE, 2000). In general, the future without-project condition should consider present day actions, laws, and policies (such as regular maintenance of existing structures), as well as reasonably foreseeable actions (such as capital improvement program [CIP] budgeted items), with assumptions based on existing literature or best professional judgment from subject matter experts. However, it should be noted that the future without-project condition is fundamentally uncertain and these assumptions represent a best guess of future conditions relative to the project site.

USACE regulations specify that forecasting should account for such conditions such as climate variability, sea-level rise, subsidence, geomorphological changes, and changes in development. Starting in 2010, the POH began engaging with the various groups that are working to define climate change scenarios for the State, including the Center for Island Climate Adaptation and Policy (ICAP), the Pacific Islands Climate Change Cooperative (PICCC), and the Ocean Resource Management Plan (ORMP) Working Group. The POH intends to use information generated by these groups to define formal scenarios for all POH projects. Because this effort is not yet complete, forecasting of the future without-project conditions for the project was defined based on best available information in the existing literature and best professional judgment from local technical experts.[22]

The forecast of future-without project conditions extends from the base year (that is, the year when the proposed project is expected to be operational) to the end of the period of analysis (that is, the time period chosen to evaluate the effect of the project). Typically, the period of analysis should be the same for all alternatives being considered, as well as for all the components of each alternative (Yoe and Orth, 1996). Since the base year for the economic analysis will be defined as the year when project benefits start accruing, the forecast period should also start at the same base year. For this project, the base year is assumed to be 2018, with a 50-year period of analysis. Therefore, the forecast period starts at 2018 and ends in 2068. To the extent possible, the following discussions of the future without-project condition apply to the full period of analysis. However, in some cases, published data only extend through part of the period of analysis (for example, to 2035); these data are included and noted accordingly.

For many of the resources, conditions within and surrounding the project site are not expected to substantially change over the forecast period. For example, in the absence of the project, it is expected that Malu`ulu o Lele Park will be maintained as a park by the County of Maui, and Loko o Mokuhinia will remain covered. Salvation Army would not relocate to another site, as required for implementation of the alternative plans (further described in Section 5.0), but rather would continue operations in their current location. Other restoration and/or preservation activities may be conducted within the Moku`ula/Mokuhinia site by the Friends of Moku`ula; these activities may result in increased use of the Moku`ula/Mokuhinia site for passive cultural uses, but excavation of Moku`ula (and any associated archaeological and/or historic features) may be limited by the presence of surrounding fill material over Loko o Mokuhinia.

[22] To the extent possible, this project used the analyses and extensive research completed for the Ala Wai Watershed Project, which is the most recent project conducted by POH that addresses future without-project conditions, particularly as related to climate change. The Ala Wai Watershed Project information is current as of March 2011.

Given the current extent of development and the degree of zoning regulations (for example, historic district or SMA), land uses in the areas surrounding the project site are expected to remain relatively unchanged over time.[23] With relatively consistent land uses within and surrounding the project site, no appreciable changes would be expected to those resources that are related to land use, such as noise and visual resources. Similarly, there would be no activities within or surrounding the project that would be expected to result in release of contaminants, or other conditions affecting human health and safety. Although there may be an increase in traffic volumes, the general modes and patterns of transportation are expected to remain relatively unchanged. The underlying geology and soils within the site are not expected to significantly change within the period of analysis. Nor would the range of emission sources or trade wind patterns be expected to change substantially; therefore, air quality levels are expected to remain relatively constant.

The resources that could differ substantially under the future without-project condition – climate, and hydrology and water resources – are discussed below. Given the relevance to the project objective, biological resources are also addressed.

4.1 Climate

A broad spectrum of climate change impacts have been investigated and described for Hawai`i, including rising surface air temperature, decreasing quantity of total annual precipitation, increasing intensity of storm events, increasing hurricane wind speeds, rising sea levels, increasing ocean temperature, and increasing ocean acidification (Fletcher, 2010; USFWS, 2011b).

To consider which of these factors would be likely to influence conditions at the project site, the risk and degree of sensitivity associated with each climate variable was assessed based on the general trends projected for Hawai`i. This assessment was based on the concepts incorporated into the risk management framework currently being developed by the USACE, as presented in *Risk Informed Decision Making for Climate Change* (USACE, 2011a). For those variables that are considered a risk for this project, an appropriate method of evaluation was determined. The evaluation methods were determined primarily based on the availability of relevant data, the degree of relevance to the project objectives, and level of analysis recommended for CAP projects. The results of the risk assessment are summarized in Table 9.

TABLE 9
Risk Assessment of Climate Change Variables

Variable	Expected Trend in Hawai`i	Assessment of Risk to Mokuhinia Project (Sensitivity Rating)	Evaluation Method
Surface Air Temperature	Decrease in daily temperature range, with an increase in average ambient temperatures	Increasing air temperature would likely affect evapotranspiration within the project site (moderate sensitivity).	Use published data for Hawai`i to establish range of future temperatures; use range as input to sensitivity analysis to estimate groundwater availability
Total Annual Precipitation	Decrease in annual rainfall, with most of the decrease occurring in winter months	Decreasing annual rainfall would likely affect groundwater recharge, and thus, groundwater availability within the project site (moderate sensitivity).	Use published data for Hawai`i to establish range of future annual precipitation; use range as input to sensitivity analysis to estimate groundwater availability

[23] A recent study by Engott and Vana (2007) investigated the effect of changes in agricultural land uses on groundwater recharge. However, large-scale agricultural operations in West Maui ceased in the 1990s, and therefore, future changes in agricultural land use are not expected to be a significant consideration relative to the future without-project condition.

TABLE 9
Risk Assessment of Climate Change Variables

Frequency and Intensity of Precipitation	Increased intensity of precipitation event	Increased precipitation intensity could lead to a decrease in the proportion of precipitation that infiltrates and result in a decrease in groundwater recharge (moderate sensitivity).	Qualitative assessment of impacts associated with increased precipitation intensity; sensitivity analysis of groundwater availability is based on future annual precipitation
Hurricanes	Increasing wind speeds	Increasing hurricane wind speeds are not expected to significantly affect project site (low sensitivity).	N/A
Sea Level	Rise in sea level of approximately two to three feet	Rising sea level not expected to result in inundation of project site, but could affect salt water intrusion of groundwater (moderate sensitivity).	Qualitative assessment of impacts associated with saltwater intrusion to groundwater quality
Ocean Temperature	Increase of ocean surface temperatures by approximately 2 to 4°F	Increasing ocean temperatures are not expected to significantly affect project site (low sensitivity).	N/A
Ocean Acidification	Increased acidification because of higher levels of dissolved carbon dioxide	Increasing ocean acidification is not expected to significantly affect project site (low sensitivity).	N/A

Source: USFWS, 2011b and Fletcher, 2010

As summarized in Table 9, the climate variables that are most likely to influence conditions at the project site are expected to be air temperatures, annual precipitation, frequency and intensity of precipitation, and sea-level rise. Following is a discussion of the future without-project conditions relative to these climatic changes.

4.1.1 Temperature

Overall, air temperature data in Hawai`i have indicated a warming trend that has accelerated in recent decades, resulting in a warmer environment, especially at higher elevations and at night (Giambelluca et al., 2008; USFWS, 2011b). The warming is generally related to a larger increase in minimum temperatures compared to the maximum, causing a reduction of the daily temperature range (Fletcher, 2010).

Regional Climate Projections (Christensen, et al., 2007) from the Intergovernmental Panel on Climate Change (IPCC) for the North Pacific region estimate an increase in annual temperature by the year 2100 of 2.3 degrees Celsius (°C) (4.1°F), slightly below the global average, with values ranging from 1.9°C (3.4°F) to 2.6°C (4.7°F) and 50 percent of the model results within ±0.4°C (0.7°F) of the mean. Increased air temperatures could influence monthly and annual evapotranspiration in the project area.

4.1.2 Annual and Seasonal Precipitation

Precipitation data for Hawai`i, which include sea-level precipitation and the added orographic effects, show a steady and significant decline over the last 15 to 20 years (Diaz et al., 2005; Chu and Chen, 2005). Figure 21 illustrates these changes in precipitation relative to central and West Maui.

As summarized in *Climate Change in the Pacific Islands* (USFWS, 2011b), global climate modeling predicts that by the year 2090, net precipitation at sea level near the Hawaiian Islands will decrease in winter by about 4 to 6 percent, with no significant change during summer (IPCC, 2007). Downscaling of global

climate models indicate that wet-season (winter) precipitation will decrease by 5 to 10 percent, while dry-season (summer) precipitation will increase by about 5 percent (Timm and Diaz, 2009). The decadal scale regional climatic feature of El-Nino Southern Oscillation (ENSO) also results in drier than normal winter months, so conditions will likely be aggravated when ENSO events occur concurrent with the anticipated decrease in rainfall. These conditions could impact groundwater recharge, and thus groundwater availability within the project area.

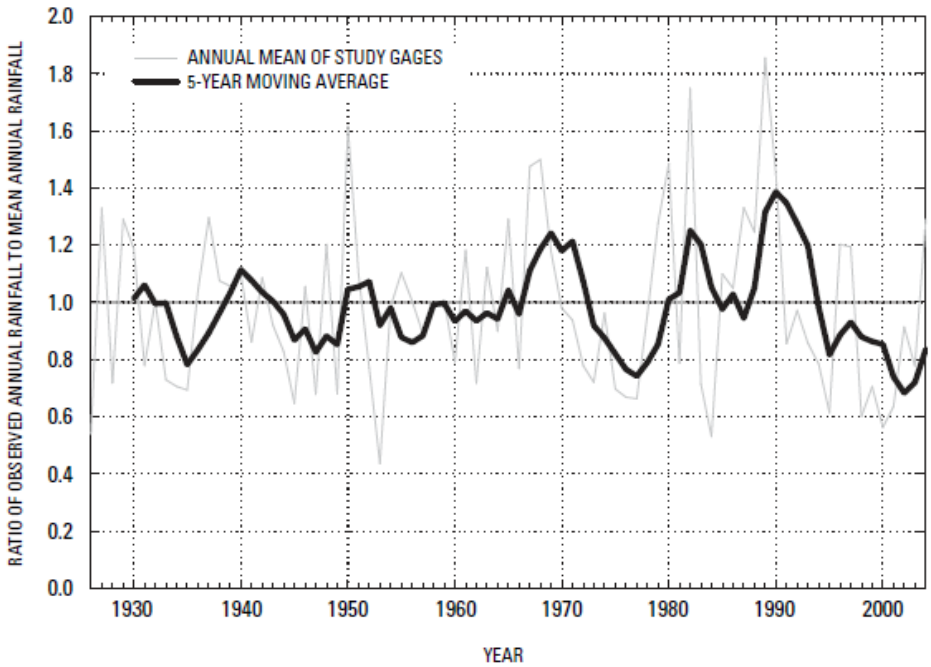


FIGURE 21
Five-year Moving Average of the Mean Ratio of Measured Annual Rainfall to Mean Annual Rainfall (as measured for the 33 rainfall gages used in the water-budget calculation for central and West Maui, Hawai`i) (from Engott and Vana, 2007)

4.1.2.1 Rainfall Frequency and Intensity

For the period 1958-2007, very heavy precipitation (defined as the heaviest 1 percent of all daily rain events) for the State of Hawai`i increased by 12 percent, and average number of days with heavy precipitation increased by 8 percent (U.S. Global Change Research Program [USGCRP], 2009). It is expected that the frequency of heavy rainfall events will increase while the lightest precipitation is projected to decrease. The 5 percent chance (20-year) storm is expected to be between 10 to 25 percent heavier by the end of the 21st century (USGCRP, 2009). It is unknown if decadal events such as ENSO variations will temper the expected increase in precipitation frequency and intensity.

4.1.2.2 Sea-Level Rise

In 2011, the USACE issued updated guidance ("Incorporating Sea-Level Change Considerations in Civil Works Programs") (EC 1165-2-212) requiring that all projects that could be affected by sea-level rise identify three scenarios (low, intermediate, and high) for consideration in the planning process. Consistent with guidance presented in Appendix C of EC 1165-2-212 (USACE, 2011b), three potential rates of future sea-level rise were calculated for the project area. The first step was to find and determine the applicability of available tide station data. Per EC 1165-2-212, such data should be from tide station records of at least 40 years. The Kahului tide gage (No. 1615680) is located on the windward side of Maui, and has a record dating to 1946 (Figure 22). Based on data from 1947 to 2005, the mean sea-level trend is 2.32 millimeters per year (mm/yr) (+/- 0.53 mm/yr), or 0.23 meter (0.76 foot) in 100 years. Although this

gage is located on the opposite side of the island from the project site, it provides information about ocean trends in the project area.

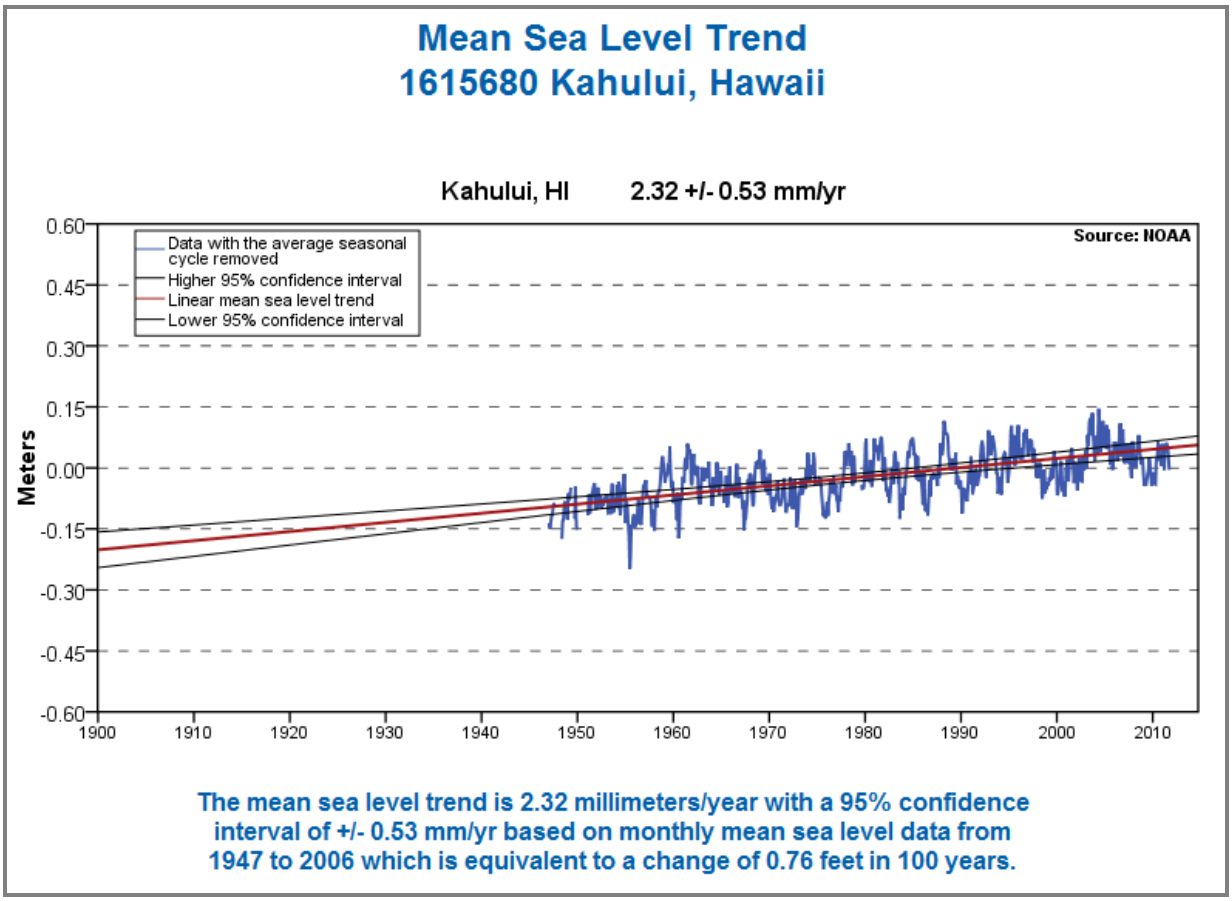


FIGURE 22
Mean Sea-Level Trend for the Kahului Tide Gage (No. 1615680) (NOAA, 2011a)

EC 1165-2-212 (USACE, 2011b) recommends the use of NOAA CO-OPS values for the sea-level trend analysis, if such values have been computed for the tide gage. Following the convention of the National Research Council (NRC) and EC 1165-2-212, the term “M” is used to express the local differential in trend because of vertical land motion. To estimate M at each tide station, NOAA estimates the regional oceanographic component by de-trending each series and averaging the oceanographic residuals over an entire region, then adding a trend of 1.7 mm/yr to the regionally averaged residual. The final adjusted time series is then subtracted out of each observed time series for each station to get the final local component, which is due mainly to local vertical land movement (either subsidence or uplift) (NOAA, 2011b). The M value used for the Kahului tide gage was 2.21 mm/yr.

To conduct the analysis for the three curves, the USACE guidance (EC 1165-2-212) recommends the use of the historic rate of sea-level change for the "low curve." The rate for the "intermediate curve" is computed from the modified NRC Curve I, considering both the most recent IPCC projections and modified NRC projections with the local rate of vertical land movement added. The rate for the "high curve" is computed from the modified NRC Curve III considering both the most recent IPCC projections and modified NRC projections with the local rate of vertical land movement added. The modified NRC curves are based on NRC scenarios for global sea-level rise, adjusted to include the historic sea-level change rate of 1.7 mm/yr presented by the IPCC in 2007 (IPCC, 2007).

The low, intermediate and high curves for the project were calculated using the USACE sea-level change calculator (USACE, 2012). As shown in Table 10 and Figure 23, the results range from 0.17 meter (low) to 0.82 meter (high) of sea-level rise in the year 2068. For the year 2100, the range is 0.24 meter (low) to 1.56 meters (high); these results generally fall within the range of global sea-level rise rates of 0.5 to 1.4 meters by 2100, as presented in the updated studies accounting for accelerated glacial ice melting (Fletcher, 2009). In those studies, Fletcher (2009) makes a case for a 1-meter mean global sea-level rise by 2100, which suggests that either the intermediate or high rate calculated for the project may be the most realistic estimate. However, even under the high rate of sea-level rise (0.82 meter by the year 2070), the project site is at an elevation that is not expected to be subject to inundation.[24] As such, consistent with the requirements of EC 1105-2-212, the alternative evaluation process is based on a single-scenario approach using the high rate of sea-level rise. As further discussed in Section 4.2.2, the project site may be indirectly affected by sea-level rise through saltwater intrusion of the groundwater.

TABLE 10
Estimated Rates of Sea-Level Rise (based on USACE methodology using records from the Kahului tide gage)

Year	Estimated Rates of Sea-Level Rise (meters)		
	Low	Intermediate	High
2018	0.06	0.08	0.13
2023	0.07	0.09	0.18
2028	0.08	0.11	0.23
2033	0.09	0.14	0.28
2038	0.10	0.16	0.34
2043	0.11	0.18	0.41
2048	0.12	0.21	0.48
2053	0.13	0.24	0.56
2058	0.15	0.26	0.64
2063	0.16	0.29	0.73
2068	0.17	0.32	0.82
2073	0.18	0.36	0.92
2078	0.19	0.39	1.03
2083	0.20	0.43	1.14
2088	0.21	0.46	1.25
2093	0.22	0.50	1.38
2098	0.23	0.54	1.50
2100	0.24	0.55	1.56

SOURCE: U.S. Army Corps of Engineers. 2012. Comprehensive Evaluation of Projects with Respect to Sea-Level Change. *Sea-Level Change Curves.* Available online at http://corpsclimate.us/ccaceslcurves.cfm

[24] Future rates of coastal erosion could and/or storm surge could affect the potential for inundation of the project site; however, assessment of the potential for coastal erosion and/or storm surge is beyond the scope of this project.

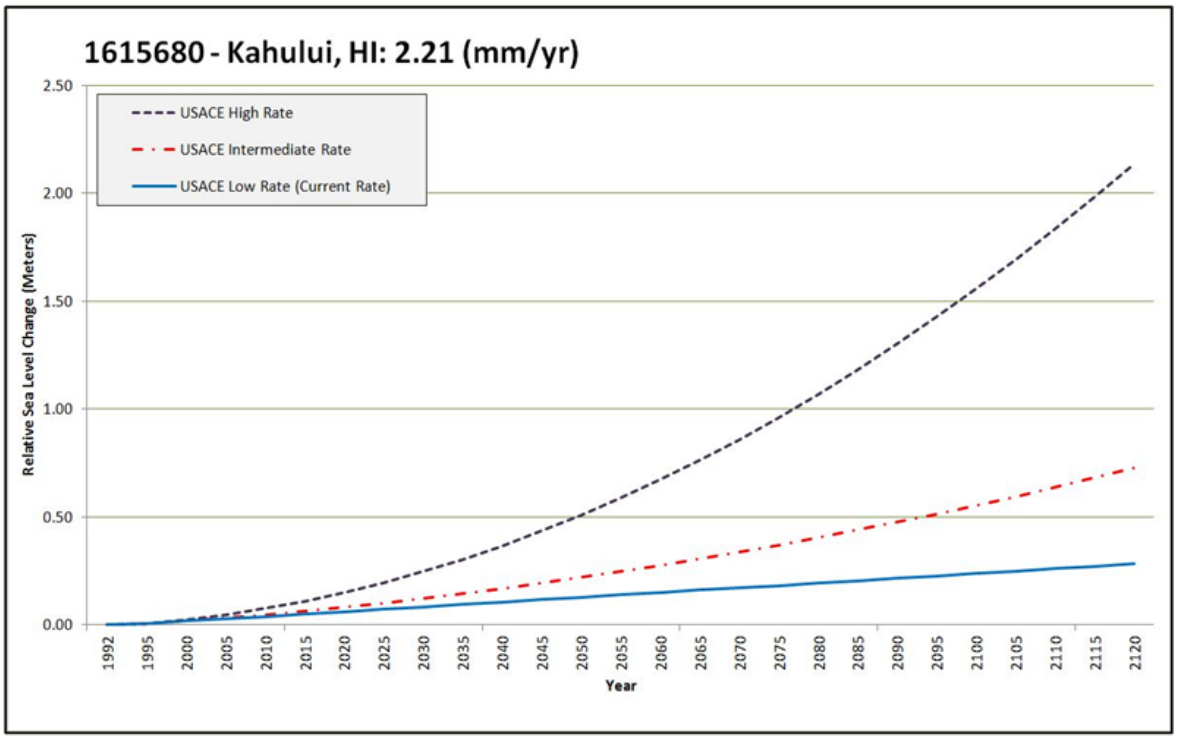


FIGURE 23
Estimated Rates of Sea-Level Rise (based on USACE methodology using records from the Kahului tide gage)

4.2 Hydrology and Water Resources

It is expected that future climatic changes, as described above, will influence hydrologic conditions within the project site. Under the future without-project condition, these changes would be expected to primarily affect groundwater resources, as further discussed below. Because no substantial changes are expected related to existing land uses in the project vicinity, the project site is expected to remain as a recreational park, with no surface water features present.

It is assumed that drainage infrastructure and other improvements associated with the Lāhainā Town Drainage Master Plan and the Lāhainā Watershed Flood Control Project would be implemented. However, these projects are generally focused on improving existing drainage features. For example, as part of the Lāhainā Town Drainage Master Plan, the existing ditch that runs along the northern boundary of the site would be upgraded to a double box culvert, and a flap gate would be installed to reduce blockage of flows to the ocean. Similarly, a flood diversion channel above Lāhainā town would be installed as part of the Lāhainā Watershed Flood Control Project, serving to replace the existing temporary diversion system. As such, it is expected that future drainage patterns in the areas surrounding the project site would be similar to those under the existing condition.

4.2.1 Groundwater

In general, it is expected that the future availability of groundwater in central and West Maui could be affected by climatic changes (particularly rainfall), as well as regional changes in land use. Relative to land use changes, a recent study by Engott and Vana (2007) indicates that a shift away from agriculture could result in decreased groundwater recharge, because of a reduction in artificial irrigation. However, large-scale agricultural operations in West Maui ceased in the 1990s, and as such, it is assumed that future

changes in agricultural land uses would not be a significant factor relative to future groundwater availability within the project site. Other concerns relative to the effect of future land use on groundwater recharge include increased withdrawals (Engott and Vana, 2007).

To estimate the availability of groundwater at the project site under the future without-project condition, the inputs to the water balance equation prepared by Oceanit (2009) were systematically adjusted using a Monte Carlo simulator to evaluate input sensitivities on possible groundwater outflow to the ocean. For review, the water balance equation is as follows, where P is precipitation, SW_{in} is stormwater run-on, ET is evapotranspiration, GW_{in} is the upgradient groundwater flux to the site, and delta S is the groundwater outflow to the ocean:

$$\boxed{\Delta S = P + SW_{in} - ET + GW_{in}}$$

The Monte Carlo simulator creates a series of experimental inputs using the data series probability distribution with a random number generator.

Future condition inputs for precipitation and evapotranspiration were varied based on the range and distribution of observed historical values, and adjusted to account for likely future conditions relative to precipitation and temperature. Adjustments to precipitation (P) were based on an anticipated decrease of 5 to 10 percent, as described in Section 4.1.2. ET estimates were developed with the 1985 Hargreaves-Samani Method (using the Reference Evapotranspiration Calculation Software [REF-ET]), which uses minimum and maximum temperatures as inputs to approximate solar radiation. Adjustments to ET for future conditions were made by inputting the anticipated temperature increases into the ET calculations to obtain an estimate of the corresponding ET values. Because of the uncertainty associated with the aquifer hydraulic conductivity estimate, for this analysis the upgradient groundwater input (GW_{in}) was held fixed at summer and winter values estimated by Oceanit. Stormwater run-on (SW_{in}) was assumed to be 0, as the Lāhainā Town Drainage Master Plan specifies that stormwater flows be kept separate from the proposed wetland (Belt Collins, 2005).

Four Monte Carlo scenarios (MCS) were analyzed, based on the following adjustments to precipitation and evapotranspiration: [25]

- MCS 1: summer conditions, with precipitation decreased by 5 percent and evapotranspiration increased based on a 1.19°F rise in temperature
- MCS 2: winter conditions, with precipitation decreased by 5 percent and evapotranspiration increased based on a 1.19°F rise in temperature
- MCS 3: summer conditions, with precipitation decreased by 10 percent and evapotranspiration increased based on a 1.65°F rise in temperature
- MCS 4: winter conditions, with precipitation decreased by 10 percent and evapotranspiration increased based on a 1.65°F rise in temperature

Table 11 presents the inputs used for each scenario: minimum, maximum, mean, standard deviation, and distribution.

[25] The adjustment for the evapotranspiration rates are based on the assumption that 35 percent of the low and high increases in the future temperature range would occur over the 50-year forecast period.

TABLE 11
Inputs to the Monte Carlo Simulations for Groundwater Outflow

Statistics	Precipitation (gallons/day)[1]		Evapotranspiration (gallons/day)[2]		GW_{in} (gallons/day)[3]	
	Winter	Summer	Winter	Summer	Winter	Summer
MCS 1 & 2: Precipitation decreased by 5 percent; ET increased based on a 1.19°F rise in temperature						
Minimum	1,268	-	25,255	38,901		
Maximum	28,117	7,003	38,494	42,363		
Mean	11,460	1,603	30,871	41,101	74,414	50,103
Median	10,852	1,043	29,736	41,549		
Std. Deviation	6,163	1,634	4,916	1,421		
Distribution	Gamma	Gamma	Gamma	Gamma	Fixed	Fixed
MCS 3 & 4: Precipitation decreased by 10 percent; ET increased based on a 1.65°F rise in temperature						
Minimum	1,201	-	25,459	39,105		
Maximum	26,637	6,634	38,697	42,567		
Mean	10,856	1,519	31,045	41,345	74,414	50,103
Median	10,280	988	29,940	41,752		
Std. Deviation	5,838	1,548	4,951	1,404		
Distribution	Gamma	Gamma	Gamma	Gamma	Fixed	Fixed

NOTES:

[1] Future precipitation statistical inputs were developed based on the monthly filled dataset for Lāhainā Weather Station 361 (515177) in the Rainfall Atlas of Hawai`i (Giambelluca et al., 2011); the monthly values were then decreased by 5 or 10 percent to reflect the estimated future conditions (as discussed in Section 4.1.2).

[2] Future evapotranspiration statistical inputs were developed using the 1985 Hargreaves-Samani Method with the REF-ET: Reference Evapotranspiration Calculation Software developed by the University of Idaho and Dr. Richard G. Allen, updated 2011. This calculation uses temperature as an input for solar radiation. Monthly maximum and minimum historical temperatures were averaged over the years 1942 to 2001; the monthly values were then increased by 1.19°F (35 percent of 3.4°F), and 1.65°F (35 percent of 4.7°F), to reflect the portion of the future projected low and high increases that would occur over the 50-year forecast period.

Figures 24 through 27 present the resulting relative frequency and cumulative probability for each of the four Monte Carlo scenarios. Table 12 presents the output statistics for the estimated groundwater outflow.

TABLE 12
Output Statistics for Monte Carlo Simulations for Groundwater Outflow

Statistics	MCS 1 (Summer, 5% Precipitation Decrease)	MCS 2 (Winter, 5% Precipitation Decrease)	MCS 3 (Summer, 10% Precipitation Decrease)	MCS 4 (Winter, 10% Precipitation Decrease)
Minimum	4,009	26,466	4,002	26,389
Maximum	28,544	95,744	24,390	92,558
Mean	10,605	55,003	10,277	54,226
Stdev	2,158	7,823	2,081	7,736
Skew	0.87	0.46	0.81	0.39

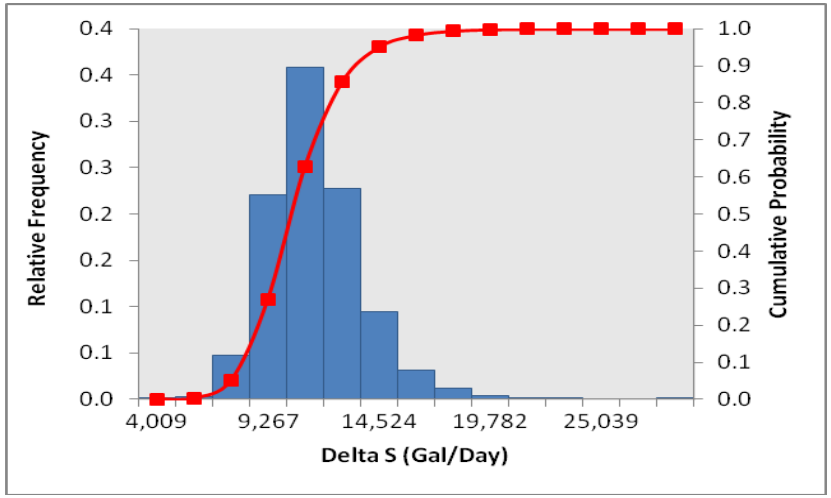


FIGURE 24
Relative Frequency and Cumulative Probability for Groundwater Outflow (MCS 1)

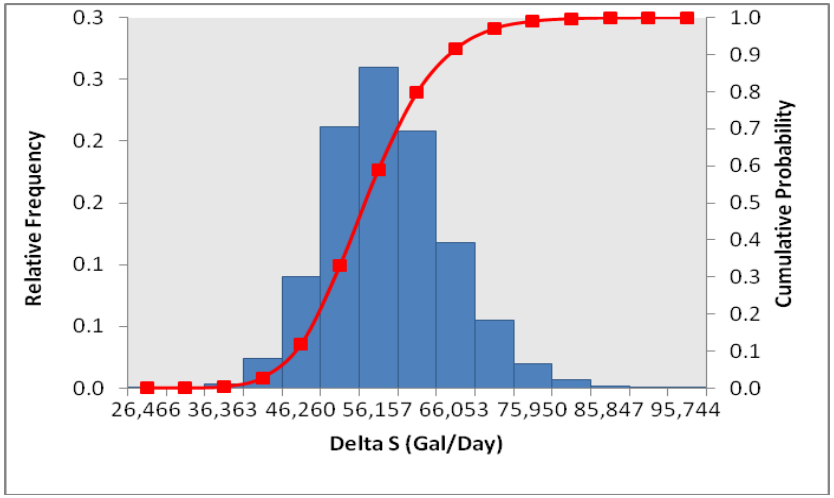


FIGURE 25
Relative Frequency and Cumulative Probability for Groundwater Outflow (MCS 2)

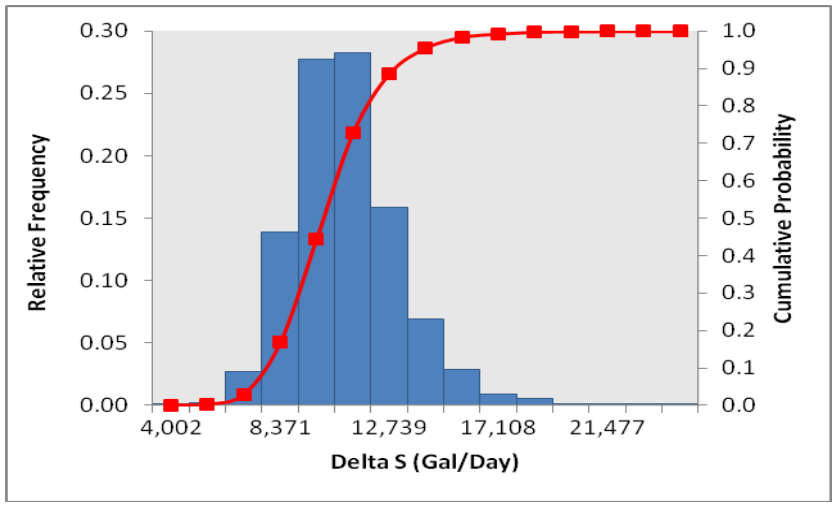


FIGURE 26
Relative Frequency and Cumulative Probability for Groundwater Outflow (MCS 3)

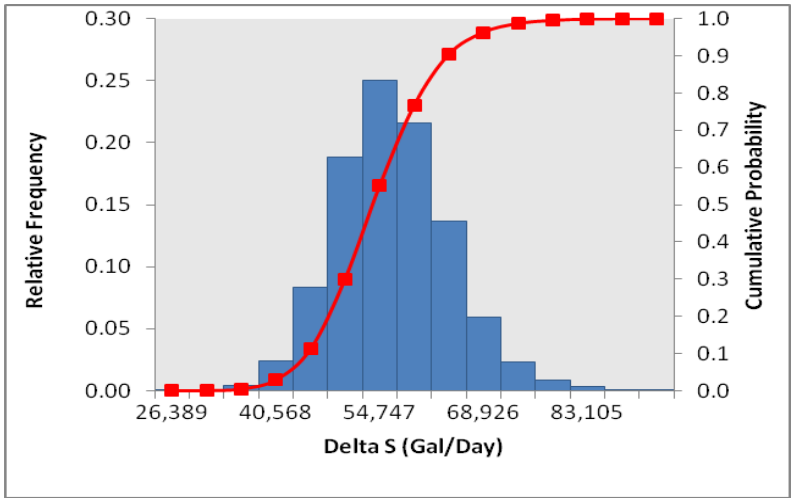


FIGURE 27
Relative Frequency and Cumulative Probability for Groundwater Outflow (MCS 4)

Of the four future conditions evaluated, the estimated groundwater outflow (delta-S) to the ocean ranges from a minimum of 4,002 gallons/day (MCS 3) to a maximum of 95,744 gallons/day (MCS 2). The delta-S distributions are positively skewed and can be characterized by a log-normal distribution. Summer future conditions exhibit a lower delta-S range than winter conditions. The fact that the delta-S estimates are positive for all future condition scenarios suggests that groundwater flows consistently outward to the ocean. However, this Monte Carlo analysis is somewhat limited because of the uncertainty associated with GW_{in} input; a more precise quantification of potential groundwater outflow to the ocean could be completed based on aquifer pump tests to validate aquifer transmissivity and hydraulic conductivity.[26] For the purposes of the feasibility planning process, evaluation of the alternative plans is based on the range of conditions represented by the different scenarios, which collectively indicate continued groundwater flows to the ocean.

4.2.2 Water Quality

As described in Section 3.2.4, groundwater in West Maui occurs primarily in a freshwater lens overlaying a transition zone, where salinity gradually increases from near fresh water to salt water. The thickness of this transition zone could be affected by a variety of factors—including tides, pumpage, or reduced groundwater flows—resulting in saltwater intrusion into the freshwater lens. In particular, sea-level rise would be expected to affect groundwater quality within and adjacent to the project site, particularly given the proximity to the ocean. Quantification of future rates of saltwater intrusion is not feasible at this time, without development of a detailed groundwater model based on aquifer pump tests. However, it is expected that under the future without-project condition, groundwater salinity would increase, with the transition to increasingly brackish water occurring at shallower depths.

4.3 Biological Resources

Potential impacts of climate change on island ecosystems have been widely described, and the range of potential impacts in Hawai`i are relatively well understood (USFWS, 2011b; USGRP, 2009; Mimura et al., 2007). Specifically, future changes in air temperatures, rainfall patterns, and sea-level rise are expected to result in increased habitat loss and degradation, decreased biodiversity (including extinction of endangered species and migration and loss of native species), and spread of invasive species. Coastal wetlands, such as those that historically occurred within Loko o Mokuhinia, are especially vulnerable to these changes, and a range of wetland functions within these areas could be directly and indirectly affected (PCJV, 2010). In particular, changes in wetland hydrology could eliminate already sparse habitat for wetland-dependent species, including endangered waterbirds. To date, these impacts have not been well quantified at either the state or local level, although more information is expected to be made available in the relatively near future through ongoing efforts such as the initiatives through ICAP, PICCC, Pacific Risk Management Ohana (PRiMO), and the ORMP Working Group.

In general, trends for Hawaiian stilt and coot indicate that the populations are stable or increasing, and assuming ongoing active conservation management, these trends are generally expected to continue over time (Reed et al., 2012). However, both species are expected to be vulnerable to climate change, which could result in a range of potential negative impacts, thus threatening species recovery. The current literature indicates that scientists are still in the early stages of understanding the nature and extent of climate change impacts on Hawaiian waterbird species, but of particular concern are rising sea levels and incursion of salt water into coastal wetlands, which could inundate nesting areas (VanderWerf, 2012; North American Bird Conservation Initiative, 2010). Declining precipitation and increasing temperatures

[26] As noted in Section 3.2.4.2, It has been strongly recommended that aquifer pump tests be conducted to validate the aquifer transmissivity and hydraulic conductivity estimates used in the Oceanit hydrogeologic assessment (2009). The USACE has indicated that this work will be conducted as part of the design phase.

could also contribute to reduced open water areas, as well as avian botulism outbreaks (Work et al. 2010; Reed et al., 2012). Despite the broad range of climate change impacts that have been described relative to Hawai`i's ecosystems, the biological resources that currently exist within the project site are not expected to be significantly affected. As described in Section 3.2.5, the majority of the site is vegetated with Bermuda grass, with a variety of non-native and Polynesian-introduced species around the perimeter of the park. Wildlife species generally include those that are typical of urbanized areas. Although the site would be subject to future climatic changes, none of the existing biological resources are expected to be particularly vulnerable and the type of resources within the project site is not expected to substantially change. It is possible that there would be some degree of shift in species composition, but it is expected that the project site would continue to be characterized by a suite of non-native species that typically occur in disturbed urban environments.

5.0 Plan Formulation and Evaluation

Following the development of problems and opportunities (Step 1) and inventory and forecast conditions (Step 2), the next step in the planning process is the formulation of alternative plans (Step 3) that address the planning objectives and constraints. This is followed by evaluation and comparison of those plans (Steps 4 and 5, respectively). Based on the results of evaluation and comparison, a plan is selected and recommended for implementation (Step 6). This chapter presents the results of the plan formulation, evaluation, and comparison process, resulting in identification of a tentatively selected plan. Appendix F of ER 1105-2-100 (Continuing Authorities Program) states that plan formulation and evaluation for CAP-authorized projects should be at a level of detail appropriate for the scope and complexity of the project, as determined by the district staff (in coordination with the Major Subordinate Command [MSC]). Consistent with this guidance and other applicable regulations, an approach for alternatives formulation, evaluation, and comparison was developed as needed to meet the project-specific requirements; this process was reviewed and refined based on input provided by POD, who serves as the MSC for POH.[27]

The resulting approach involved the identification of a suite of restoration measures that reflect the desired ecosystem conditions; a conceptual model was developed and used to guide this effort. These measures were then combined to form an array of alternative plans, which collectively represent a range of ecosystem outputs and costs. Each of the measures and alternative plans were iteratively screened and reformulated to maximize the extent to which they address the planning objectives and constraints. Through the screening and reformulation process, a final array of alternatives was identified. The final array of alternatives was evaluated with regard to cost and ecosystem outputs (habitat benefits) based on a cost effectiveness and incremental cost analysis (CE/ICA). The plans identified as "best buy" plans through the CE/ICA analysis were then compared to one another, the results of which provided the basis for selection of a recommended plan for implementation ("tentatively selected plan"). Throughout this process, input was incorporated from the PDT (including the non-federal sponsor), TAC team, agencies, members of the community, and other stakeholders. The plan formulation process is illustrated in Figure 28; the results are described in the following sections.

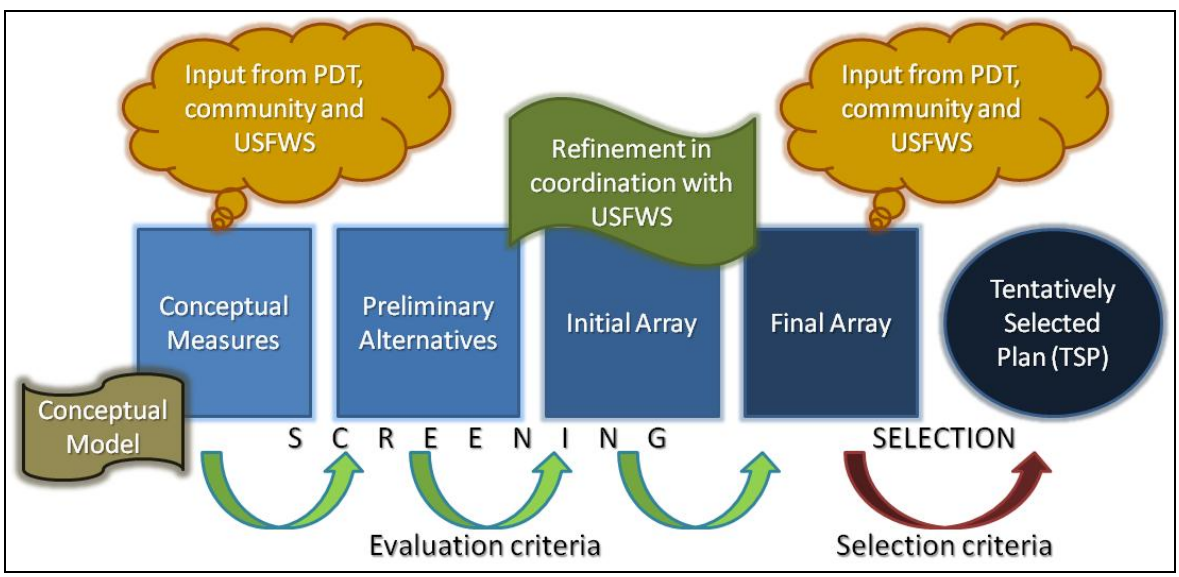


FIGURE 28
Plan Formulation and Evaluation Process

[27] The plan formulation and evaluation process was reviewed with POD as part of a PDT meeting held on November 16, 2012. The alternatives formulation and evaluation process was refined to incorporate specific input provided as part of this meeting.

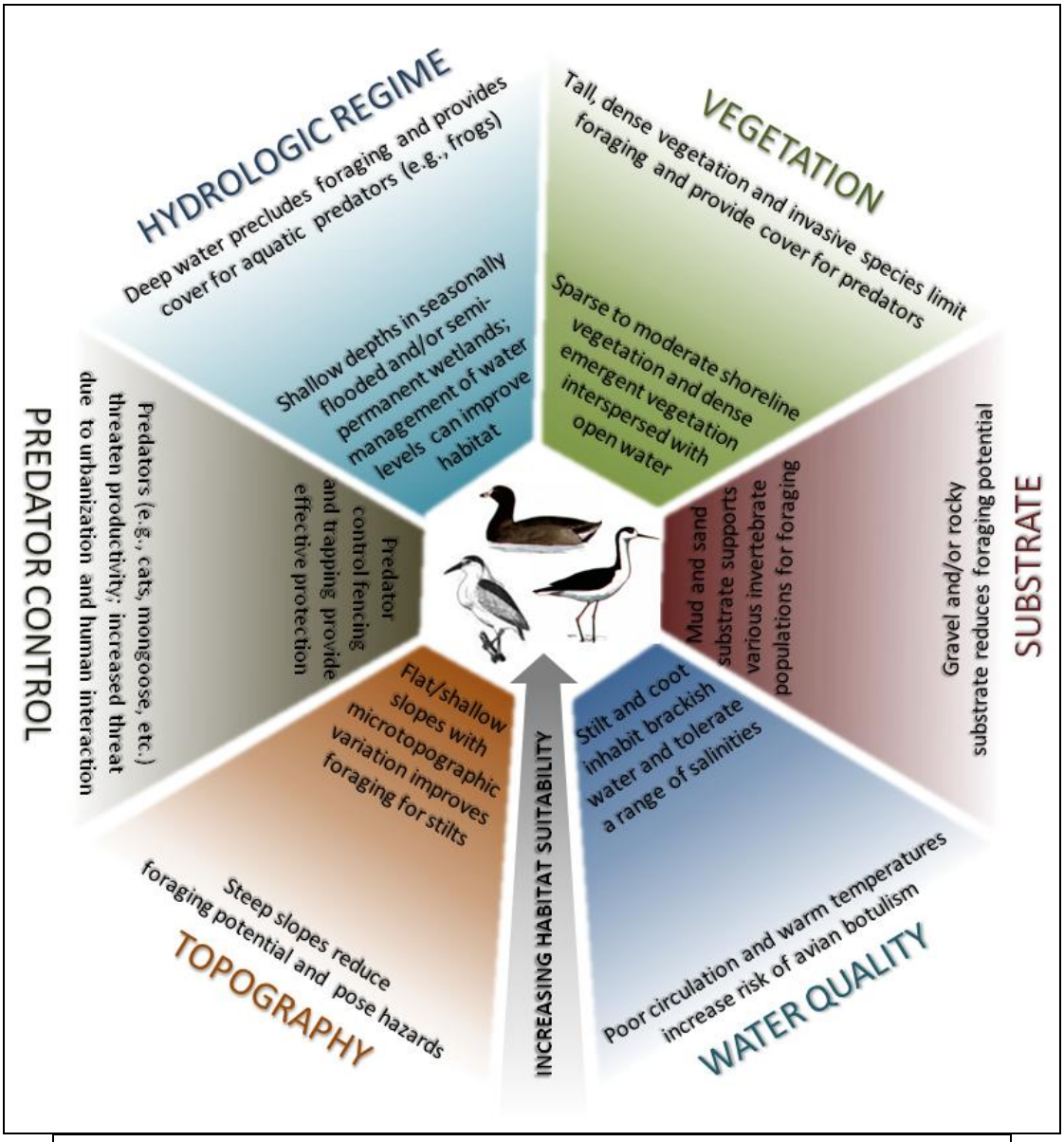
5.1 Conceptual Habitat Model

To provide the foundation for alternative plan formulation, a conceptual model was developed to clearly articulate the components of the desired ecosystem condition and the relationships between those components. Although the basic components of all coastal wetland ecosystems are generally captured, the model is more specifically intended to address the required components of ecosystem restoration specific to Loko o Mokuhinia. The model was developed based on an understanding of both historical and current site conditions, within the context of the planning objectives and constraints. As discussed in Section 2.2, the planning objectives relate to restoration of (1) wetland functions and values, (2) foraging habitat for the Hawaiian stilt and coot, and (3) habitat for migratory waterfowl and shorebird species. Relative to restoration of wetland functions and values, the necessary ecosystem components were identified relative to the basic criteria for wetland function: wetland hydrology, hydric soils, and hydrophytic vegetation. However, recognizing that the habitat requirements for Hawaiian stilt and coot are subsumed within these parameters, it was determined that by addressing the components of foraging habitat for stilt and coot, the basic wetland functions would also be addressed. Similarly, the habitat requirements for stilt and coot also capture the requirements for migratory waterfowl and shorebird species. As such, consideration of the habitat components for model development focused specifically on foraging habitat requirements for the Hawaiian stilt and coot. The validity of this concept was confirmed through ongoing technical consultation with the USFWS.

The conceptual model, which includes both a basic overview of the various habitat components and the general relationships between them, is shown in Figure 29. As shown, the components that are identified in the model include (1) hydrologic regime, (2) water quality, (3) substrate, (4) topography, (5) vegetation, and (6) predator control. Collectively, these reflect the key ecosystem components that contribute to wetland habitat that supports foraging for the Hawaiian stilt and coot, as well as for migratory waterfowl and shorebird species. Important concepts that are reflected in the model include the following:

- The preferred hydrologic regime is comprised of semi-permanently and/or seasonally flooded conditions, influenced by groundwater inputs, evapotranspiration, and surface outputs.
- Water depths are preferably shallow (i.e., less than 2 feet), as deeper water limits foraging potential; active management of water levels is recognized as a valuable tool for improving habitat for stilts and coots (USFWS, 2011a).
- Stilts and coots tolerate a range of salinities. A key water quality parameter is adequate circulation, as needed to minimize the potential for avian botulism.
- Topographically, foraging habitat for stilts is characterized by flat or shallow slopes around the fringe of the wetland, with valuable “edge” habitat increasing with microtopographic variation.
- Mud and/or sand substrates are preferable, as they support a variety of invertebrate populations, providing a prey base for foraging.
- Stilts prefer moderate to low coverage of low-growing species along shoreline slopes, while coots prefer dense emergent vegetation mixed with patches of open water. Both species are negatively affected by invasive plant species, as they can affect the habitat structure. In addition, tall, dense vegetation can provide refuge for predators (including cats, dogs, mongoose, and rats).
- Predation is recognized as one of the greatest threats to stilt and coot survival, and active predator control is considered vital to the species survival (USFWS, 2011a).

By providing a basic understanding of the ecosystem conditions to be restored, the conceptual model helped to guide the identification of measures and formulation of alternative plans, as further discussed in the following sections. In addition, the model was considered in the development of the monitoring and adaptive management approach, as further discussed in Section 5.



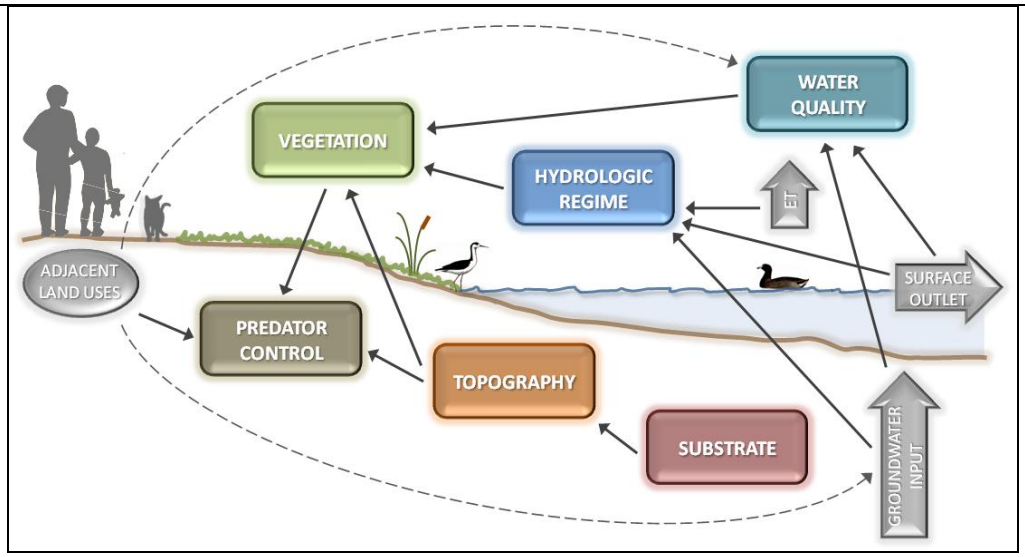


FIGURE 29
Conceptual Model of Habitat Requirements for Hawaiian Stilt and Coot

5.2 Screening Criteria

To facilitate the identification of a plan that best meet the project needs, a set of project-specific criteria were developed for screening the restoration measures and alternative plans. The criteria were developed based on the four criteria specified in the P&G, which should be considered for all federal water resource projects, and include the following:

- Completeness (or the extent to which a given alternative plan provides and accounts for all necessary investments or actions to ensure realization of the planned effects)
- Effectiveness (or the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities)
- Efficiency (or the extent to which an alternative plan is the most cost effective means of alleviating the specific problems and realizing the specified opportunities)
- Acceptability (or the viability of the alternative plan with respect to acceptance by state and local entities and the public, and compatibility with existing laws, regulations, and public policies)

Within the context of the P&G criteria, the screening criteria were defined to reflect the planning objectives and constraints, and agency and stakeholder input. Table 13 summarizes the screening criteria and the methodology for assessing each criterion.

TABLE 13
Screening Criteria for the Mokuhinia Ecosystem Restoration Project

Screening Criteria	Description	Assessment Methodology
Habitat requirements[1]	Approach is technically feasible and accommodates habitat requirements for Hawaiian waterbird species (stilt and coot).	Yes/No (based on technical input by USFWS staff)
Historic boundaries of Loko o Mokuhinia[1]	Land within project area is documented as being within historic boundaries of Loko o Mokuhinia.	Yes/No (based on review of historic maps (for example, S.E. Bishop, 1884)
Project costs[2]	Proposed plan could be designed, permitted and constructed for cost that is affordable to project sponsors.	Yes/No (based on input by USACE and County staff)
Operations and Maintenance (O&M) requirements[3]	Long-term O&M requirements can be reasonably fulfilled within the means of the County (or their designee).	Yes/No (based on input by County staff)
Land ownership[3]	Land within project area is owned (or in process of being acquired) by County of Maui; does not require acquisition of additional land.	Yes/No (based on input by County staff)
Predator control[3]	Proposed plan incorporates proven predator control techniques.	Yes/No (based on technical input by USFWS staff)
Historic district standards/ zoning requirements[4]	Design is consistent with historic district standards and zoning requirements (or, if necessary, a waiver could be reasonably obtained).	Yes/No (based on input by County staff)
Archaeological resources[4]	Design would not directly impact any archaeological resources that have been identified in association with Moku`ula.	Yes/No (based on results of previous archaeological studies

TABLE 13
Screening Criteria for the Mokuhinia Ecosystem Restoration Project

Screening Criteria	Description	Assessment Methodology
Cultural values and use[4]	Proposed plan would accommodate existing/future cultural values and uses of site, and would not substantially limit desired level of access/use.	Yes/No (based on input by visioning group and other stakeholders)
Stakeholder acceptability[4]	Proposed plan does not substantially violate stakeholder views and desires.	Yes/No (based on input by visioning group and other stakeholders)

NOTES:
[1] These screening criteria were defined within the context of the P&G's effectiveness criteria.
[2] These screening criteria were defined within the context of the P&G's efficiency criteria.
[3] These screening criteria were defined within the context of the P&G's completeness criteria.
[4] These screening criteria were defined within the context of the P&G's acceptability criteria.

5.3 Formulation of Alternative Plans

5.3.1 Conceptual Measures

In the context of the USACE planning process, measures are defined as actions that can be implemented to cause a desirable change relative to the planning objective; they are individual features or activities that serve as the building blocks of alternative plans. Measures can be structural or non-structural. Structural measures are physical actions that result in a changed condition. Non-structural measures involve the use of knowledge, practices, or agreements to change a condition, in particular through policies and laws, increased public awareness, training, and education. In the case of this project, non-structural measures were considered, but none were identified that would fully achieve the planning objectives; as such, non-structural measures were not further addressed in this study. However, recognizing that public education and awareness will contribute to the long-term operations and maintenance of the project, the non-federal sponsor (in concert with their partners) will consider opportunities to highlight the ecological and cultural values associated with the site. Educational activities relative to the cultural importance of the site is ongoing via the Friends of Moku`ula; preliminary discussions with the County of Maui regarding educational opportunities focused on the ecological components of the site have been initiated.

Identification of structural measures was conducted within the context of the planning objectives, which focus on reestablishing wetland functions and values within Loko o Mokuhinia and providing foraging habitat for Hawaiian stilt and coot, as well as migratory waterfowl and shorebird species. As described in Section 3.2.4, previous hydrogeologic studies have concluded that the existing groundwater conditions are adequate to hydrologically sustain the proposed wetland habitat (Oceanit, 2009). Based on this information and the desired outcomes, the project team identified categories of conceptual measures; this effort was guided by the conceptual model, as presented in Section 5.3.1. The categories of measures that were identified include (1) excavation, (2) grading, (3) hydrologic input, (4) water circulation, (5) surface water outlet, (6) wetland vegetation, and (7) predator control.

Specific measures were then defined within each category; these reflect the wetland habitat that historically occurred at Loko o Mokuhinia, as well as current restoration techniques and wetland management practices in Hawai`i. These measures were then screened by the PDT, with particular consideration given to input from the non-federal sponsor, USFWS, and other stakeholders. Those measures that passed screening were retained for further consideration. They were then categorized as required, supplemental, or mutually exclusive. This categorization provided the foundation for the development of alternative plans that achieve the planning objectives. Specifically, measures that are

needed to provide basic wetland functions were identified as required components of any alternative; in other words, these measures must be combined as part of any alternative plan. Supplemental measures were identified as those that would enhance wetland function; these were generally considered to be measures that could be added or combined with the set of required measures. Although no measures were defined as mutually exclusive, it was determined that the measure for providing internal water circulation (for example, through use of a surface water pump or aerator) was required if an alternative plan did not include a groundwater pump. Table 14 summarizes the measures that were identified, the results of the screening process, and the relationship of the measures that were carried forward in the plan formulation process.

5.3.2 Preliminary Alternative Plans

The next step taken as part of the plan formulation process was to group measures into preliminary alternatives, with the groupings based on the measure relationships presented in Table 14. Consistent with USACE guidance, this process involved several iterations of reformulation, as needed, to incorporate stakeholder input and accommodate specific project considerations. In the case of many planning studies, development of alternative plans considers the application of individual measures to various locations, as appropriate to provide alternative approaches to achieving the planning objectives. However, given the focused planning objectives and well-defined study area, implementation of the measures was considered specifically within the historic boundaries of Loko o Mokuhinia. As such, alternative plans that address restoration of coastal wetlands or foraging habitat for endangered waterbird species in other locations on the island of Maui (or more broadly throughout Hawai`i) were not contemplated as part of this study.

The USACE guidance states that scaling should be considered as part of the plan formulation process, with measures or plans of different scales considered exclusively from one another. Specifically, scaling refers to application or implementation of different amounts of a given measure or plan. Ultimately, the purpose of scaling is to demonstrate that a recommended plan has greater benefits than that of smaller-scale plans, and that net benefits do not maximize at a smaller scale. In the case of this project, the concept of scaling was considered relative to the extent of excavation and grading (or ultimately, the overall area of wetland habitat to be reestablished). To maximize the efficiency and effectiveness of the plan formulation efforts, the PDT specifically considered formulation of each alternative plan at a scale that would meet the planning objectives and constraints. As a result, the only scale that was carried forward in the development of alternative plans was one in which wetland habitat was reestablished across the entire project site (as defined in Figure 3). Consistent with the discussion of planning constraints in Section 2.2, a larger scale plan (for example, reestablishment of wetland habitat beyond the project site) was not considered a feasible option, as the adjacent land is already developed.[28] A smaller scale plan was also not considered a feasible option as it would not be entirely consistent with the planning objectives and constraints. Specifically, the planning constraints identify that the alternative plans should avoid conflicts with use of cultural resources. Reestablishment of wetland habitat over only a portion of the site (especially in a configuration that would not entirely surround Moku`ula) would conflict with cultural uses and values associated with the site, at least in part. These considerations of scale were confirmed by stakeholder input, particularly the views of the non-federal sponsor.

[28] The County of Maui considered the potential for acquisition of the vacant lot located just north of the project site (which is the only undeveloped land surrounding the site), but it was determined to be infeasible.

TABLE 14
Identification and Screening of Conceptual Restoration Measures

Measure Category	Measure	Definition	Screening Results	Measure Relationships for Plan Formulation[1]
Excavation	Excavate to accommodate wetland hydrology (via groundwater interception and/or groundwater pump)	Excavation as needed to accommodate appropriate hydrologic conditions for sustaining wetland; excavation depth should consider seasonal fluctuations in existing groundwater levels; deeper excavation may allow for increased interception of groundwater; shallower excavation may allow site to be drained for maintenance; depending on excavation depth, groundwater pump may be required to supplement existing groundwater levels; clay liner may be required for shallow excavation depths to increase retention of pumped ground water	Carried forward for additional analysis. Meets screening criteria.	Required
Grading	Rough grading of steep slopes around wetland edge	Grounding-moving to form steep (<3:1) slopes around the edge of wetland	Eliminated from further analysis. Does not meet habitat requirements for Hawaiian waterbirds.	N/A
	Rough grading of shallow slopes around wetland edge	Grounding-moving to form shallow (>3:1) slopes around the edge of wetland	Carried forward for additional analysis. Meets screening criteria.	Required
	Fine grading to provide microtopographic variation	Refinement of wetland topography (including slopes, edges, and bottom areas) to provide habitat variation	Carried forward for additional analysis. Meets screening criteria.	Required
Hydrologic input	Install groundwater pump	Use of groundwater pump to supplement existing groundwater-based wetland hydrology; pump would also contribute to site management	Carried forward for additional analysis. Meets screening criteria.	Supplemental
	Surface water inlet	Creation of an inlet feature that would direct surface water to wetland; surface water inputs would supplement wetland hydrology; any input of stormwater runoff would require appropriate levels of treatment	Eliminated from further analysis. No reliable source of surface water that is reasonable to obtain.	N/A
Water circulation	Surface water pump (aerator)	Utilize surface water pump (for example, aerator) to maintain internal flow and circulation within wetland	Carried forward for additional analysis. Meets screening criteria.	Supplemental; required if no groundwater pump
Surface water outlet	Tie into adjacent ditch[2]	Install slide gate (or other outlet feature) that provides overflow drainage from wetland into adjacent ditch along northern edge of project site	Carried forward for additional analysis. Meets screening criteria.	Supplemental
	Install outlet that drains to ocean	Creation of an outlet feature that would drain the wetland to the ocean, would require crossing under Front Street and the adjacent shoreline properties	Eliminated from further analysis. Cost of building a new outlet to ocean is beyond project capacity.	N/A
	Drain to force main	Provide mechanism for overflow drainage from wetland into the force main system located along Front Street	Eliminated from further analysis. Outlet to force main is not consistent with County policies and regulations.	N/A
Wetland vegetation	Install wetland vegetation	Install assemblage of characteristic wetland species on wetland edges and slopes, using planted stock and/or seed	Carried forward for additional analysis. Meets screening criteria.	Required
Predator control	Predator control fence	Install fence around perimeter of wetland to provide a barrier to entry for predators of wildlife species that may utilize the wetland, particularly endangered waterbirds	Carried forward for additional analysis. Meets screening criteria.	Supplemental

NOTES:

[1] Required measures are those that must be combined as part of any alternative plan. Supplemental measures are those that can be added or combined with the set of required measures.

[2] As described in Section 3.2.4.3, this ditch runs along the edge of Mokuhinia Way, on the northern edge of the project site. Near Front Street, the ditch jogs to the north, then drains to the ocean via a box culvert that runs adjacent to Kamehameha III Elementary School. The County is planning to upgrade the ditch to address existing drainage problems.

Additional considerations during the plan formulation process included avoidance or minimization of significant adverse impacts and incorporation of mitigation as needed, consistent with the guidance set forth in EC 1105-2-404, "Planning Civil Works Projects Under the Environmental Operating Principles" (USACE, 2003a).[29] As the project site is currently a recreational field vegetated primarily with Bermuda grass and other non-native species, no adverse impacts to biological resources are anticipated and, therefore, mitigation was not incorporated as part of the plan formulation process. Mitigation for other potential environmental impacts, such as those to archaeological and cultural resources, was included as appropriate.

Based on the plan formulation strategy, a total of eight preliminary alternatives were identified – each including the required measures (excavation, rough grading, fine grading, and wetland vegetation), but varying in terms of the supplemental measures (groundwater pump, surface pump, outlet, and perimeter fence). It is recognized that the suite of preliminary alternatives are relatively similar; however, this is a reflection of the focused planning objectives as a desired outcome. Within the context of the planning objectives and constraints, the preliminary alternatives are believed to represent an appropriate and comprehensive range of possible solutions. The list of preliminary alternatives, and the measures included in each are presented in Table 15.

Based on the best professional judgment of the PDT, as well as input from the project stakeholders, the preliminary alternatives were reformulated using the criteria listed in Table 13. As shown in Table 15, six alternative plans were eliminated from further consideration and two were carried forward in the plan formulation process. The two primary factors that resulted in elimination of alternatives were the absence of an outlet and/or a perimeter fence. Although these measures were originally identified as supplemental components during the measure identification phase, further consideration (particularly in light of technical input provided by USFWS based on their experience with other similar restoration efforts) resulted in the identification of these measures as necessary features of any alternative plan. Specifically, it was determined that an outlet is necessary both in terms of managing water levels and maintaining water quality; the absence of an outlet could contribute to localized flooding as well as stagnant water conditions, which could lead to botulism outbreaks. The need for a perimeter fence is based on anticipated predation issues, particularly given the urban context of the project site. One of the project constraints is avoiding a "sink" for endangered species, wherein failed nests from predation lead to non-productivity of the species. Predator fences are recognized as one of the most effective tools to address predation and are an important feature of some of the most valuable waterbird habitats in Hawai`i. Although it is possible to proceed without a perimeter fence, the project would instead need to rely solely on a rigorous trapping program, which is expected to result in O&M requirements that are prohibitive for this project.[30] Therefore, based on input from UFWS, it was determined that at a minimum, each alternative should include a basic fence to limit human disturbance and keep out larger predators (primarily dogs, but to deter cats as well).

[29] EC 1105-2-404 expired in 2004, but is still considered operational guidance.

[30] Based on experience managing similar wetland types, USFWS has recommended that predator trapping be required as part of O&M for any alternative plan. The amount of trapping required will depend on the type and effectiveness of the perimeter fence, as determined through monitoring.

TABLE 15
Formulation of Preliminary Alternatives and Identification of Initial Array of Alternatives

	Preliminary Alternatives	Screened Measures								Results of Reformulation (to identify Initial Array)
		Excavate	Rough grading	Fine grading	Groundwater pump	Surface pump (aerator)	Outlet to ditch	Wetland vegetation	Perimeter fence	
1	Excavate and grade wetland; install vegetation Surface water pump (aerator)	x	x	x		x		x		Eliminated from further analysis. Outlet is necessary to meet habitat requirements; O&M requirements for addressing predation without perimeter fence are prohibitive.
2	Excavate and grade wetland; install vegetation Surface water pump (aerator) Outlet to adjacent ditch	x	x	x		x	x	x		Eliminated from further analysis. O&M requirements for addressing predation without perimeter fence are prohibitive.
3	Excavate and grade wetland; install vegetation Surface water pump (aerator) Perimeter fence	x	x	x		x		x	x	Eliminated from further analysis. Outlet is necessary to meet habitat requirements.
4	Excavate and grade wetland; install vegetation Surface water pump (aerator) Outlet to adjacent ditch Perimeter fence	x	x	x		x	x	x	x	Carried forward for additional analysis. Meets screening criteria.
5	Excavate and grade wetland; install vegetation Groundwater pump	x	x	x	x			x		Eliminated from further analysis. Outlet is necessary to meet habitat requirements; O&M requirements for addressing predation without perimeter fence are prohibitive.
6	Excavate and grade wetland; install vegetation Groundwater pump Outlet to adjacent ditch	x	x	x	x		x	x		Eliminated from further analysis. O&M requirements for addressing predation without perimeter fence are prohibitive.
7	Excavate and grade wetland; install vegetation Groundwater pump Perimeter fence	x	x	x	x			x	x	Eliminated from further analysis. Outlet is necessary to meet habitat requirements.
8	Excavate and grade wetland; install vegetation Groundwater pump Outlet to adjacent ditch Perimeter fence	x	x	x	x		x	x	x	Carried forward for additional analysis. Meets screening criteria.

5.3.3 Final Array of Alternative Plans

The two preliminary alternative plans that were identified for the initial array (Alternatives 4 and 8) were subsequently refined, based on variations in achieving the desired habitat conditions. In particular, different approaches to achieving suitable water depths were assessed, resulting in a total of three alternative plans, as further discussed in the following paragraphs. In each case, the extent of excavation

would be based on the maximum suitable water depth, following which microtopography would be added to provide variation within the range of suitable depths.

Alternative 4 would include excavation as needed to achieve the maximum suitable water depth throughout the year without use of a groundwater pump. The amount of excavation would be determined such that the maximum suitable water depth would be achieved based on existing average summer groundwater levels. Alternative 8 would include shallower excavation depths, assuming that a groundwater pump would be used on an as-needed basis to achieve suitable water depths throughout the year. As part of the alternatives refinement, two approaches to Alternative 8 were identified. Alternative 8A includes excavation depths based on existing average winter groundwater levels, such that the wetland hydrology would be primarily groundwater driven through much of the year, with a pump used only when groundwater levels are low (for example, during summer). Alternative 8B would include just enough excavation to accommodate the maximum suitable water depths, with wetland hydrology primarily supplied via groundwater pump. Because this alternative would use a pump to maintain water levels above the groundwater level throughout the year, it includes an impervious liner to increase retention of surface water within the wetland. In addition to supplementing groundwater levels, use of a groundwater pump would improve site management capabilities, by contributing to water circulation and providing a mechanism for managing water levels. Management of water levels not only allows for more long-term predictability and control over habitat conditions, but also assists with site maintenance (for example, control of invasive species, and avian botulism); this is generally recognized as an important tool for managing endangered waterbird habitat in Hawai`i (USFWS, 2011a).

These three alternative plans were reviewed by the PDT based on the criteria listed in Table 13, with all three plans being carried forward for evaluation. Table 16 summarizes the refinements that were made to the initial array, and presents the final array of alternative plans based on the results of screening.

TABLE 16
Reformulation of Initial Array of Alternatives and Identification of Final Array of Alternatives

Screened Alternatives (Initial Array)		Refinement of Initial Array		Identification of Final Array
Alt. 4	Excavate and grade wetland Install vegetation Surface water pump (aerator) Outlet to adjacent ditch Perimeter fence	Alt. 4	Excavation depth to achieve maximum suitable water depths based on summer groundwater levels; microtopographic features to provide variation within the range of suitable water depths	Carried forward for additional analysis as part of final array.
Alt. 8	Excavate and grade wetland Install vegetation Groundwater pump Outlet to adjacent ditch Perimeter fence	Alt. 8A	Excavation depth to achieve maximum suitable water depths based on winter groundwater levels; water levels supplemented with groundwater pump, as needed (for example, during summer); microtopographic features to provide variation within the range of suitable water depths	Carried forward for additional analysis as part of final array.
		Alt. 8B	Excavation depth to accommodate maximum suitable water depth, with groundwater pump as primary water source; microtopographic features to provide variation within the range of suitable water depths; install liner to increase retention of pumped water	Carried forward for additional analysis as part of final array.

5.3.4 Conceptual Design of Alternative Plans

To establish the basis for the evaluation of alternatives, a conceptual design was developed for each of the alternative plans in the final array. ER 1110-2-1150 ("Engineering and Design for Civil Works Projects") specifies that the level of detail for the analysis of CAP projects should be minimized to that needed to determine the recommended plan, based on the judgment of USACE district staff. POH has determined that a 10 percent level of design is adequate for alternatives evaluation. It is important to note that the conceptual designs are intended to be preliminary by nature, with refinements and modifications made as the design effort progresses. Specifically, additional detail (to an approximately 35 percent design level) is provided for the tentatively selected plan, as further discussed in Section 6. The final design effort for the project would be conducted as part of the next phase, following USACE authorization.

In general, the conceptual design effort focused on addressing the habitat conditions captured in the conceptual model. To support the design effort, target parameters were identified relative to those habitat conditions, as listed in Table 17. These parameters were developed based on a variety of sources, including data presented in *Managing Endangered Species Habitat in Hawai`i* (MESHH), which is a modeling tool that relates habitat characteristics to endangered waterbird species requirements; this was recommended by USFWS staff as one of the best available sources of quantified data relative to habitat quality for endangered Hawaiian waterbirds. In addition to the MESHH data, other sources of information relative to target habitat conditions also included the professional judgment of USFWS staff (based on experience with managing other similar wetland habitat types in Hawai`i), stakeholder input, as well as other available literature. In addition, historic documents were considered as part of the conceptual design process to identify the range of habitat conditions that previously occurred onsite. In particular, this effort included a review of topographic profiles of Loko o Mokuhinia that were developed prior to the site being filled (see Figure 30); although the survey benchmarks indicated on the profiles cannot be used to tie the information to existing survey data, these profiles provide information about the relative amount of imported fill and range of depths to the historic pond sediments.

Conceptual designs were developed for each alternative using the target habitat parameters listed in Table 17. Consistent with the formulation strategy, all of the conceptual designs include excavation to accommodate a maximum water depth of approximately 2 feet, based on life requisites for both stilt and coot. Within this maximum depth, microtopograhic features would then be added to increase habitat variability throughout the wetland area based on the range of suitable water depths. Based on input from USFWS, the conceptual plans maximize shallow slopes in the northern and eastern portions of the site, so as to focus foraging away from publically accessible areas and minimize conflict associated with future use of Moku`ula. While the slopes along the western/ southern edges and around the perimeter of Moku`ula are slightly greater, they are still within the range of suitable conditions for both stilt and coot.[31]

[31] Based on input from USFWS, the conceptual designs also include the concept of a revetment feature around Moku`ula.

FIGURE 30
Historical Survey Documents for Loko o Mokuhinia

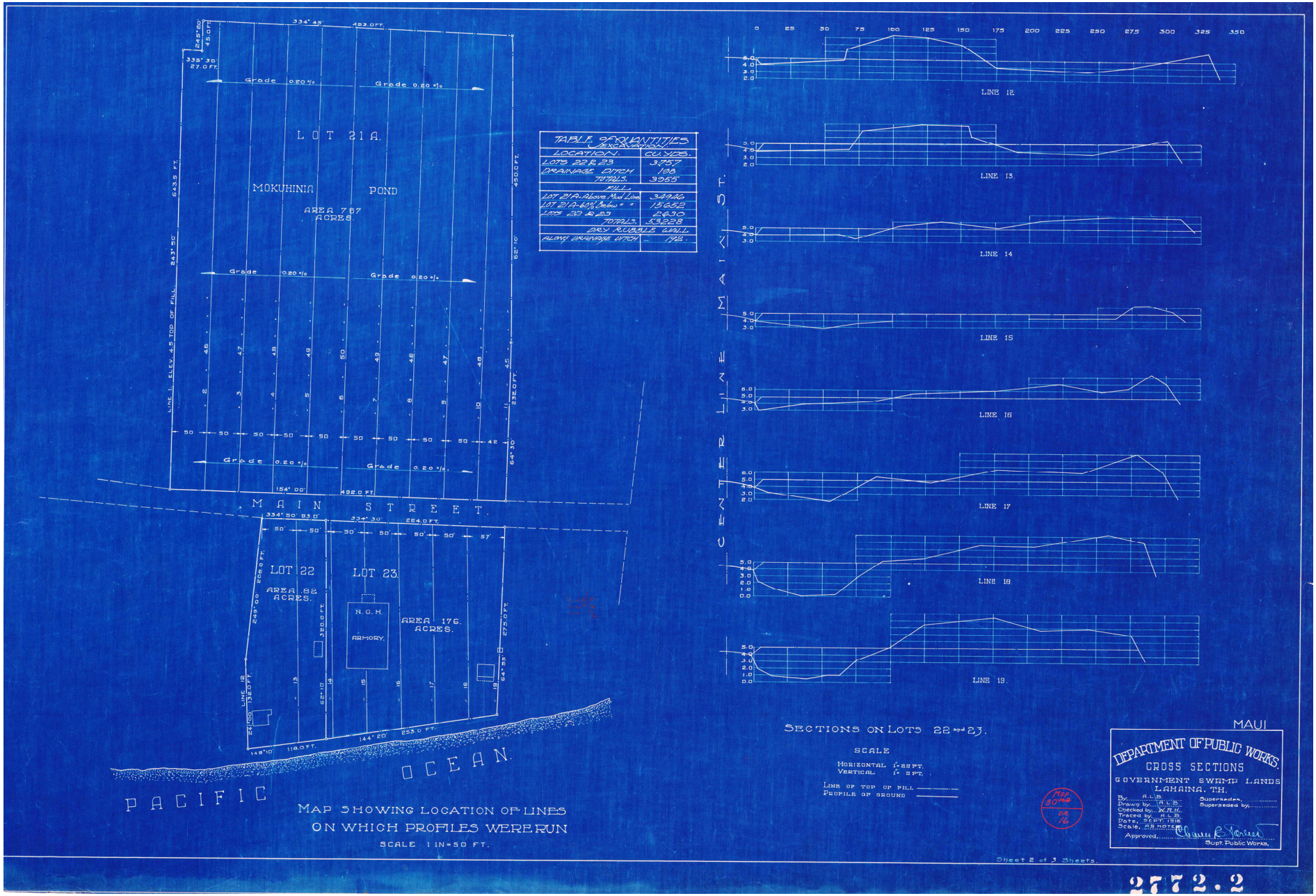


FIGURE 30
Historical Survey Documents for Loko o Mokuhinia

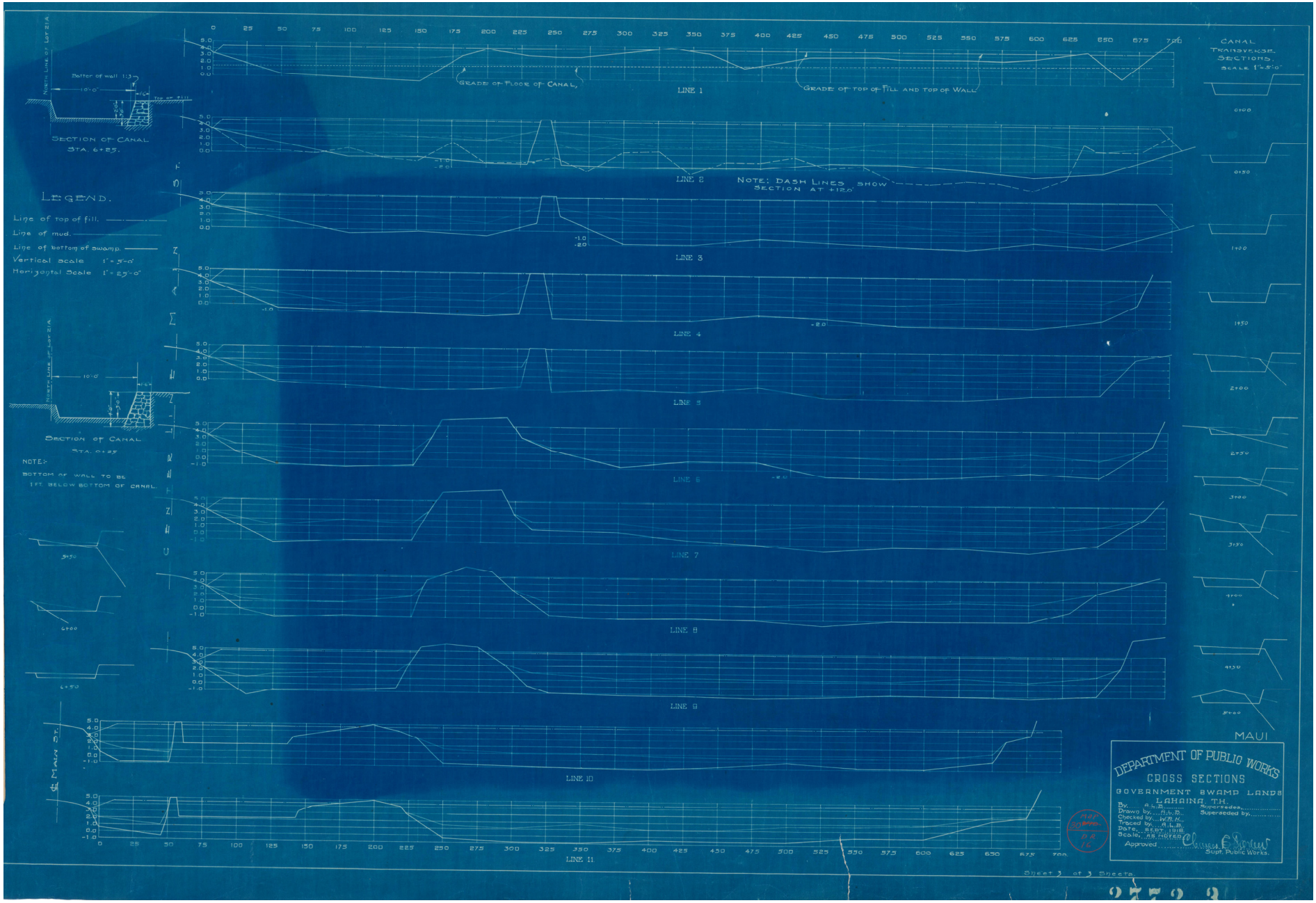


FIGURE 30
Historical Survey Documents for Loko o Mokuhinia

TABLE 17
Target Parameters Used for Conceptual Restoration Design

Habitat Component 1	Target Parameter	Source of Information
Flooding regime	Seasonally flooded and/or semi-permanently flooded	MESHH and USFWS staff
Water depth (summer and winter)	Up to approximately 9 inches (3 to 6 inches preferred) for stilts; up to approximately 24 inches for coots	MESHH; USFWS staff; Kealia Pond National Wildlife Refuge Comprehensive Conservation Plan
Slopes	Maximum slopes of 20 degrees (about 3:1) for both species; stilts prefer shallower slopes (up to 18:1)	MESHH
Topography	No islands or moats	USFWS staff
Microtopography	Variable microtopography and irregularity (hummocky terrain) to maximize habitat variation for foraging; to the extent possible, microtopographic features should consider circulation patterns	USFWS staff
Salinity	<80 ppt for stilts, <20 ppt for coots	MESHH
Circulation	Requires some form of internal circulation; use wind direction to increase circulation (not decrease)	USFWS staff
Outlet	Requires some form of outlet (to prevent flooding and increase groundwater exchange)	USFWS staff
Vegetation cover	Minimal cover on shallow wetland slopes for stilts (less than 20% is ideal, but up to 80% is acceptable); approximately 50% cover in emergent zone for coots	MESHH
Vegetation species	*kaluha* (*Bolboschoenus maritimus*), *makaloa* (*Cyperus laevigatus*), *akulikuli* (*Sesuvium portulacastrum*), *ae'ae* (*Bacopa monnieri*)	USFWS staff; stakeholder input
Maintenance access	Minimum width to allow for ATV access (12 feet); pathway on north and/or east edges	Friends of Moku`ula/ County of Maui

NOTE:
[1] The MESHH model considers the minimum wetland size used by Hawaiian stilt and coot to be 0.74 and 0.5 acre, respectively. As the project would exceed these size estimates, the target parameters did not further consider minimum wetland size.
ppt = parts per thousand

As part of the conceptual design development process, consideration was also given to site-specific cultural resources and values, to the extent that they could be accommodated within the range of target habitat conditions; this approach is consistent with the planning objectives and constraints, which specify the need to avoid conflicts with protection and use of cultural resources. In particular, previous investigations have indicated that survey-grade data are not available for the boundaries of Moku`ula. As such, there is some concern that the exact location and extent of Moku`ula is not known, which could increase the potential for impacts to associated archaeological and cultural resources. Therefore, based on previous recommendations, the conceptual designs provide a 10-meter (approximately 32.8-foot) buffer around the estimated boundary of Moku`ula (Cultural Surveys Hawai`i, 2009); this approach was confirmed through stakeholder input. In addition, other considerations relative to existing and future cultural values and uses of the site were identified through stakeholder input, particularly a visioning group that was convened by the County of Maui to discuss the restoration of the overall Moku`ula site. Based on this input, the conceptual designs also accommodate a symbolic corridor along a historic canoe route between Moku`ula and a set of stone steps on the western edge of the Waiola Church property. Further discussion of the cultural uses and values of the site is provided in Section 3.2.6.

The resulting conceptual designs are shown in Figures 31 to 35. The primary difference between the alternatives is illustrated in Figure 31, which shows the greatest amount of excavation for Alternative 4 (to

intercept existing groundwater throughout the year), moderate excavation depths for Alternative 8A (with a groundwater pump used to supplement groundwater levels on an as-needed basis), and the least amount of excavation for Alternative 8B (with a groundwater pump providing the main hydrologic driver); in the case of Alternatives 8A and 8B, the groundwater pump would serve to elevate the water level surface above that of the groundwater, but would be operated to mimic natural wetland hydrology (for example, wetting and drying cycles associated with stilt and coot life requisites). Because Alternative 8B would use a pump to maintain water levels above the groundwater level throughout the year, a clay liner is included to increase retention of water in the wetland. In addition, an organic topsoil layer would be added to provide an appropriate foraging substrate; this organic topsoil layer would not be required for Alternatives 4 and 8A, which are both expected to fall within the range of the historic pond sediments.[32] Figure 32 presents the conceptual site plan for all three alternatives, acknowledging some variation in the exact location of the respective contours. Figures 33 to 35 present the associated cross-sections for Alternatives 4, 8A and 8B, respectively. It is important to note that the excavation depths shown for the conceptual designs are based on the data presented in the Hydrogeologic Assessment (Oceanit, 2009); it is assumed that additional data will be acquired through aquifer pump tests during the final design phase and will be used to refine the exact excavation depths as needed.

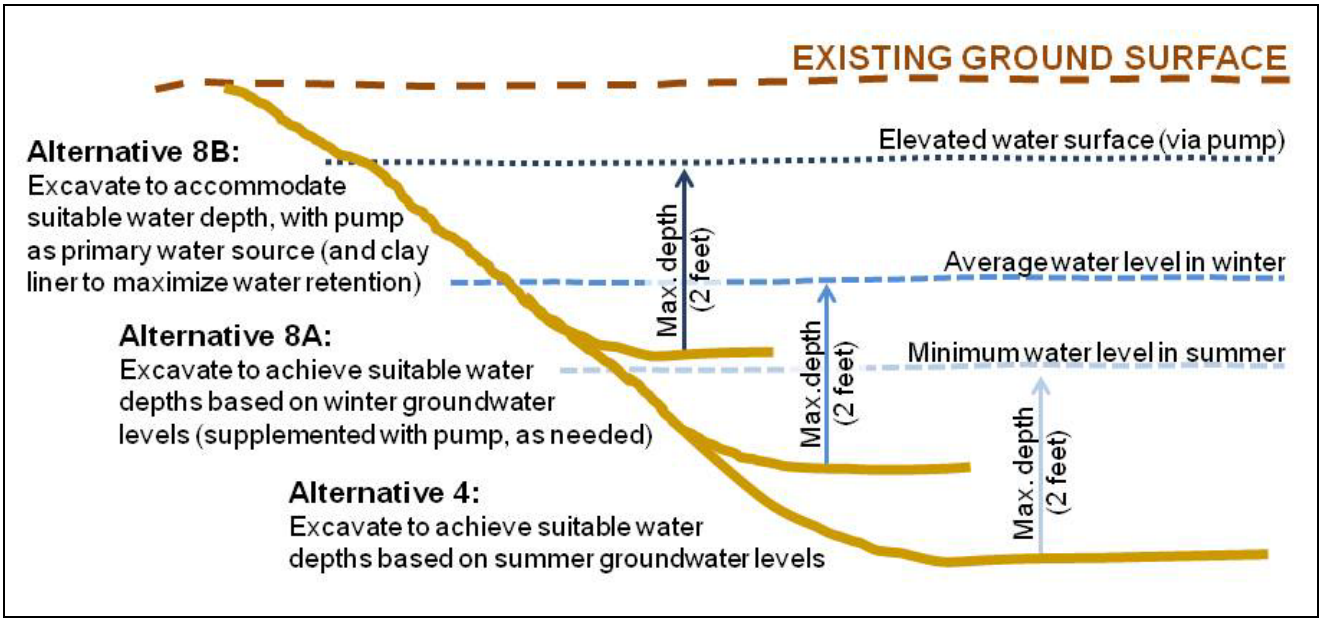


FIGURE 31
Different Excavation Approaches for Final Array of Alternatives

[32] The potential for the excavated material to be reused as a foraging substrate above the clay liner was considered (in place of the organic topsoil layer); however, the excavation depths for Alternative 8B are not expected to reach the historical pond sediments and the imported fill material is not expected to be suitable as a foraging substrate.

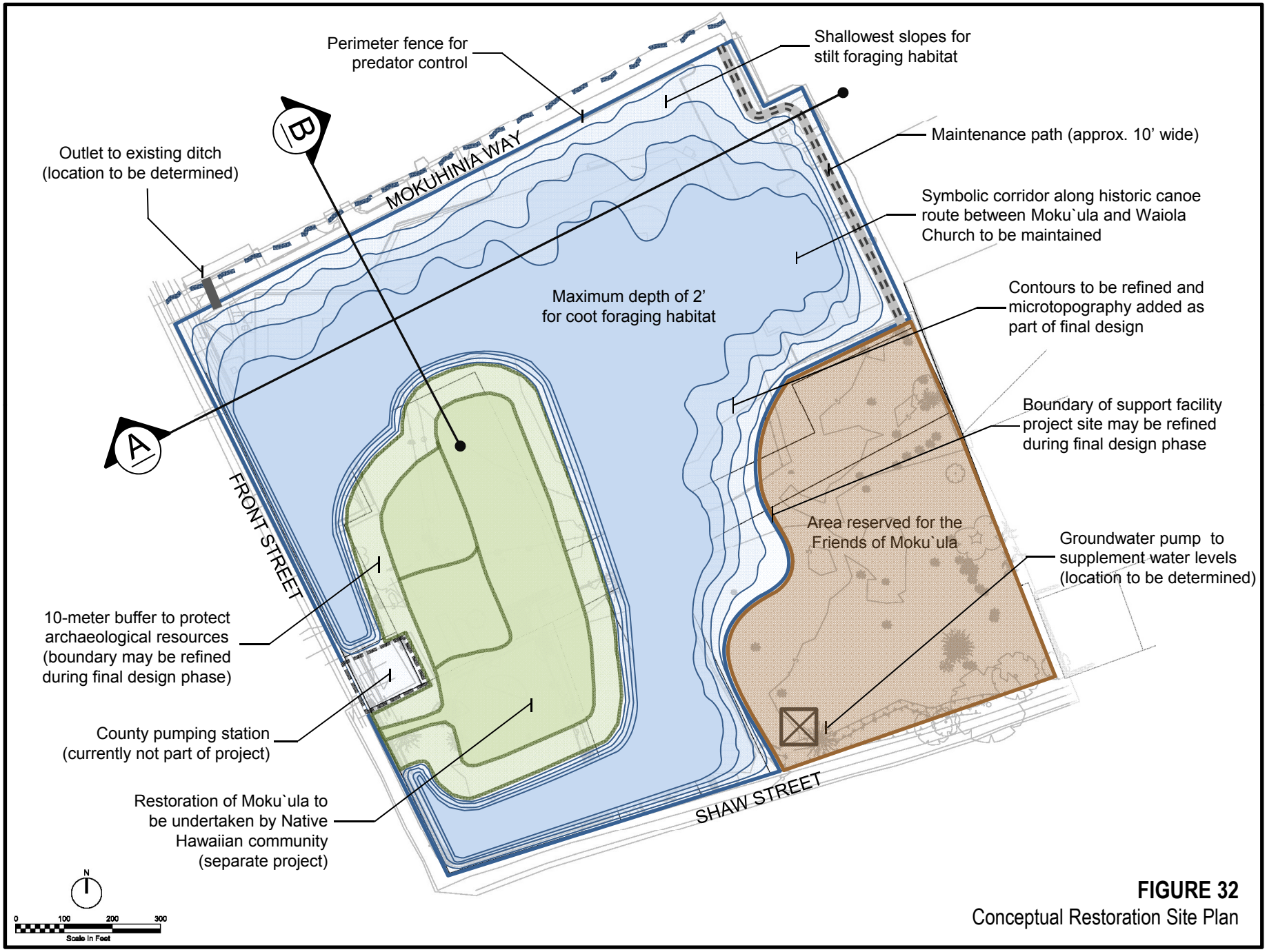
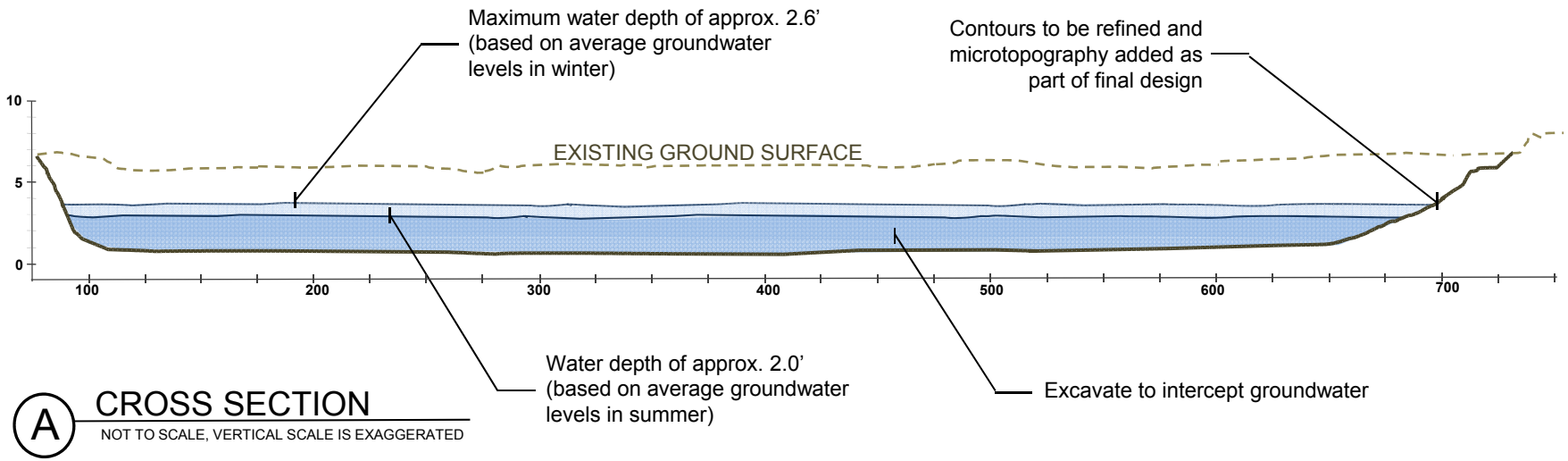


FIGURE 32
Conceptual Restoration Site Plan



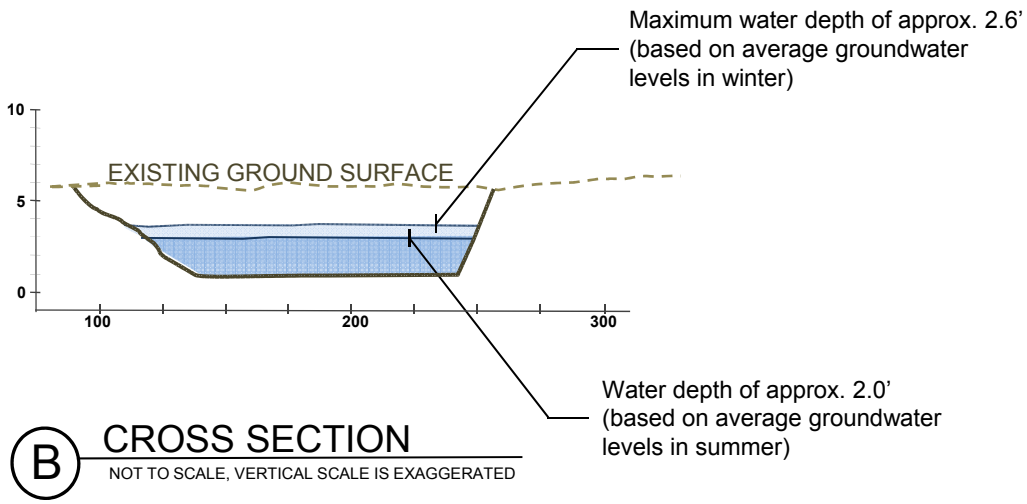
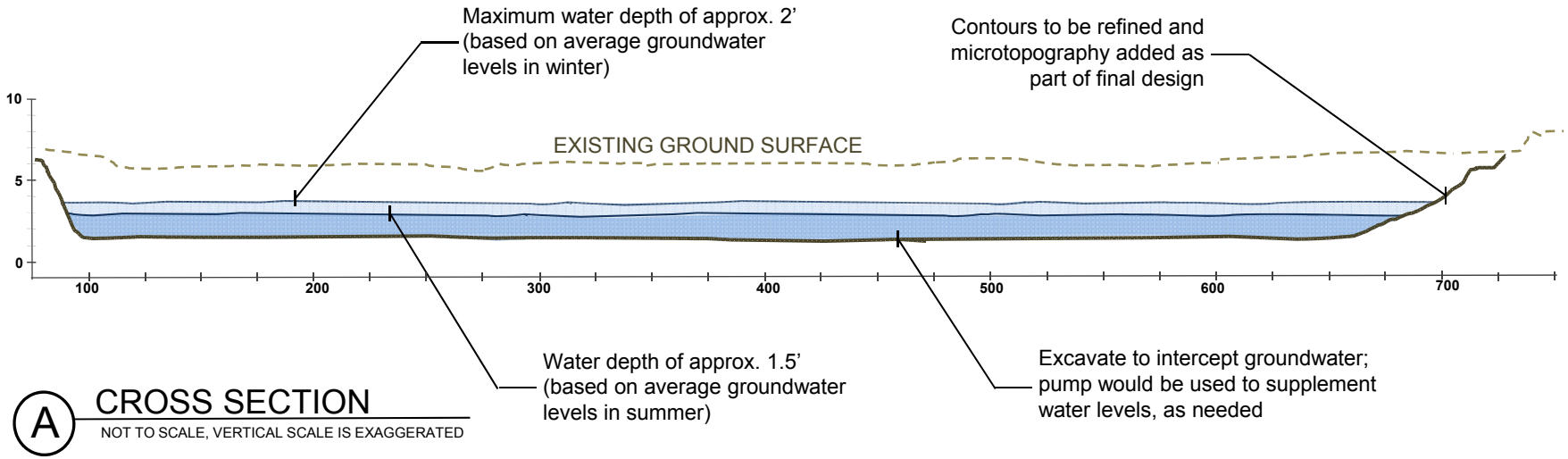


FIGURE 33
Conceptual Design for Alternative 4 (Cross-sectional View)



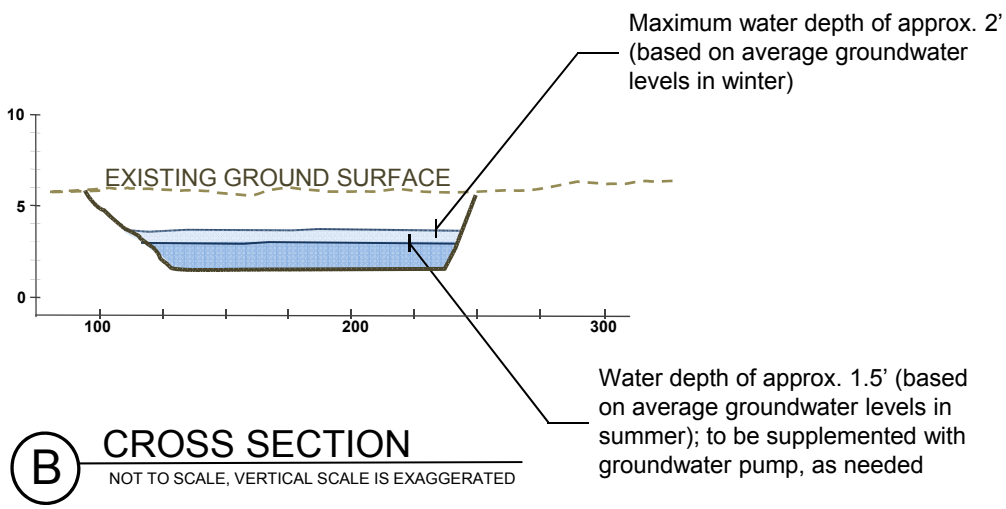
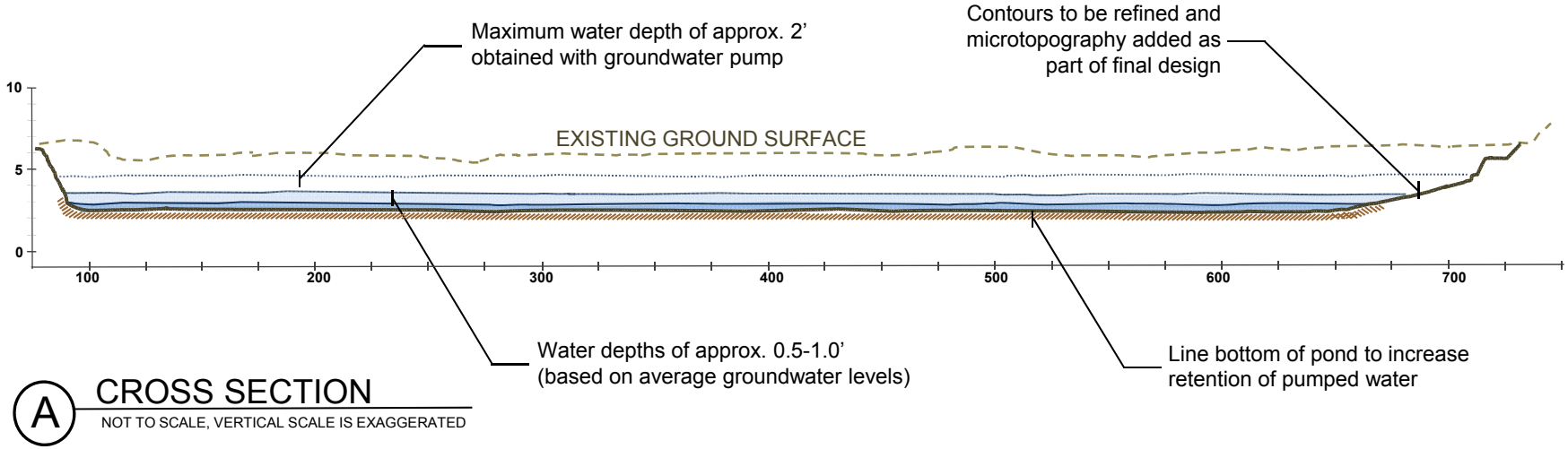
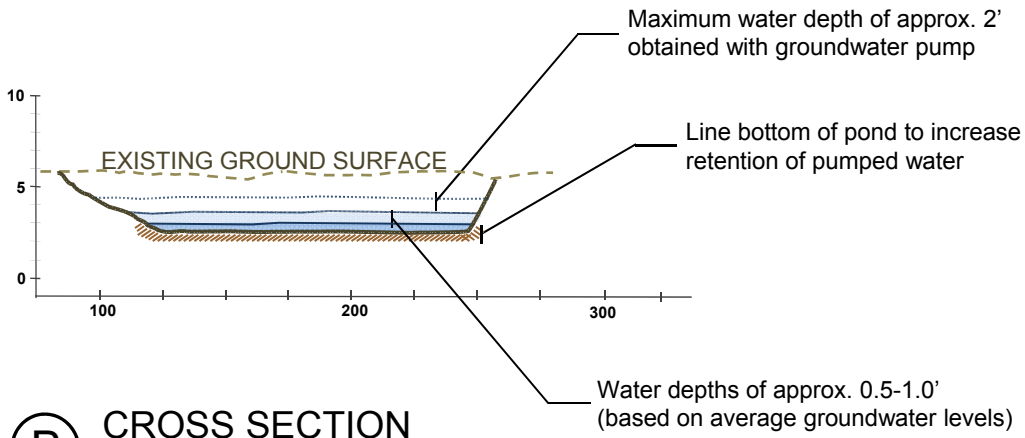


FIGURE 34
Conceptual Design for Alternative 8A (Cross-sectional View)



A CROSS SECTION
NOT TO SCALE, VERTICAL SCALE IS EXAGGERATED



B CROSS SECTION
NOT TO SCALE, VERTICAL SCALE IS EXAGGERATED

FIGURE 35
Conceptual Design for Alternative 8B (Cross-sectional View)

5.4 Evaluation of Alternative Plans

Based on the conceptual designs, the alternative plans in the final array were then evaluated, as part of Step 4 of the USACE planning process. Alternatives evaluation consists of quantifying and judging the expected contribution of each alternative plan as compared to the future without-project condition, to determine which will be further carried forward. The purpose of this process is to "determine whether or not the plan qualifies to advance and be compared against other plans that have independently qualified" (Yoe and Orth, 1996).The planning guidance in ER 1105-2-100 specifies that, at a minimum, two categories of effects should be evaluated: outputs and costs. Environmental outputs are the desired or anticipated measurable results of restoration measures and plans; the term "outputs" is often used interchangeably with "benefits." With respect to costs and benefits, the ecosystem restoration alternatives are evaluated on the basis of cost effectiveness and incremental cost analyses, as well as the significance of the ecosystem resources. As detailed in Section 1.6, the ecosystem resources associated with the range of alternative plans (including wetland habitat, native wetland vegetation, and habitat for the Hawaiian stilt and coot, as well as migratory waterbird species) were determined to have institutional, public and technical significance. All USACE water resources development projects must also be evaluated in terms of the four P&G criteria: acceptability, completeness, effectiveness, and efficiency. The specific evaluation methods and results are described below.

5.4.1 Ecosystem Outputs

The outputs of an ecosystem restoration project are not readily convertible to actual monetary units as is required for traditional benefit-cost analyses. As such, USACE planning guidance specifies that ecosystem outputs must be clearly identified and quantified in appropriate units, preferably ones that measure change in ecosystem value and productivity. Measurable changes in ecosystem values are typically described using suitability indices, habitat units, animal population counts, or animal use days; an ecosystem output model can be used to quantify these changes.

5.4.1.1 Development of Ecosystem Output Model

A range of potential modeling approaches were considered for use in quantifying the ecosystem outputs associated with the alternative plans formulated for this project. The modeling approaches that were considered include standard methodologies that have been certified for use in USACE planning projects,[33] models that have been developed specifically for use in Hawai`i,[34] and a customized, project-specific approach. The results of this assessment indicated that development of a customized spreadsheet model would be the most appropriate approach for this project, as there is no regionalized or USACE-certified model that quantifies ecosystem benefits of wetland habitat in Hawai`i, as needed for this project.[35,36]

[33] Methodologies that have been approved for use in USACE projects are presented in the USACE White Paper "ECO-PCX Recommendations to Headquarters on Certification of Ecosystem Output Models" (dated May 2008). These include Habitat Evaluation Procedure (HEP), Hydrogeomorphic (HGM) Approach to Assessment of Wetland Functions, Index of Biotic Integrity (IBI), among others.

[34] Models known to have been developed specifically for use in Hawai`i include Hawaiian Stream Habitat Evaluation Procedure (HSHEP), Interim Procedure for Determination of Wetland Minimal Effect (MW), Hawai`i Stream Bioassessment Protocol (HSBP), and Managing Endangered Species Habitat in Hawai`i (MESHH).

[35] The only model known to relate specifically to wetland habitat in Hawai`i is the MESHH model; although directly applicable to the project, MESHH does not serve to quantify habitat benefits, as required by the USACE planning process. However, it contains information that relates habitat characteristics to species requirements, which was considered in the development of the spreadsheet model for this project.

[36] USACE regulations (ER 1105-2-412) require that planning models, including ecosystem restoration models, be certified for use by the relevant Centers of Expertise. However, the Director of Civil Works' Policy Memorandum #1 (dated January, 2011) states that planning model certification is not required for CAP projects; as such, it is understood that the model does not require certification.

Based on an approach agreed upon by the PDT and TAC teams, a spreadsheet model was developed specifically for this project based on the concepts used in standard ecosystem modeling approaches, tailored to the project objectives and constraints. Specifically, model development was focused on the wetland functions that are anticipated for the range of alternative plans, particularly as related to providing suitable foraging habitat for Hawaiian stilt and coot, as well as migratory/shorebird species. Model variables were identified that relate these functions to habitat characteristics; the variables also incorporate components of long-term site management (such as vegetation management and predator control), as these activities are recognized as key to maintaining suitable habitat for endangered waterbird species (USFWS, 2011a). Each variable is scored on a scale ranging from 0 to 1, with scoring based on the best available information and professional judgment relative to the species' habitat requirements. The variables are averaged then multiplied by wetland size (to normalize the output), resulting in an overall score of habitat benefits (habitat units).

The overall modeling framework, the list of variables, and the approach to scoring were iteratively developed and refined in coordination with the PDT and TAC teams; in particular, this process incorporated technical input provided by USFWS staff, based on their professional judgment and experience with similar wetland habitat types in Hawai`i. This effort also specifically considered information from the MESHH model, which the USFWS identified as one of the best available source of information relative to habitat quality for Hawaiian waterbirds.[37] Other resources that were used to support the development of model variables include the USFWS Recovery Plan for Hawaiian Waterbirds (USFWS, 2011) and Hawai`i's Comprehensive Wildlife Conservation Strategy (Mitchell et al., 2005), as well as personal communication with management staff at the USFWS Kealia Pond Wildlife Refuge in Kihei, Maui, which includes similar characteristics to the proposed project. The final list of model variables, with a description and scoring protocol for each variable is presented in Table 18.

5.4.1.2 Application of Ecosystem Output Model

Based on the modeling approach and variable scoring described above, ecosystem outputs were quantified for the final array of alternatives plans. The variable scores (with the rationale for assignment of those scores) and calculation of habitat units for each of the alternatives plans is presented in Table 19. As shown, the variable scores that differed substantially between alternatives are for flooding regime and water depth, water quality and circulation, and invasive species control. These differences primarily relate to the use of a groundwater pump, both as used to contribute to wetland hydrology and to manage water quality and overall habitat conditions.

As noted in Table 18, the scores for the flooding regime and water depth variables were calculated as the approximate percentage of the site that provides the appropriate flooding regime and water depths for the stilt and coot during the summer and winter months; this was determined based on the percentage of the site that would support up to two feet of water, given the groundwater levels reported in the Hydrogeologic Assessment (Oceanit, 2009).[38] As the excavation depths for Alternative 4 are based on achieving maximum suitable depths based on summer water levels, the majority of the site (approximately 80 percent) would provide suitable conditions in the summer. Higher groundwater levels in the winter would contribute to greater water depths, resulting in a smaller area of suitable conditions in

[37] MESHH does not serve to quantify ecosystem benefits; however, it relates habitat characteristics to species requirements, which can be used as the basis for variable scoring.

[38] The percentages were calculated based on estimates of area within specific contours of the wetland that relate to the target water depths, based on the summer and groundwater levels reported in the Hydrogeologic Assessment (Oceanit, 2009). For example, for Alternative 4, the areas within the 2.95-foot contour would provide water depths up to two feet during the summer. For Alternatives 8A and 8B, it was assumed that through pumping, two-foot water depths would be achieved within the 3.45-foot and 4.5-foot contours, respectively. The area within these contours was then compared to area of the larger site to determine the percentage of area that would provide suitable water depths.

the winter; however, it is expected that these water levels would be managed via the wetland outlet, such that the extent of suitable water depths would be commensurate with summer conditions. For Alternative 8B, excavation depths are based on achieving the maximum suitable water depths given the winter groundwater levels, with a groundwater pump used to supplement water levels in the summer. In both cases, approximately 85 percent of the site would provide suitable conditions. Similarly, Alternative 8B is designed to accommodate the maximum suitable water depths, with use of a groundwater pump to regulate water levels through most of the year, such that approximately 90 percent of the site would provide suitable conditions. Use of the groundwater pump in Alternatives 8A and 8B also contribute to higher variable scores relative to water quality, as it provides a directed input of incoming flows, which helps to increase internal circulation and water turnover. It also contributes to a higher score relative to invasive species, as it provides a mechanism for vegetation and overall site management.

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TABLE 18
Description and Scoring of Variables for Ecosystem Output Model

Variable	Rationale for Including Variable in Model	Methodology	Description		Score
Flooding regime and water depth	Life history requirements for native Hawaiian waterbirds include habitats with specific flooding regimes and water depths. Stilts prefer foraging/loafing habitat that consists of shallow, ephemerally flooded areas; water depth is a limiting factor. Coots prefer flooded open water, up to approximately 2 feet deep (USFWS, 2011a; Mitchell et al., 2005). Migratory / shorebirds also benefit from this range of conditions (USFWS, pers. comm., 2012); these species rely on these habitat conditions year-round.	Assess the percentage of the site that provides appropriate foraging habitat for Hawaiian stilt and coot (as well as migratory / shorebirds): - Stilt foraging habitat: ephemerally flooded, up to 9 inches deep, with shallow slopes (>3:1) - Coot foraging habitat: semi-permanently flooded, open water, generally less than 24 inches deep	Summer Conditions	Foraging habitat is not present at site during summer.	0
				Foraging habitat is present over all or part of site during summer (score is rounded to nearest tenth percent).	0.1 - 1.0
			Winter Conditions	Foraging habitat is not present at site during winter.	0
				Foraging habitat is present over all or part of site during winter (score is rounded to nearest tenth percent).	0.1 - 1.0
Water quality and circulation	Water circulation is an important component of habitat quality, by helping to maintain suitable water quality levels, prevent warm and stagnant water, and limit botulism outbreaks (USFWS, pers. comm., 2012).	Consider factors that could affect water quality and circulation: - no directed input of untreated stormwater or urban runoff - directed input of incoming water flow - mechanism for internal circulation - outlet for flows	Two (or fewer) of the water quality and circulation factors are accommodated at the site.		0
			Three of the water quality and circulation factors are accommodated at the site.		0.5
			All four of the water quality and circulation factors are accommodated at the site.		1
Protection from predation	Predation is an important factor that has contributed to the decline of Hawaiian waterbird species; adequate predator control is a critical component of maintaining suitable habitat for endangered waterbird species; predators include mongooses, rats, cats, dogs, herons, egrets, *pueo*, mynas, and bullfrogs (USFWS, 2011a).	Assess factors that could provide protection from predation: - lack of island or moat features - maintenance of vegetation density and height (for example, through long-term O&M activities) - predator control barrier (for example, fence) - predator monitoring and trapping	Two (or fewer) of the predation factors is accommodated at the site.		0
			Three of the predation factors are accommodated at the site.		0.5
			All four predation factors are accommodated at the site.		1
Vegetation cover	Vegetation is an important component of wetland function; the density or coverage of vegetation is a factor in habitat suitability. Stilt favor habitat with limited cover of low-growing perennial vegetation; MESHH suggests total cover should ideally be less than 20% (but up to 80% is acceptable). Coot favor open water with moderately dense emergent vegetation; MESHH suggest total cover should ideally be up approximately 50% (but a range of 20-80% is acceptable) (USFWS, 2011a; Reed et al., 2011).	Assess average vegetative cover on wetland slopes >3:1 (either based on naturally occurring conditions or based on O&M activities)	Wetland Slopes	Average cover of >80%	0
				Average cover of 20 - 80%	0.5
				Average cover of <20%	1
		Assess average vegetative cover in emergent zone (either based on naturally occurring conditions or based on O&M activities)	Emergent Zone	Average cover of <20% or >80%	0
				Average cover of 20-40% or 60-80%	0.5
				Average cover of 40-60%	1
Plant species composition	Plant species composition serves as an indicator of the floristic quality of a wetland; it also serves as a proxy for habitat structure, which is an important habitat consideration for native Hawaiian waterbirds (Reed et al., 2011).	Assess whether the site achieves diversity and dominance of target plant species (either naturally or through maintenance activities): *kaluha (Bolboschoenus maritimus), makaloa (Cyperus laevigatus), ahuawa (Cyperus javanicus), akulikuli (Sesuvium portulacastrum), ae'ae (Bacopa monnieri) , akiaki (Sporobolus virginicus)*	Less than 20% of dominant species are on target species list.		0
			Between 20 and 50% of dominant species are on target species list.		0.5
			More than 50% of dominant species are on target species list.		1
Invasive species control	Invasive species outcompete native species, and decrease the quality of habitat for wildlife by reducing mudflats and shallow water habitat (Mitchell et al., 2005); species of concern are expected to include California grass, Indian marsh fleabane, California bulrush, and pickleweed.	Assess the factors that could deter the establishment and growth of invasive species and/or contribute to management efforts: - source of fresh water - ability to manage water levels - implementation of invasive species control efforts	None of the invasive species control factors are accommodated at site.		0
			One of the invasive species control factors are accommodated at site.		0.5
			Two or more of the invasive species control factors are accommodated at site.		1

NOTES:
Model does not address the following:
1. Minimum wetland size: the MESHH model considers the minimum wetland size used by Hawaiian stilt and coot to be 0.74 and 0.5 acre, respectively. As the project would exceed the size estimates, minimum wetland size was not incorporated into the model. However, the model will account for the habitat value associated with wetland size by weighting the model scores by wetland area.
2. Salinity: the MESHH model cites Coleman (1981) as reporting that stilts tolerate salinities ranging from 4-68parts per thousand (ppt), and have been observed in areas with salinities as high as 116 ppt. Based on the hydrogeologic assessment of the Mokuhinia site (Oceanit, 2009), the salinities are expected to be well within this range (2.1 to 9.8 ppt). Therefore, salinity is not considered as a variable in the habitat model.

References:
USFWS (U.S. Fish and Wildlife Service). 2011a. Revised Recovery Plan for Hawaiian Waterbirds. Second Draft of Second Revision. May.
Mitchell, C., C. Ogura, D.W. Meadows, A. Kane, L. Strommer, S. Fretz, D. Leonard, and A. McClung. 2005. Hawai`i's Comprehensive Wildlife Conservation Strategy. Department of Land and Natural Resources. Honolulu, Hawai`i. 722 pp. October.
Reed, J.M., N. Fefferman, C.S. Elphick, D.W. DesRochers, and M. Silbernagle. 2011. MESHH: Managing Endangered Species in Hawai`i. Software for Optimal Design for Endangered Waterbirds. January.
USFWS (U.S. Fish and Wildlife Service). 2012. Personal communication with Aaron Nadig and Paula Levin. March 22 and April 9.

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TABLE 19
Variable Scoring and Calculation of Habitat Units for Final Array of Alternative Plans[1]

Variable	No Action (Future Without Project)	Alt. 4	Alt. 8A	Alt. 8B	Rationale for Variable Scoring and Explanation of Habitat Unit Calculations
Flooding regime and water depth – summer conditions	0	0.80	0.83	0.94	Scoring is based on the approximate percentage of site that would support up to 2 feet of water under summer and winter conditions (calculated based on the estimated area within the corresponding contour in the conceptual restoration design). For Alternative 4, it is assumed that water depths in the summer would be approximately 2 feet, given existing groundwater levels; in the winter, the wetland outlet would be used to manage water levels at approximately the same depth. For Alternative 8A, it is assumed that water depths in the winter would be approximately 2 feet, given existing groundwater levels; in summer, the pump would be used to elevate water levels to approximately the same depth. The extent of ponded conditions is slightly greater for Alternative 8A than for Alternative 4 because of the excavation depths relative to groundwater levels. For Alternative 8B, a pump would elevate the water levels above the groundwater during both summer and winter, resulting in coverage over a larger percentage of the site.
Flooding regime and water depth – winter conditions	0	0.80	0.83	0.94	
Water quality and circulation	0	0.5	1.0	1.0	All of the alternatives would have an outlet and mechanism for internal circulation, with no directed inputs of untreated stormwater or urban runoff. However, Alternative 4 does not include a pump, which would provide a directed input of incoming water flow.
Protection from predation	0	1.0	1.0	1.0	Alternatives 4, 8A and 8B each incorporate all four of the factors that were identified as providing protection from predation.
Percent cover of vegetation– wetland slopes	0	1.0	1.0	1.0	Vegetation management is recognized as an important component of habitat suitability for Hawaiian waterbirds (USFWS, 2011a). The O&M activities for Alternatives 4, 8A, and 8B would include vegetation management, as needed to maintain the target vegetation cover on the wetland slopes.
Percent cover of vegetation– emergent zone[1]	0	0.0	0.0	0.0	Initially, it is assumed that vegetation will be sparse in the emergent zone, but will increase to achieve the target cover in the first 5 years. Over time, it is expected that the O&M activities for Alternatives 4, 8A, and 8B would include vegetation management, as needed to maintain the target cover in the emergent zone.[1]
Plant species composition	0	1.0	1.0	1.0	Vegetation management is recognized as an important component of habitat suitability for Hawaiian waterbirds (USFWS, 2011a). The O&M activities for Alternatives 4, 8A, and 8B would include vegetation management, as needed to maintain the target species composition.
Invasive species control	0	0.5	1.0	1.0	All of the alternatives would include implementation of invasive species control efforts. Alternatives 8A and 8B would also include a pump, which is recognized as an important tool for managing water levels as part of an invasive species control effort (USFWS, 2011a).
Total Score	**0**	**5.6**	**6.7**	**6.9**	Calculated as the sum of the variable scores (listed above)
Average Score	0	0.70	0.83	0.86	Calculated as the average of the variable scores (listed above)
Wetland Area (acres)	0	6.1	6.1	6.1	Approximate acreage of restored wetland habitat
HABITAT UNITS	**0**	**4.3**	**5.1**	**5.3**	Calculated as the product of the average variable score and the approximate acreage of restored wetland habitat

NOTES:

[1] The habitat units presented in the table represent the anticipated outputs that would be provided in the first year following construction. Outputs are expected to increase slightly over the first five years, as the vegetation in the emergent zone progresses toward the target coverage. This increase in outputs in reflected in the annualized outputs which were used as inputs to the CE/ICA.

5.4.2 Preliminary Cost Estimates

Based on the conceptual designs, preliminary cost estimates were developed for each alternative plan, as needed to support the alternatives evaluation process. The preliminary costs were developed as bottom, rolled-up type estimates at the 10 percent design level and generally assume a construction period of approximately 1 year, with construction starting in late 2016. Table 20 provides a summary of the estimated cost, project first cost, and total project cost for each alternative in the final array (with costs rounded to the nearest thousand dollars for summary purposes). A discussion of the different components accounted for in these cost estimates is provided in the following sections. A more detailed cost breakdown for each alternative (as well as the quantities and assumptions used to develop the costs) is provided in Appendix E.

TABLE 20
Preliminary Cost Estimate for Final Array of Alternatives

Alternative	Estimated Cost (EPL October 2012)[1]	Project First Cost (EPL October 2014)[2]	Total Project Cost (Fully Funded)[3]
Alternative 4	$8,162,000	$8,505,000	$10,160,000
Alternative 8A	$8,138,000	$8,481,000	$10,134,000
Alternative 8B	$9,609,000	$10,009,000	$11,777,000

NOTES:

EPL = Effective Price Level

[1] The Estimated Cost is the initially developed cost estimate which includes contingencies. The EPL is usually the date of preparation of the cost estimate.

[2] The Project First Cost is the estimated cost brought to the program/budget year price level. The EPL is the date of the common point in time of the pricing used in the cost estimate. It includes (1) preconstruction engineering and design costs, (2) construction costs, (3) LERRD values, and (4) contingencies. The Project First Cost serves as the basis for providing the cost of the project for which authorization is sought.

[3] The Total Project Cost is the constant dollar cost, fully funded with escalation to the estimated midpoint of construction. The Total Project Cost is the estimate used in Project Partnership Agreements.

As specified in Appendix F, Amendment #2 (31 January 2007) of ER 1105-2-100, the CAP legislative authorities identify specific federal financial participation limits for each project implemented under a CAP authority. Under Section 206, the federal participation limit is $5 million per project; based on the cost-share percentages for this project, this limit equates to a cost of approximately $7.6 million. As shown in Table 20, the preliminary costs that were identified for the final array of alternative plans all exceed this threshold.[39] In large part, this is because of the high cost of real estate in Hawai`i, with the real estate costs for the project expected to exceed $1.7 million.

The costs shown in Table 20 were developed based on broad assumptions for the purpose of evaluating the alternatives and selecting a recommended plan for implementation. They are expected to be reasonable estimates that provide the relative cost differences between the alternatives, thereby providing a justifiable basis for the CE/ICA. Based on input from POD, it was determined that although the preliminary costs exceed the threshold of $7.6 million, they should be used to conduct the CE/ICA, and the costs for the tentatively selected plan should be further refined with this threshold in mind (with a waiver coordinated through USACE Headquarters (HQUSACE) and the OASA(CW) would be sought, as needed).

39 A smaller project area was contemplated as a mechanism to reduce total project cost. However, as described in Section 4, it was determined that a smaller-scale plan would not be consistent with the planning objectives and constraints.

5.4.2.1 Construction Costs

Mobilization and Demobilization

The preliminary construction costs include mobilization and demobilization, which accounts for pre-construction and post-construction surveys, construction permits, contractor mobilization and demobilization efforts (including preconstruction coordination meetings), installation of dust and erosion control fencing and other best management practices (BMPs), clearing and grubbing, demolition of existing structures, establishment of a construction entrance, and site cleanup efforts. Through coordination with the County of Maui and the Friends of Moku`ula, it is assumed that the area reserved for the Friends of Moku`ula would be used as a staging area during construction. The estimated costs associated with mobilization and demobilization (as well as the assumptions used to develop those costs) are provided in Appendix E.

Habitat Facilities

The preliminary construction costs also include those associated with installation of the habitat facilities, which generally account for the various conceptual restoration measures identified in the plan formulation process. These include excavation and fill (including clay liner and topsoil for Alternative 8B), surface water outlet, maintenance path, wetland vegetation, groundwater well and pump for Alternatives 8A and 8B (including the associated mechanical controls and pump shelter), surface water aerator (for Alternative 4), and fencing (both a concrete revetment around Moku`ula and a predator control fence). The concrete revetment was identified through coordination with the USFWS as a mechanism for discouraging bird use on Moku`ula, in order to minimize potential conflicts associated with future cultural uses of the island. A large percentage of the construction cost is associated with excavation and grading, particularly as it is assumed the material will need to be hauled and disposed at the County of Maui's Construction and Demolition Landfill, located in Kīhei (approximately 20 miles southeast of the project site). Differences between the alternatives are primarily those associated with the amount of excavation, use of a clay liner, inclusion of a well and pump, and vegetation quantities. The estimated cost of the habitat facilities for each alternative (as well as the assumptions and quantities used to develop these costs) are provided in Appendix E.

Performance Monitoring and Adaptive Management

The regulations that govern USACE ecosystem restoration projects specify that monitoring may be used to determine if the predicted outputs are being achieved and to provide feedback for future projects. The USACE *Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration* (dated August 2009) clarifies that a plan for monitoring restoration success should be developed as part of the feasibility study for an ecosystem restoration project, both for specifically authorized projects and those initiated under the CAP authority. Monitoring should focus on the systematic collection and analysis of data that provide information useful for assessing project performance and determining whether ecological success has been achieved or whether adaptive management may be needed to attain project benefits. Monitoring is a cost-shared project cost for up to 10 years following completion of construction, and the implementation guidance specifies that the estimated cost of the proposed monitoring program should be included in the project cost estimate and cost-shared accordingly.

Consistent with the assessment of habitat quality as presented for the ecosystem output modeling effort, ecological success for this project would relate to the development of wetland functions, and more specifically, those conditions that provide suitable foraging habitat for Hawaiian stilts and coots. In terms of measuring ecological success, it was determined that the performance monitoring should focus on the physical site characteristics that contribute to habitat quality, as these are the conditions that can be most closely controlled. Consideration would be given to the biological characteristics of the site in the overall

decision-making process; as such, anecdotal information will be recorded as part of the overall monitoring effort (for example, a log documenting observations of bird use). However, these attributes were not considered as the basis for performance monitoring, as they can be widely affected by other external factors. Specific parameters to be measured as part of the performance monitoring are expected to include the extent of wetland function, flooding regime and water depth, circulation, plant species composition, vegetation cover, and predator monitoring.

For the purposes of evaluation, monitoring requirements were estimated for the three alternative plans in the final array based on the project objectives. Given that the site is currently an open field, with no aquatic habitat features present, pre-construction monitoring was not included as part of the overall effort. Based on technical input from USFWS (incorporating lessons learned from restoration of other similar wetland habitat types in Hawai`i), and as allowed under the USACE guidance, it is assumed that monitoring would be conducted over a 10-year period that would start upon completion of construction. Within the 10-year monitoring period, a total of five monitoring events would occur. Based on the conceptual design, it is assumed that monitoring would be conducted in Years 1, 3, 5, 7, and 10 (that is, in the first, third, fifth, seventh and tenth years following completion of construction). Post-project monitoring costs were developed based on specific assumptions about the tasks to be completed and the associated level of effort; it was assumed that the post-construction monitoring costs would be generally consistent across the final array of alternative plans.

The monitoring costs are based on the following assumptions relative to the tasks to be completed for each monitoring event:

- An assessment will be conducted using standard delineation methods to determine the extent of area that meets the vegetative, hydrologic, and soils criteria for basic wetland functions.
- Assessment of flooding regime and water depths will use water level data gathered as part of ongoing O&M effort; data would be compiled and analyzed.
- Assessment of water quality will include a qualitative assessment of circulation patterns.
- Assessment of wetland vegetation will include measurement of species composition and cover along established transects.
- Assessment of protection from predation will use data gathered as part of ongoing O&M effort; data would be compiled and analyzed.

In addition to assessing project performance, the results of the monitoring effort will be used to identify any adaptive management requirements needed to achieve the ecosystem restoration benefits. Adaptive management is a structured process of learning and using newly-acquired knowledge to adjust and improve project implementation. The adaptive management process promotes flexible decision-making as outcomes from management actions are better understood. Implementation guidance for Section 2039 of WRDA 2007 specifies that an adaptive management plan will be developed for all ecosystem restoration projects. Based on an initial assessment of the final array of alternatives, potential adaptive management measures that were identified include modifications to the following: (1) the timing and/or amount of groundwater pumping, (2) management of the surface water outlet, (3) vegetation management efforts, and/or (4) the placement and/or timing of predator trapping efforts. In general, it is anticipated that these would fall within the range of activities to be conducted as part of the O&M program (as further discussed in Section 5.4.2.8), with adaptive management resulting in a modification to a particular aspect of the activity (for example, timing and duration). No physical modifications are anticipated as part of the adaptive management effort. A more detailed analysis of adaptive management efforts is considered for the tentatively selected plan; any associated costs would be reflected in the refined cost estimate.

5.4.2.2 Lands and Damages

As part of the feasibility study process, the nature and extent of real estate requirements must be analyzed in accordance with USACE policies and be consistent with ER 405-1-12, including consideration and identification of the specific interests, estates, and acreage required. After coordination and consultation with the non-federal sponsor, the USACE determines the lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRDs) required for implementation of the project.

A total of five fee-simple parcels would be used in support of the proposed project (as shown in Figure 11); each of these is listed in Table 21. As shown, Parcels 1 to 3 are legally owned by the State of Hawai`i, but were assigned by State Executive Order to the County of Maui. Although a fee simple interest is proposed generally required for the project footprint as the standard estate for environmental ecosystem restoration projects, ER 405-1-12 (Real Estate Handbook, Section 12-9.b(6)) provides that "a lesser, or easement estate, may be appropriate based on the extent of interest required for the operation or requirements of a project." Although the County of Maui does not have a fee simple interest (deriving its control and management over the subject parcels from gubernatorial Executive Orders and Hawai`i state law), POH has determined, in accordance with ER 405-1-12, Section 12-10.c, that the lesser interest the County possesses, particularly in combination with an acknowledgment and concurrence by the State in the use of the parcels for the project, will provide the minimum interest in the subject real property required to support the project.

TABLE 21
Tax Map Key (TMK) Parcels and Land Ownership

Parcel	TMK	Land Owner	Current Use	Total Area (square feet)
1	(2)4-6-007:002	State of Hawai`i (Assigned to County of Maui by Executive Order 52 in April 1918)	Malu`ulu o Lele Park	326,700
2	(2)4-6-007:036	State of Hawai`i (Assigned to County of Maui by Executive Order 02889 in February 1978)	Friends of Moku`ula Parking Lot	40,437
3	(2)4-6-007:001	State of Hawai`i (Assigned to County of Maui by Executive Order 3430 in October 1989)	Malu`ulu o Lele Park	87,555
4	(2)4-6-007:037	Salvation Army	Salvation Army, Lāhainā Outpost	16,674
5	(2)4-6-007:038	Salvation Army	Salvation Army, Lāhainā Outpost	17,686

Implementation of the project would require acquisition of the fee-simple title to Parcels 4 and 5. The fully funded cost for acquisition of these parcels is $1,787,000; only the fee interest has been identified at this time, as that is the typical estate required for environmental restoration projects. USACE policy specifies that as a target, land acquisition values should not exceed 25 percent of the total project cost (projects with land costs exceeding this target level are not likely to be given a high priority for budgetary purposes). The real estate costs for this project are estimated to be approximately 23 percent of the total project cost limit.

A detailed Real Estate Planning Report (REPR) was prepared in accordance with the requirements of Chapter 12 of ER 405-1-12; a copy is contained in Appendix F.

5.4.2.3 Preconstruction, Engineering, and Design

In general, the costs for the preconstruction engineering and design phase include those related to (1) project management, (2) planning and environmental compliance, (3) engineering and design, (4) technical review and value engineering, (5) contracting reprographics, (6) engineering during construction, (7) planning during construction, and (8) project operations. In addition, a contingency is applied to the PED costs based on an analysis of potential cost and schedule risks, as further described in Section 5.4.2.7. The estimated PED-related costs, and the assumptions used to develop those costs, are provided in Appendix E.

5.4.2.4 Construction Management

In general, the costs for construction management include those related to (1) construction management, (2) project operation, and (3) project management during construction. In addition, a contingency is applied to the construction management costs based on an analysis of potential cost and schedule risks, as further described in Section 5.4.2.7. The estimated construction management costs (as well as the assumptions used to develop those costs) are provided in Appendix E.

5.4.2.7 Contingency

Engineering and Construction Bulletin (ECB) No. 2007-17 (*Application of Cost Risk Analysis Methods to Develop Contingencies for Civil Works Total Project* Costs, dated 10 September 2007) specifies that "cost risk analysis methods will be used for the development of contingency for the Civil Works Total Project Cost estimate. It is the process of identifying and measuring the cost and schedule impact of project uncertainties on the estimated total project cost. When considerable uncertainties are identified, cost risk analysis can establish the areas of high cost uncertainty and the probability that the estimated project cost will or will not be exceeded. This gives the management team an effective additional tool to assist in the decision making process associated with project planning and design."

In accordance with these requirements, contingencies for were developed with input from the PDT based on an evaluation of the risks to the project and their effect on cost and schedule. Specifically, an abbreviated cost schedule risk analysis (ACSRA) was completed for each alternative based on the 10% level of design information. The resulting contingencies are summarized in Table 22, with additional details in Appendix E.

TABLE 22
Contingencies Included in the Preliminary Cost Estimates

	Alternative 4	Alternative 8A	Alternative 8B
Habitat Facilities	18.2%	18.1%	18.0%
Planning Engineering and Design	19.6%	24.4%	24.4%
Construction Management	19.6%	17.7%	19.6%

The risk level assumed in the ACSRA for all three alternatives was low (no life safety issues). Key uncertainties that could affect the project pricing, and are thereby reflected in the contingency levels, include the following:

- Results of the aquifer pump test in the final design phase could potentially require design modifications (conceptual designs are based on limited groundwater data and generic assumptions)
- Inadvertent discovery of archaeological resources during construction could result in delays and/or design modifications

The additional contingency assigned to Alternatives 8A and 8B for the PED costs is associated with the well and groundwater pump. In particular, the type, size, and capacity of equipment specified as part of these alternatives could be modified as part of the detailed design, thereby affecting cost.

5.4.2.8 Operations and Maintenance

Although there is a general desire for ecosystem restoration projects to be self-regulating, the USACE planning process recognizes the needs for operations and maintenance measures in the functionality of a project, particularly in light of irreversible cultural modifications in the landscape. ER 1105-2-100 specifies that, if required, operations, maintenance, repair, rehabilitation and replacement (OMRR&R) should be included as part of project implementation costs.

The O&M requirements were determined for the three alternative plans in the final array based on the project objectives and anticipated requirements to maintain habitat quality and functionality. These requirements are generally consistent with management actions recommended in the Recovery Plan for Hawaiian Waterbirds (USFWS, 2011a), as well as ongoing O&M activities conducted for other similar wetlands, based on input provided by USFWS. O&M costs were developed based on specific assumptions about the tasks to be completed and the associated levels of effort. Specific tasks considered in the development of O&M costs and assumptions regarding level of effort include:[40]

- General site management including trash removal, fence inspection, and similar (assumes 12 person-days per year for all three alternatives; assumes purchase of materials for fence maintenance every 10 years)
- Water level inspection/monitoring and outlet management (assumes 18 person-days per year for all three alternatives)
- Groundwater pump operations and maintenance (27 person-days per year for Alternative 8A and 47 person-days per year for Alternative 8B; assumes equipment replacement every 10 years)
- Surface water aerator operations and maintenance (assumes 7 person-days per year for Alternative 4; assumes equipment replacement every 10 years)
- Vegetation management (assumes 36 person-days per year for all 3 alternatives)
- Predator control including monitoring, trapping and trap replacement (assumes 78 person-days per year and replacement of traps every 10 years for all three alternatives)

Based on these assumptions the annualized O&M costs are estimated to be as follows:

- Alternative 4 - approximately $37,750 per year (151 person days at $250 per day), plus equipment replacement costs every 10 years
- Alternative 8A - approximately $42,750 per year (171 person days at $250 per day), plus equipment replacement costs every 10 years
- Alternative 8B - approximately $47,750 per year (191 person days at $250 per day), plus equipment replacement costs every 10 years

Annualized O&M costs were incorporated into the CE/ICA analysis with the total project costs, as further discussed below.

[40] In addition to these tasks, the need for maintenance dredging of sediment was considered. However, there are not expected to be any directed inputs of stormwater runoff from areas outside of the Moku`ula/Mokuhinia site; as such, the site is not expected to accumulate sediment at a rate that would require dredging over the project period.

5.4.3 Cost Effectiveness and Incremental Cost Analysis

As specified in the USACE regulations, the outputs of ecosystem restoration are not monetized, as is required for traditional benefit-cost analyses. Rather, evaluation of alternative restoration plans considers the relationship of habitat benefits to project costs to identify the most cost-effective plans for various levels of restoration output and provide a basis for determining whether increasing levels of restoration output are worth the added cost.

The evaluation process includes two distinct analyses to identify cost-effective and incrementally justified plans. First, the cost effectiveness analysis is conducted to identify which alternative plans have output levels that cannot be produced more cost effectively by another plan. “Cost effective” means that, for a given level of output, no other plan costs less, and no other plan yields more output for less money. Subsequently, through the incremental cost analysis, the range of plans is evaluated to arrive at a “best” level of output. The subset of cost effective plans are examined sequentially (by increasing scale and increment of output) to ascertain which plans are most efficient in the production of restoration benefits; these are referred to as “best buy plans.”[41] They provide the greatest increase in output for the least increase in cost. That is, they have the lowest incremental cost per unit of output. In most cases, the incremental analysis will not necessarily identify an optimal plan; rather, there is a series of best buy plans. The results must be synthesized with other decision-making criteria (for example, acceptability, completeness, effectiveness, reasonableness of costs, risk and uncertainty) to provide the basis for selection and recommendation of a particular plan.

The IWR Planning Suite software (IWR Plan, version 1.0.11.0) was used to conduct the CE/ICA for this project. Inputs to the CE/ICA included average annual habitat units, which were calculated based on the results of the ecosystem output model (as described in Section 5.4.1), and estimated average annual costs, which were calculated based on estimated cost at the FY2013 price level (as described in Section 5.4.2). In addition to the estimated costs, the CE/ICA also considers the O&M costs, as these are considered necessary to achieve the habitat benefits over the lifetime of the project. The results of the CE/ICA are summarized in the following sections; additional detail is provided in the Economic Appendix, contained in Appendix G.

5.4.3.1 Annualized Outputs and Costs for Cost Effectiveness and Incremental Cost Analyses

As part of the CE/ICA, environmental outputs and estimated costs should be annualized across the period of analysis (in the case of this project, 50 years). To annualize the estimated costs, an implementation timeline must be developed that categorizes cost components as investment costs (i.e., initial costs of construction and real estate, as well as PED and interest during construction) or future costs, so that they can be evaluated in present value terms. The anticipated timeline for this project assumes that all project costs, with the exception of monitoring and O&M, will be incurred in Year 0. For each alternative, the estimated costs utilized for CE/ICA are equal to the investment costs plus future costs, in present value terms. For each alternative, the investment costs include construction, LERRDs, PED, and construction management; future costs include post-construction monitoring, and O&M.

Based on the estimated total project costs, the IWR Planning Suite annualizer was used to calculate the average annual cost for each alternative. This calculation is based on estimated project costs at the Fiscal Year 2013 price level, and assumes a 50-year period of analysis and a federal discount rate of 3.75 percent

[41] As described in Section 4.3.2, different scales were considered in the plan formulation process, relative to the overall area of wetland habitat to be reestablished. However, given the planning objectives and constraints, only a single scale was carried forward in the plan formulation process. A larger scale was not considered a feasible option as the adjacent land is not available for use as part of the project; a smaller scale was also not considered a feasible option as it would not be entirely consistent with the planning objectives and constraints. These considerations of scale were confirmed by stakeholder input, particularly the views of the nonfederal sponsor.

(that is, the federal discount rate established for the evaluation of water resources development projects in Fiscal Year 2013). A detailed breakdown of project costs, by year, is included in the attachments to the Economic Appendix (Appendix G).

For proper comparison of costs and benefits, the habitat units were also annualized over the period of analysis. Average annual habitat units were calculated using the IWR Planning Suite annualizer, based on estimated habitat units at selected years. Based on the anticipated rate of change of the habitat units post-construction, across the 50 year period of analysis, the average annual habitat units range from 0 (No Action) to 5.911 (Alternative 8b). Table 23 summarizes the average annual costs and outputs (habitat units) for each alternative.

TABLE 23
Summary of Outputs and Costs

Alternative	Output (Average Annual Habitat Units)	Cost (Average Annual Cost)[a]
No Action	0	0
Alternative 4	4.954	$405,514
Alternative 8a	5.729	$410,401
Alternative 8b	5.911	$482,217

NOTES:

[a] Annualized costs are based on estimated project costs at the FY2013 price level (with all project costs, except monitoring and O&M occurring in Year 0), a 50-year period of analysis, and a federal discount rate of 3.75 percent. A detailed breakdown of project costs, by year, is included in the attachments to the Economic Appendix (Appendix G).

5.4.3.2 Cost Effectiveness Analysis

To determine whether each of the alternative plans is cost-effective, they are compared based on their predicted level of output (average annual habitat units) and estimated average annual cost. For each level of output, only the least expensive alternative is considered cost-effective. In the case of this project, none of the alternatives have the same predicted level of output, and therefore, each of the alternative plans are considered cost-effective.

5.4.3.3 Incremental Cost Analysis

The ICA is conducted on only the cost-effective plans; as summarized above, all of the alternative plans are considered cost effective, and were carried forward to the ICA. The ICA is comprised of the following steps: (1) calculating the incremental cost of implementing each cost-effective plan over the No Action Alternative, (2) removing plans where the incremental cost per unit does not increase with increasing output, (3) calculating the cost of implementing each remaining plan over the next least costly plan, and (4) again removing plans where the incremental cost per unit does not increase with increasing output. All remaining plans are considered “best buy” plans. The No Action Alternative does not have an associated cost and is therefore always considered a “best buy” alternative.

Based on the ICA, Alternative 4 was eliminated as a best buy plan because its incremental cost per unit of output over the No Action Alternative was higher than the same incremental cost of plans with greater output (i.e., Alternatives 8A and 8B) (Table 24). No alternatives were eliminated during the subsequent step of calculating incremental cost of implementing the next least costly plan. Therefore, the No Action Alternative and Alternatives 8A and 8B are considered “best buy” plans and are carried forward for further consideration as part of determining the tentatively selected plan (see Figure 36).

TABLE 24
Summary of Incremental Costs per Unit over the No Action Alternative

Cost-Effective Alternatives	Average Annual Habitat Units	Average Annual Cost	Incremental Output from No Action	Incremental Cost from No Action	Incremental Cost Per Unit Output from No Action	Less than Incremental Cost of Alternative in All Subsequent Rows?
No Action	0.0	$ 0				N/A
Alternative 4	4.954	$405,514	4.954	$405,514	$81,856	No
Alternative 8A	5.729	$410,401	5.729	$410,401	$71,636	Yes
Alternative 8B	5.911	$482,217	5.911	$482,217	$81,580	Yes

Note: Shaded alternative is removed as potential Best Buy plan.

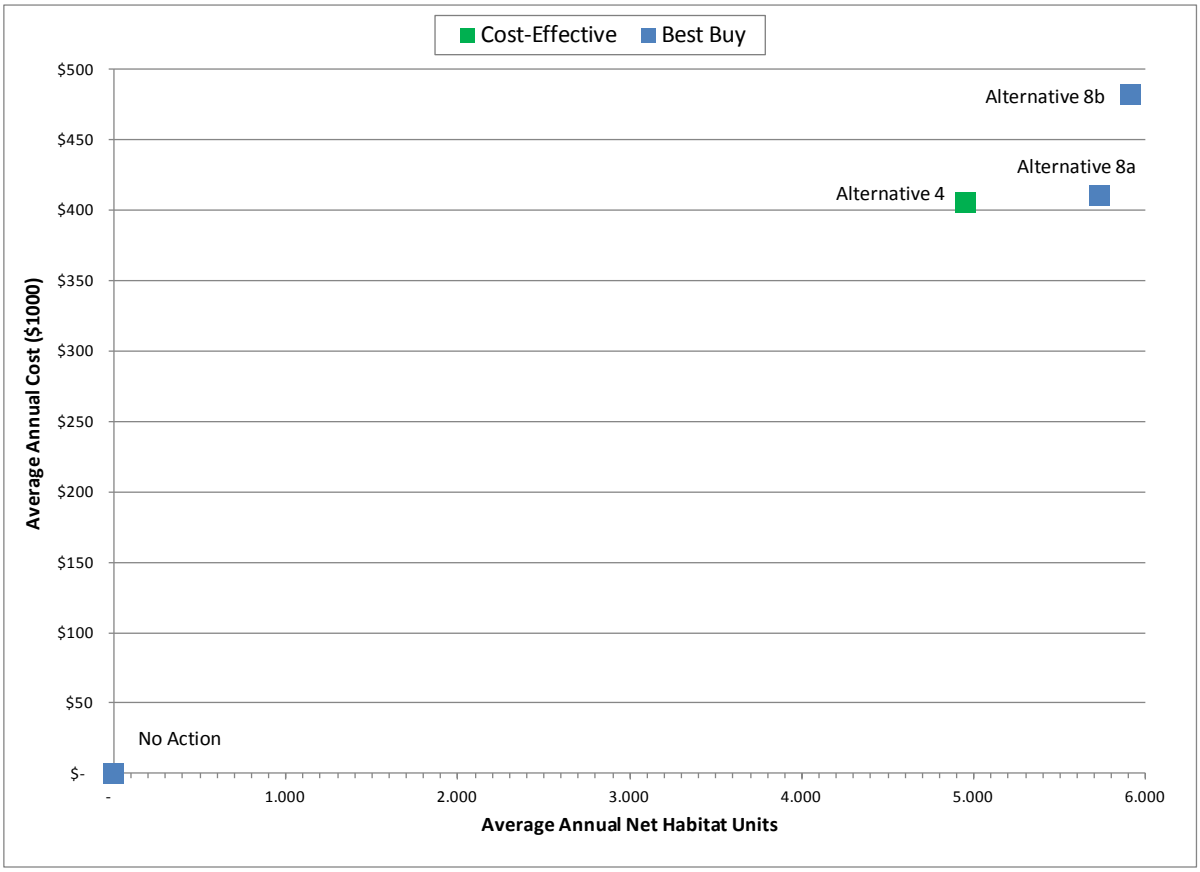

FIGURE 36
Costs and Outputs of Cost Effective and Best Buy Plans

5.4.3.4 Summary

Table 25 summaries the CE/ICA and provides the incremental cost of implementing each best buy plan over the previous best buy plan. The incremental costs of best buy plans (also displayed in Figure 37) are used to evaluate the remaining plans for selection of the recommended plan for implementation. As shown, the average annual costs of Alternatives 8A and 8B differ by approximately $72,000 and their average annual cost per average annual habitat unit differ by less than $10,000; however, the incremental cost differences are much higher. The incremental cost of implementing Alternative 8B rather than

Alternative 8A is $394,593 per habitat unit, while the incremental cost of implementing Alternative 8A rather than the No Action Plan is only $71,636 per habitat unit. These values, along with factors identified through the alternative plan comparison process, are used by decision makers to identify the tentatively selected plan, as further discussed in Section 5.5.1.

TABLE 25
CE/ICA Summary

Alternative	Estimated Cost for CE/ICA[1]	Average Annual Cost	Average Annual Habitat Units	Cost-Effective	AAC/ AAHU	Best Buy?	Incremental Cost of BB Plan over Last BB Plan	Incremental Output of BB Plan over Last BB Plan	Incremental Cost/Output of Best Buy Plan
No Action	$0	$0	0	Yes	-	Yes			
Alt. 4	$10,158,610	$405,514	4.954	Yes	$81,856	No	N/A	N/A	N/A
Alt. 8A	$10,436,136	$410,401	5.729	Yes	$71,636	Yes	$410,401	5.729	$71,636
Alt. 8B	$12,187,378	$482,217	5.911	Yes	$81,580	Yes	$71,816	0.182	$394,593

NOTES:
[1] The estimated costs utilized for CE/ICA are equal to the investment costs plus future costs, in present value terms. For each alternative, the investment costs include construction, LERRDs, PED, and construction management; future costs include post-construction monitoring, and O&M.

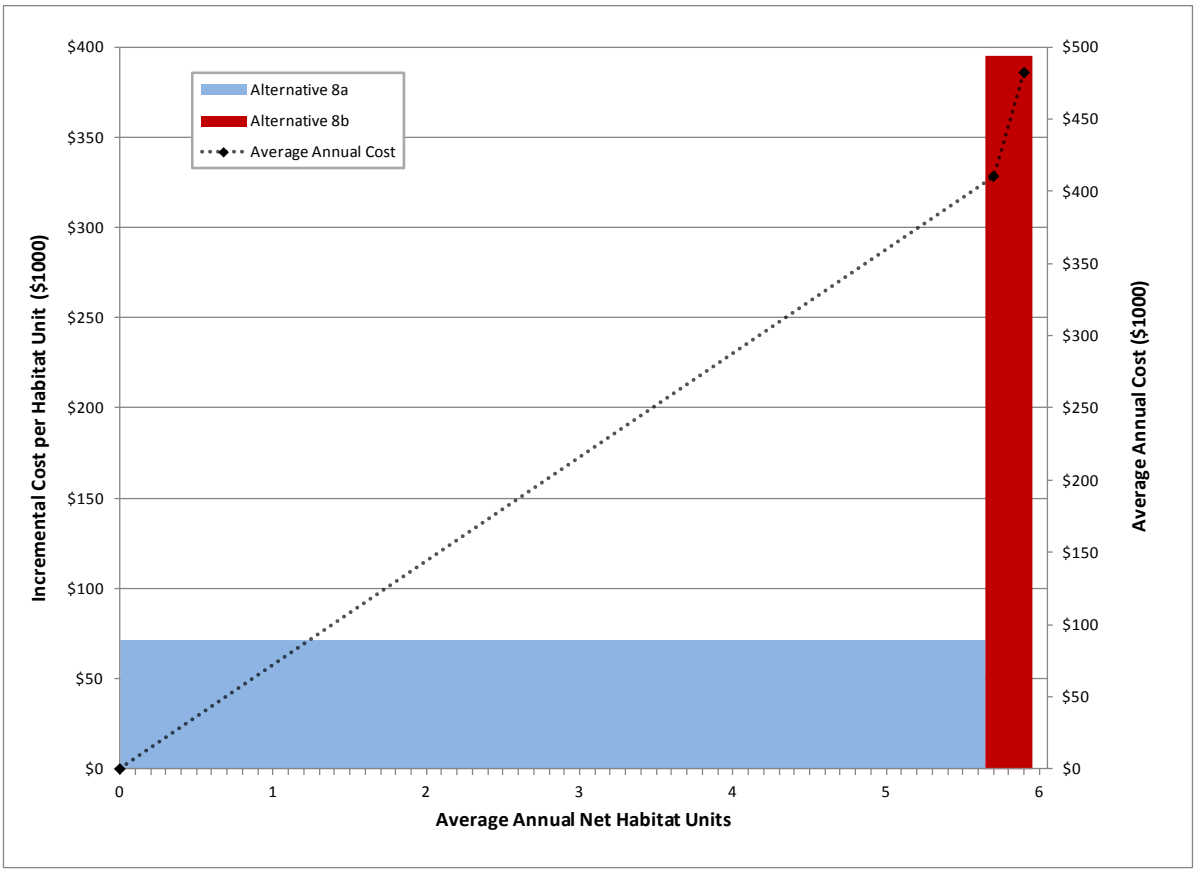

FIGURE 37
Incremental Cost of Best Buy Plans

5.4.4 Evaluation Criteria (Acceptability, Completeness, Efficiency and Effectiveness)

As noted in Section 5.2, the P&G specify four criteria that should be considered in the evaluation of alternative plans: acceptability, completeness, effectiveness, and efficiency. Alternatives considered in any federal water resource planning study should meet minimum subjective standards for these criteria in order to qualify for further consideration and comparison with other plans. Evaluation of the alternative plans based on these criteria is detailed below.

5.4.4.1 Completeness

In general, restoration of Mokuhinia is considered a desirable component of the cultural revitalization of the overall Mokuhinia/Moku`ula site. However, the wetland restoration effort is not dependent on the other activities that are planned for the site (for example, preservation of Moku`ula and/or any associated activities by the Friends of Moku`ula), as these actions do not relate to habitat improvement.

Specific to the alternative plans, it is believed that each plan includes all of the required elements needed to achieve restoration success. In particular, implementation of a sufficient O&M program is considered to be critical to the completeness of each alternative plan in order to protect and maintain the restoration efforts. As described in Section 5.4.2.8, O&M activities were defined for each alternative plan, with the associated costs incorporated into the total project costs. Consistent with the USACE's cost-sharing requirements, the County of Maui has assumed responsibility for these efforts. Based on this evaluation, each of the alternative plans in the final array is considered to be equally complete.

5.4.4.2 Effectiveness

Consideration of the effectiveness of the alternative plans in achieving the desired outcomes was incorporated into the screening process, as detailed in Section 5.2. In particular, this process considered general habitat requirements and project location, both of which specifically reflect the planning objectives. Alternative plans (or components of those plans) that did not accommodate the habitat requirements for Hawaiian waterbird species or were located outside of the historic boundaries of Loko o Mokuhinia were dismissed from further consideration.

The effectiveness of the alternative plans in the final array was further considered as part of the evaluation process. Specifically, as discussed in Section 5.4.1, the effectiveness of each plan was quantified in terms of habitat units, providing an indication of the increase in ecosystem outputs relative to the planning objectives. As discussed in Section 5.4.1, Alternative 8A would provide an annual average of 5.729 habitat units and Alternative 8B would provide an annual average of 5.911 habitat units. The number of habitat units is slightly higher for Alternative 8B, as suitable foraging conditions would be available over a slightly larger portion of the project site throughout the year (based on the excavation depths and use of groundwater pump). However, both alternatives are still considered to be effective.

5.4.4.3 Efficiency

As discussed in Section 5.4.3, efficiency was evaluated through a CE/ICA analysis using the IWR Planning Suite tool. This process uses non-monetary environmental outputs and total project costs to determine (1) which alternative plans are "cost-effective," or the least costly for a given level of environmental output, and (2) which of the cost-effective plans provide the greatest increase in output for the least increase in cost; these are termed "best-buy" plans. The results of the CE/ICA for this project indicate that Alternative 8A and 8B are both considered "best buy plans."

5.4.4.4 Acceptability

The planning process included a focused screening process, which included considerations relative to technical feasibility as well as stakeholder acceptability. Through this process, alternative plans (or

components of alternative plans) that were not considered to be technically feasible or acceptable to the stakeholders were eliminated from further consideration (for example, plans that did not include a surface water outlet to the ocean were eliminated). Stakeholder input was further incorporated into the plan formulation process, as cultural considerations were explicitly integrated into the conceptual designs (for example, accommodation of a symbolic canoe corridor). Through the stakeholder involvement process, stakeholder support was generally provided for each of the alternative plans in the final array; however, based on input received to date, the No Action alternative is not expected to be acceptable to a majority of the stakeholders. As part of this evaluation process, the alternative plans in the final array were also reviewed by the PDT and were found to be compatible with existing laws, regulations and public policies.

5.4.5 Risk and Uncertainty Considerations

Given the underlying variability of complex natural, social, and economic conditions, the P&G and USACE planning framework acknowledge that risk and uncertainty is inherent in water-resource planning. Such that the decision-making process is based on the best available information, it is required that known risks and uncertainties be characterized and clearly described, to the extent possible. Proper consideration of the project-related risks and uncertainties helps to inform the selection of the recommended plan, which ultimately can increase the potential for restoration success.

Consistent with the USACE's current guidance, project-related risks and uncertainties were identified and proactively addressed throughout the planning process. For those items considered to be moderate to high risk, potential risk-mitigation strategies were developed, with a focus on minimizing potential cost, schedule or performance impacts. The risks and associated risk management strategies were iteratively reviewed by the PDT and incorporated into the planning process, as appropriate.

This information has been recorded in a risk register, which will continue to be maintained over the duration of the USACE's involvement in the project. The purpose of the risk register is to document and track the project risks over the course of project planning and implementation. In addition to being updated in the risk register, the results of the risk assessment are translated into a Decision Management Plan (DMP), which is a document that serves as a guide to the decision-making process for the PDT. The DMP is routinely updated to describe the steps to be undertaken to achieve the next study milestone. In parallel with the risk register, the plan integrates the PDT's strategy to manage risk and reduce uncertainty. These documents collectively address the risks identified to date, with associated risk-mitigation strategies that have been agreed upon by the PDT and vertical review team. Table 26 summarizes key high-risk issues and the risk management strategy agreed upon by the PDT.

TABLE 26
Key Project-Related Risks and Associated Mitigation Response Strategy

Area of Risk	Risk Assessment	Risk Management Strategy
Existing groundwater levels	Analysis is based on a single year of groundwater data, with some generic assumptions; concern is that data do not accurately reflect existing conditions.	Proceed with conceptual design development based on existing data; conduct aquifer pump tests to validate data during next phase; modify design during next phase, as needed
Surface water outlet to adjacent ditch	Ditch is known to back up with sand, which could potentially reduce functionality near the project site; identified as problem by County and addressed as a high-priority upgrade in Drainage Master Plan.	Identify completion of the ditch upgrades as a requirement of the project partnership agreement (PPA) with the County of Maui
Realization of stated habitat benefits	Wetland restoration in a heavily urbanized setting can pose risks to Hawaiian waterbird species, particularly as a result of	Closely coordinate with USFWS through conceptual restoration design process and incorporate design recommendations (for

TABLE 26
Key Project-Related Risks and Associated Mitigation Response Strategy

Area of Risk	Risk Assessment	Risk Management Strategy
	increased predation; concern is that project would not achieve desired habitat benefits.	example, perimeter fence) and O&M requirements (for example, monitoring and trapping); include site management activities as part of adaptive management strategy
O&M requirements	Restoration success is dependent on long-term O&M efforts; concern that County will be unable to achieve the O&M requirements.	Obtain County commitment based on anticipated O&M requirements; develop O&M plan that provides detailed description of O&M activities
Location of *moku*	Survey-grade coordinates are not available for the *moku*; location has been estimated by georeferencing historical maps and archaeological studies; concern is that wetland restoration would affect archaeological resources associated with Moku`ula.	Establish a 10-meter buffer around estimated edge of Moku`ula; if more accurate information is obtained, buffer may be reduced in the final design phase
USFWS concurrence as required for compliance with ESA	USFWS has not yet concurred with USACE's determination of "*may affect, but not likely to adversely affect;*" ongoing consultation is needed throughout the final design phase (including development of detailed O&M plan); there is a risk that USFWS will not concur with USACE's determination, thus requiring formal consultation.	Continue ongoing coordination with USFWS and incorporation of USFWS input into conceptual restoration design and O&M requirements
SHPO concurrence as required for compliance with NHPA	SHPO has not yet concurred with USACE's determination of "*no adverse effect to historic properties;*" there is a risk that SHPO will not concur with USACE's determination, thus requiring development of a Memorandum of Agreement (MOA).	Continue coordination with SHPO, and incorporate additional measures to avoid, minimize, and/or mitigate, as necessary; if SHPO does not concur with USACE's determination, an MOA will be pursued
Project implementation costs	Preliminary implementation costs exceed total cost threshold for CAP program (based on federal participation limits and cost-sharing percentages).	Complete plan formulation based on screening level costs; refine implementation costs for the tentatively selected plan If implementation costs for the tentatively selected plan exceed threshold, waiver will be requested

5.4.6 System of Accounts

The P&G established four accounts to facilitate the display and comparison of the beneficial and adverse effects of each alternative plan. This mode of analysis, commonly referred to as the "System of Accounts," displays the positive and negative effects of broad categories of impacts in a tabular format. The accounts established in the P&G include those that relate to contributions to National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE). In the case of single-purpose ecosystem restoration projects, such as this, contributions are typically considered relative to National Ecosystem Restoration (NER), rather than the NED account. The NER account displays changes in the net quantity and/or quality of desired ecosystem outputs. The EQ account displays the beneficial and adverse effects of the restoration plans on ecological, cultural, and aesthetic

resources. The RED account displays changes in the distribution of regional economic activity (for example, income and employment). The OSE account displays plan effects on social aspects such as community impacts, health and safety, displacement, energy conservation and others.

Table 27 presents the comparison of the best buy alternatives based on the system of accounts and plan evaluation factors, including contributions to the planning objectives, avoidance of the planning constraints, and response to the P&G evaluation criteria

5.5 Comparison and Selection of Plan for Recommendation

Evaluation of the alternative plans, as presented above, provides the foundation for comparison and selection of a plan for recommendation, the final two steps in the USACE planning process. Alternative plan comparison involves identification and description of the differences between the alternative plans, with emphasis placed on important effects or those that could influence the decision-making process. The alternative plans are then ranked, providing the basis for selection of a plan for recommendation.

As previously described, the selected plan must meet the planning objectives and constraints, and reasonably maximize environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness; this is referred to as the NER plan. The USACE planning guidance (ER 1105-2-100) acknowledges that local interests may prefer a plan that differs from the NER plan, and allows for identification of a Locally Preferred Plan (LPP). If requested, authorization to recommend the LPP over the NER plan must be granted by the Assistant Secretary of the Army for Civil Works (ASA[CW]). In cases where the cost of the LPP is greater than the NER plan, the non-federal sponsor is typically responsible for paying the difference. In all cases, the LPP must have greater net benefits than smaller scale plans, and enough alternatives must be analyzed during the formulation and evaluation process to insure that net benefits do not maximize at a smaller scale than the sponsor's preferred plan.

5.5.1 Alternative Plan Comparison

Comparison of the alternative plans should consider the beneficial and adverse effects, including both monetary and non-monetary benefits and costs of each plan. Analysis of the differences (or trade-offs) between the plans is required to support selection of a plan for recommendation. The analysis may be conducted using a variety of techniques, such as a ranking index, weighted ranking, effects matrix, or professional judgment. In the case of this project, professional judgment was used to identify the trade-offs and rank the alternatives, based on the results of the evaluation process.

As described throughout Section 5, the planning objectives and constraints are quite focused such that after screening, the differences in the final array of alternative plans were generally limited to excavation depth and the extent to which a groundwater pump would be used to supplement hydrologic wetland function and contribute to site management. Of the three alternative plans in the final array, two were identified as best buys. Alternative 4 was not found to be a "best buy;" this plan is based on excavation as needed to achieve the target water depth in summer, resulting in a lesser extent of area with suitable habitat conditions and thus lower habitat outputs. The lack of a pump also limits site management capabilities, such as those related to maintaining circulation and managing invasive species. However, the cost savings of not having a pump were offset by the increased excavation costs.

TABLE 27
System of Accounts Displaying Effects of Best Buy Plans

		No Action Alternative	Best Buy 1 (Alternative 8A)	Best Buy 2 (Alternative 8B)
PLAN DESCRIPTION				
(1)	Restoration Details	No action: future without project conditions. Site is maintained as a County park.	Alternative 8A: Excavate and grade wetland to achieve maximum suitable water depth based on winter groundwater levels; water levels supplemented with groundwater pump, as needed (for example, during summer conditions); Install outlet to adjacent ditch; Plant wetland vegetation; Construct predator fence	Alternative 8A: Excavate and grade wetland to accommodate maximum suitable water depth with groundwater pump as primary water source; install liner to increase retention of pumped water; Install outlet to adjacent ditch; Plant wetland vegetation; Construct predator fence
IMPACT ASSESSMENT				
A.	**National Ecosystem Restoration (NER)**			
(1)	Total Project Cost (Fully Funded)	$0	$10,134,000	$11,777,000
(2)	Estimated Average Annual Cost (50 years)	$0	$410,401	$482,217
(3)	Average Annual Habitat Units (Future With-Project Condition)	0	5.729	5.911
(4)	Net Average Annual Habitat Units (from Future Without-Project Condition)	0	5.729	5.911
(5)	Incremental Cost per Habitat Unit	N/A	$71,636	$394,593
B.	**Environmental Quality (EQ)**			
(1)	Hydrologic Resources and Water Quality	Positive groundwater outflow to ocean expected to continue. Groundwater salinity expected to increase, with the transition to increasingly brackish water occurring at shallower depths.	Pond and associated wetland features would be re-established using existing groundwater resources; Water quality would be maintained through proper circulation and surface water outlet to adjacent ditch.	Pond and associated wetland features would be re-established using existing groundwater resources; Water quality would be maintained through proper circulation and surface water outlet to adjacent ditch.

TABLE 27
System of Accounts Displaying Effects of Best Buy Plans

		No Action Alternative	Best Buy 1 (Alternative 8A)	Best Buy 2 (Alternative 8B)
(2)	Biological Resources, Including Threatened & Endangered Species	Continued dominance by non-native species typical of disturbed urban environment, with no habitat for endangered Hawaiian waterbirds or migratory species.	Suitable foraging habitat for endangered Hawaiian waterbirds and migratory/ shorebird species would be re-established; site would also support suite of native wetland vegetation species.	Suitable foraging habitat for endangered Hawaiian waterbirds and migratory/ shorebird species would be re-established; site would also support suite of native wetland vegetation species.
(3)	Archaeological and Cultural Resources	Archaeological and cultural resources associated with Loko o Mokuhinia would continue to be buried beneath fill.	Moderate potential for excavation to disturb upper layer of historic pond sediments and associated archaeological features (for example, late historic era artifacts and faunal remains); design includes a 10-meter buffer to avoid potential impacts to archaeological resources associated with Moku`ula; Project provides for re-establishment of Loko o Mokuhinia as a living cultural resource.	Moderate potential for excavation to disturb upper layer of historic pond sediments and associated archaeological features (for example, late historic era artifacts and faunal remains); design includes a 10-meter buffer to avoid potential impacts to archaeological resources associated with Moku`ula; Project provides for re-establishment of Loko o Mokuhinia as a living cultural resource.
(4)	Topography and Soils	No changes to existing on-site topography and soil conditions.	Project would involve the removal of non-native fill material and re-establishment of previous topography; soils would be temporarily disturbed during construction, but potential for erosion would be minimized through implementation of BMPs.	Project would involve the removal of non-native fill material and re-establishment of previous topography; soils would be temporarily disturbed during construction, but potential for erosion would be minimized through implementation of BMPs.
(5)	Noise Quality	Normal noise levels created by traffic, business, residential and tourism-related activities.	Project would result in a temporary increase in noise level during construction period.	Project would result in a temporary increase in noise level during construction period.
(6)	Air Quality	No changes in existing air quality.	Project would result in short-term emissions during construction period.	Project would result in short-term emissions during construction period.
(7)	Aesthetics	No changes in existing aesthetics.	Project would result in short-term impacts to aesthetics during construction, but restoration would improve views of the project site over the long-term.	Project would result in short-term impacts to aesthetics during construction, but restoration would improve views of the project site over the long-term.

TABLE 27
System of Accounts Displaying Effects of Best Buy Plans

		No Action Alternative	Best Buy 1 (Alternative 8A)	Best Buy 2 (Alternative 8B)
C. Regional Economic Development				
(1)	Business and Industry	No changes in local economy.	Project is expected to contribute to local economy by restoring a feature of a national historic landmark.	Project is expected to contribute to local economy by restoring a feature of a national historic landmark.
D. Other Social Effects (OSE)				
(1)	Life, Health and Safety	No changes to life, health and safety.	Site would be fenced, thereby minimizing uncontrolled access to areas of ponded water; Project is not expected to result in a release of contaminants or increased risk of flooding; Positive water circulation would be provided to maintain adequate water quality conditions.	Site would be fenced, thereby minimizing uncontrolled access to areas of ponded water; Project is not expected to result in a release of contaminants or increased risk of flooding; Positive water circulation would be provided to maintain adequate water quality conditions.
(2)	Community Cohesion	No changes in community cohesion.	Implementation would require relocation of Salvation Army facilities to another location; project is expected to provide symbol of unity for native Hawaiian community.	Implementation would require relocation of Salvation Army facilities to another location; project is expected to provide symbol of unity for native Hawaiian community.
(3)	Recreation	No changes in recreation.	Minimal impact to recreation, as County has replaced existing recreational facilities at other parks in region.	Minimal impact to recreation, as County has replaced existing recreational facilities at other parks in region.
Plan Evaluation				
A. Contribution to Planning Objectives				
(1)	Reestablish wetland functions and values associated with Loko o Mokuhinia	Does not meet planning objective.	Would re-establish wetland functions and value associated with Loko o Mokuhinia within project site.	Would re-establish wetland functions and value associated with Loko o Mokuhinia within project site.
(2)	Maximize habitat for the endangered Hawaiian stilt and coot throughout the year	Does not meet planning objective.	Would provide foraging habitat for stilt and coot during through both the winter and summer months.	Would provide foraging habitat for stilt and coot during through both the winter and summer months.
(3)	Provide year-round habitat for migratory waterfowl and shorebird species	Does not meet planning objective.	Would provide year-round habitat for migratory waterfowl and shorebird species.	Would provide year-round habitat for migratory waterfowl and shorebird species.

TABLE 27
System of Accounts Displaying Effects of Best Buy Plans

		No Action Alternative	Best Buy 1 (Alternative 8A)	Best Buy 2 (Alternative 8B)
B. Avoidance of Planning Constraints				
(1)	Avoid creation of a "sink" for endangered species as a result of predation	N/A	Incorporates adequate predator control and long-term O&M activities such that a "sink" is not expected.	Incorporates adequate predator control and long-term O&M activities such that a "sink" is not expected.
(2)	Avoid conflicts with land use restrictions/zoning standards within the historic district	N/A	Consistent with land use designations and standards established for the historic district.	Consistent with land use designations and standards established for the historic district.
(3)	Avoid and/or minimize impacts to extant archaeological features within project site	N/A	Maintains a 10-meter buffer around known archaeological features.	Maintains a 10-meter buffer around known archaeological features.
(4)	Avoid conflicts with protection and use of cultural resources	N/A	Does not conflict with current and future cultural practices identified to date; incorporates specific cultural considerations into design development process.	Does not conflict with current and future cultural practices identified to date; incorporates specific cultural considerations into design development process.
C. Response to Evaluation Criteria				
(1)	Completeness	Does not meet criterion.	Meets criterion: Accounts for all actions required to achieve restoration success.	Meets criterion: Accounts for all actions required to achieve restoration success.
(2)	Effectiveness	Does not meet criterion: Would not contribute any habitat units.	Meets criterion: Would contribute an annual average of 5.729 habitat units.	Meets criterion: Would contribute an annual average of 5.911 habitat units.
(3)	Efficiency	Does not meet criterion.	Meets criterion: Evaluated as a best buy plan.	Meets criterion: Evaluated as a best buy plan.
(4)	Acceptability	Does not meet criterion: Based on stakeholder input received to date, the No Action Alternative is not expected to be acceptable to the community.	Meets criterion: Believed to be technically feasible and is generally supported by the stakeholders, based on input received to date. It is also believed to be compatible with existing laws, regulations and public policies.	Meets criterion: Believed to be technically feasible and is generally supported by the stakeholders, based on input received to date. It is also believed to be compatible with existing laws, regulations and public policies.

The two alternatives identified as best buy plans, Alternatives 8A and 8B, were both found to (1) meet planning objectives and avoid constraints, (2) be consistent with the P&G criteria, and (3) generally have the same effects relative to the EQ, OSE, and RED accounts. The fundamental differences between the two alternatives relate to the NER account, with Alternative 8B contributing slightly higher habitat outputs at a higher total project cost. Alternative 8A is the deeper of the two plans, with excavation depths as needed to achieve the maximum suitable depths in the winter. During the drier months, water depths would be slightly shallower, in which case a groundwater pump would be used to supplement water levels. In contrast, Alternative 8B includes excavation only as deep as needed to accommodate the maximum 2-foot water depths. Groundwater would likely contribute to water levels in the wetland during the wetter months, but in general, a groundwater pump would be needed to achieve the target depths through most of the year. Given that the wetland would need to sustain water levels above the groundwater table throughout the year, a liner would be installed to maximize water retention.

Based on the excavation depths, Alternative 8B would provide a slightly greater extent of suitable hydrologic conditions than Alternative 8A, thus providing slightly higher habitat outputs (5.911 versus 5.729 average annual habitat units); however, the total project cost of Alternative 8B would be about $1.5 million higher, primarily due to the need for a wetland liner and additional pump operations. As both alternatives include a groundwater pump, they generally have equal site management capabilities. In short, the trade-offs between Alternative 8A and 8B are based on a slight increase in habitat benefits related to slightly more area of suitable hydrologic conditions (0.2 unit) in exchange for an increased average annual cost of approximately $72,000 associated with installation of a wetland liner and additional O&M costs for the pump; this trade-off is reflected in the results of the incremental cost analysis (as presented in Section 5.4.3).

5.5.2 Selection of Plan for Recommendation

As described above, the trade-offs between the two best buy plans are reflected in the habitat outputs and costs. No other effects were identified through the system of accounts that indicate a significant difference between alternatives. Therefore, in coordination with POD, it was determined that consideration of the costs and habitat units (consistent with the results of the CE/ICA) provides a reasonable basis for plan selection.

To identify the selected plan, the best buy plans were ranked based on a qualitative assessment of the reasonableness of costs. Specifically, this assessment considered the results of the incremental cost analysis to determine whether the additional 0.2 unit of habitat benefits for Alternative 8B are worth the increase in cost. As shown in Table 27, the cost of implementing Alternative 8B rather than Alternative 8A is $394,593 per habitat unit, while the cost of implementing Alternative 8A rather than the No Action Plan is only $71,636 per habitat unit. Given the relatively steep increase in cost for the relatively small amount of additional benefits, Alternative 8A was ranked highest based on reasonableness of costs, and thus was selected for recommendation.

As the non-federal sponsor has not provided any indication that either of the best buy plans is significantly more desirable over another, an LPP was not identified.

6.0 Tentatively Selected Plan (Proposed Action)

Following identification as the tentatively selected plan, Alternative 8A was further developed and refined to allow for additional consideration and evaluation. Consistent with ER 1110-2-1150 and the level of effort determined appropriate by POH, the tentatively selected plan was designed to a 35 percent level of design. Refinements were based on a more detailed analysis of existing data, as well as additional stakeholder input. Wherever possible, as part of an effort to stay within the project cost threshold (based on federal participation limits and cost-sharing percentages), refinements were made to reduce project costs to the extent possible.

In general, the resulting 35 percent design is consistent with the design approach developed for the 10 percent conceptual design, with some relatively minor modifications. The design considerations and resulting refinements relative to each of the restoration measures are discussed in the following sections. The site plan for the 35 percent design is shown in Figure 38, with the complete set of preliminary design drawings contained in Appendix H. Consistent with the requirements of Federal Acquisition Regulation (FAR) and USACE policy, value engineering was conducted as part of the feasibility planning process, as the estimated total project cost exceeds $10 million; recommendations resulting from the value engineering effort have been incorporated into the 35 percent design, as further discussed in this section. In accordance with current VE guidance, another VE study needs to be performed during the final design phase (no later than the 35 percent completion of design). However, since the initial VE during the feasibility phase was based on a 35 percent level of design, a request for a waiver is being considered.

6.1 Refinement of Plan Components

6.1.1 Excavation and Grading

The 35 percent design reflects same approach for excavation and grading that was developed for the conceptual design; that is, the depth of excavation is intended to achieve the maximum suitable water depth of 2 feet based on average groundwater levels in winter. While maintaining the same upper edge and bottom elevation of the wetland, the design was refined to further extend the shallow slopes in the eastern portion of the project site. This refinement was intended to provide additional pockets of stilt foraging habitat, with the added benefit of reducing excavation quantities (and associated costs).

Based on design bottom elevation of 1.45 feet, excavation depths are expected to generally range from 3.5 to 4.5 feet across the site. As described in Section 3.2.9, previous soil borings indicate that the upper extent of the historic pond sediments generally occur at a depth of 3.1 to 5.2 feet bgs. This suggests that the excavation depths will be within the approximate range of the historic pond sediments, which is consistent with the stakeholder input requesting that the restored wetland follow the natural contour of the land below the fill. As the exact contour of the fill is not known, it is anticipated that the historic pond sediments may be intercepted during excavation in some areas. Therefore, at depths below 2 feet, excavation will be conducted in 6-inch lifts, using equipment mounted with a geographic positioning system (GPS) to allow for careful removal and inspection. As further discussed in Section 7.6, this work will be monitored by an archaeologist, such that if historic pond sediments are encountered, they may be inspected for archaeological resources.

It is estimated that a total of approximately 34,500 cubic yards of material will be excavated and will be primarily comprised of the imported material that was originally used to fill the site and establish the ballpark fields. Based on previous investigations of the site, this material is expected to generally consist of layers of coral rubble and mixed soil (Kleiger, 1998). As discussed in Section 3.2.9, the site previously investigated for the presence of HTRW, the results of which indicate that contaminants are unlikely to

occur; however, to mitigate the possibility of uncovering hazardous or toxic materials during excavation, a sampling plan will be developed and implemented as part of construction. During excavation, dewatering will be conducted onsite as needed, in accordance with a dewatering plan that will be developed specifically for the project. At this stage of project development, it is assumed that the dewatered material will be hauled offsite and disposed at the County of Maui's Construction and Demolition Landfill, located in Kīhei (approximately 20 miles southeast of the project site). Opportunities for reuse of the excavated material may be explored as part of the next phase of the project.

Following excavation, fine grading will be conducted as needed to achieve the desired side slopes and add microtopographic features (for example, "undulation" of the wetland edge, slopes, and bottom); this microtopography will be identified as part of the final design and will serve to increase habitat variability within the range of suitable water depths. In addition, grading will be conducted to construct the maintenance path, as well as to provide for placement of buried pipes associated with the pump and outlet. It is anticipated that the lower depths of excavation, as well as fine grading, will require dewatering during construction; it is assumed that all dewatering activities would occur within the project site and/or staging area.

For the conceptual site plan, a revetment was included around the perimeter of Moku`ula, as a mechanism for discouraging bird use on the island (in order to minimize potential conflicts associated with future cultural uses of the island). In the interest of reducing total project cost, this feature was eliminated in the 35 percent design and replaced with a 3:1 slope with continuous planting of rushes and sedges. This modification was made in coordination with USFWS, who concurred with the revised design approach.

6.1.2 Groundwater Well and Pump

For development of the conceptual design, it was determined in coordination with Friends of Moku`ula that the groundwater well could be installed somewhere within the adjacent reserved area, as this equipment is considered to be compatible with the potential uses of the site, and this arrangement would allow for the extent of the wetland to be maximized. This approach was maintained for the 35 percent design, with additional consideration given to siting the well. Based on input provided by Friends of Moku`ula, it was determined that well installation could be accommodated either along the eastern edge of the adjacent reserved area (near the boundary with Waiola Church) or along the western edge (near the boundary with the wetland). In general, it would be preferable to site the well at a distance from the wetland to reduce the potential hydraulic connection between the wetland and the well. However, based on stakeholder input regarding potential human burials near Waiola Church, the well was located in the western portion of the adjacent reserved area for the purposes of the 35 percent design effort. To the extent that additional information is obtained regarding archaeological resources in this area, the groundwater well location may be refined during the final design phase.

As discussed in Section 3.4, generic assumptions about aquifer transmissivity and hydraulic conductivity were used for the hydrogeologic assessment (Oceanit, 2009). As site-specific data are not available, conservative assumptions were applied for the well and pump design; refinements to the design will be conducted in the next phase based on the results of aquifer pump tests. At this stage, the design assumes a maximum well depth of up to 150 feet. Based on the well depth and potential range of infiltration rates, the design assumes a 5-horsepower (HP) submersible pump (Grundfos 85S50-4 with MS4000 motor) and a flowrate up to 100 gpm.

For the purposes of the conceptual design, it was previously assumed that solar power would be used for the groundwater pump. However, based on subsequent discussions with pump manufacturers regarding the potential power requirements, solar power is not expected to be a viable option for this project. Specifically, the power draw would require a substantial number of solar panels (and associated battery

FIGURE 38
Preliminary Site Plan for Tentatively Selected Plan

SITE PLAN

NOTES:
1. THE PROJECT WILL INCLUDE A PERMANENT FENCE AROUND THE PERIMETER OF THE PROJECT AREA, AS NEEDED TO PROVIDE PREDATOR CONTROL. THE SPECIFIC DESIGN OF THE FENCE WILL BE DETERMINED DURING FINAL DESIGN PHASE, WITH CONSIDERATION GIVEN TO THE DESIGN STANDARDS FOR THE LAHAINA HISTORIC DISTRICT.
2. THE LOCATION OF THE GROUNDWATER WELL AND PUMP IS CONCEPTUAL, AND WILL BE REFINED IN THE FINAL DESIGN PHASE, IN COORDINATION WITH THE DESIGN EFFORT FOR THE FRIENDS OF MOKUULA SUPPORT FACILITIES.
3. THE SPECIFIC LOCATION OF COUNTY OF MAUI UTILITY LINES LOCATED WITHIN THE FRONT STREET RIGHT-OF-WAY (ROW) WILL BE DETERMINED AS PART OF THE NEXT PHASE: THE LOCATION OF THESE UTILITIES AND ANY ASSOCIATED SETBACK WILL BE REFLECTED IN THE FINAL DESIGN.
4. ALL UNITS ARE IN FEET.

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DATE: 04/12/2013
DWN BY: GFB
CKD BY: LSK
SOLICITATION NO.: TASK NO.: 005
SUBMITTED BY: L. KETTLEY
CONTRACT NO.: W912BA-08-3-A07
PLOT SCALE: AS NOTED
PLOT DATE: 04/12/2013
FILE NUMBER: MMR-MA-003
SIZE: ANSI D
FILE NAME: C-01.dgn

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

SITE PLAN

SHEET IDENTIFICATION
C-01
SHEET 3 OF 10

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storage), and the constraints of the project site and the surrounding areas do not include adequate space to accommodate this equipment. As such, the 35 percent design assumes use of electrical power, with a tie-in to the existing onsite electrical lines. Other refinements to the 35 percent design include the use of PVC (Schedule 80) for the well casing (rather than stainless steel), based on the recommendations of the value engineering review. The suitability of this material will be confirmed in the final design phase, based on the results of the aquifer pump test and final design components.

6.1.3 Outlet

As determined through the screening process, an outlet is a necessary feature to maintain wetland function, with the adjacent ditch identified as the most viable option for an outlet. Further analysis of the outlet requirements, subsequent to the conceptual design effort, indicated that weir-boards would be an appropriate outlet structure for the site. The weir-boards would be installed as part of a drop-box structure, with an integrated trash catchment system; the size of the weir boards would be determined during the final design effort. Based on stakeholder input, it was also determined that the outlet to the adjacent ditch should be located toward the northeastern corner of the project site, to maximize the distance from the lower portions of the ditch which have been known to clog with sand.

As previously described in Section 3.2.4, the County of Maui identified the need to upgrade the existing ditch to a double-box (10-foot-by-4-foot) culvert to address existing drainage issues. Completion of ditch upgrades to ensure proper drainage will be identified as a requirement of the Project Participation Agreement (PPA) that will be signed with the County of Maui before construction; however, at the current time, design information has not yet been developed for the ditch upgrades. Furthermore, detailed topography is not available for the ditch. As such, for the purposes of the 35 percent design, it is assumed that the ditch upgrades will be at an appropriate elevation and provide adequate capacity to accommodate the wetland outlet. Details regarding the ditch upgrades will be coordinated and integrated with the project requirements, with any necessary adjustments in the outlet design, as part of the next phase of the project. Final alignment of the outlet will be determined as part of this effort, with consideration given to minimizing the overall length of pipe and optimizing the configuration, to the extent possible.

6.1.4 Vegetation

As part of the 35 percent design, a planting plan was developed which defines specific planting zones for different portions of the project site; each zone is comprised of a unique set of species, as determined based on habitat preferences (for example, water requirements). The list of species included in the planting plan was developed based on input from USFWS and other project stakeholders, with analysis and refinement based on the specific site conditions. The planting zones, and the species in each, are summarized in Table 28.

Vegetation will generally be planted as plugs, either from stock from existing wetlands or from reputable nurseries known to have a healthy source of local plant material. In general, the minimum spacing will be 2 or 3 feet on center to allow for healthy root development, plant growth, and infilling. Plantings will be clustered to form both loose and tight growth patterns to promote the development of diverse edge habitats most useful to native waterbirds. The revegetation effort includes use of temporary, above-ground irrigation system to facilitate establishment of vegetation.

TABLE 28
Vegetation Species Included in Planting Plan for 35% Design

Common Name	Scientific Name	Total Number	Size	Average Spacing
Zone A (Top of Slope)				
ahuawa	*Cyperus javanicus*	2621	plug	3 feet, on center
ohelo kai	*Lycium sandwicense*	2621	one-gallon	3 feet, on center
Zone B (Edge of Water)				
makaloa	*Cyperus laevigatus*	3062	plug	2 feet, on center
Zone C (Shallow Water / Gradual Slopes)				
ae'ae	*Bacopa monnieri*	2139	plug	2 feet, on center
akulikuli	*Sesuvium portulacastrum*	2139	plug	2 feet, on center
akiaki	*Sporobolus virginicus*	2139	plug	2 feet, on center
Zone D (Shallow Water / Steeper Slopes)				
kaluha	*Bolboschoenus maritimus*	5182	plug	2 feet, on center
Zone E (Perimeter of Moku`ula)				
kaluha	*Bolboschoenus maritimus*	452	plug	3 feet, on center
makaloa	*Cyperus laevigatus*	452	plug	3 feet, on center

6.1.5 Perimeter Fence

Similar to the approach taken for the conceptual design, the perimeter fence would be installed around the entire site, including the entrance to Moku`ula, as determined through discussions with the County of Maui and the Friends of Moku`ula. It is expected that the appropriate level of access to Moku`ula would be established in coordination with the native Hawaiian community as part of the final design phase, as efforts to restore Moku`ula progress. In any case, the fence would not restrict the desired level of access to the island or wetland. At a minimum, the fence would be a basic enclosure around the perimeter of the project site, as needed to limit human disturbance and keep out larger predators (primarily dogs, but also to deter cats). The specific design details for the fence will be determined during the final design phase in coordination with the County of Maui and USFWS, with the intent of balancing the predator control requirements and the Lāhainā design standards. Specifically, structures built within the Lāhainā Historic District should reflect the design concepts referred to in the Architectural Style Book for Lahaina (County of Maui Historic Commission, 1969), which provides guidance for matching site adornments to the era of construction.[42]

6.1.6 Performance Monitoring

As described in Section 5.4.2.1, performance monitoring is a required component of all USACE ecosystem restoration projects; performance monitoring should focus on the systematic collection and analysis of data that provide information useful for assessing project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain project benefits.

[42] As further described in Section 6.3, design elements that are required beyond the federal standards for the project design may be considered betterments (and thus, any incremental increase in cost would be the responsibility of the County).

Based on the requirements of *Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration* (dated August 2009), a preliminary monitoring plan was developed for the project based on the 35 percent design.

In general, the proposed monitoring plan is consistent with the approach outlined for the conceptual alternatives, as described in Section 5.4.2.1. However, additional detail about the proposed monitoring requirements is presented in the plan. In particular, the plan presents the process and results relative to the development of the following information: (1) design parameter to be monitored, (2) performance criteria, and (3) monitoring techniques. The resulting monitoring requirements are summarized in Table 29. Additional detail is presented in the Preliminary Monitoring and Adaptive Management Plan, which is contained in Appendix I.

As described in Section 5.4.2.1, based technical input from USFWS (incorporating lessons learned from restoration of other similar wetland habitat types in Hawai`i) and as allowed under the USACE guidance, it is assumed that monitoring would be conducted over a 10-year period, which would start upon the completion of construction. Within the 10-year monitoring period, a total of five monitoring events would occur. Based on the current design, it is assumed that monitoring would be conducted in in Years 1, 3, 5, 7 and 10; the exact timing and specific frequency of monitoring will be determined in the final design phase.

As detailed in the Preliminary Monitoring and Adaptive Management Plan (Appendix I), the cost of the proposed monitoring effort is estimated to be approximately $50,000. Consistent with the requirements of WRDA of 2007, this cost is included as part of the total project costs, which are typically cost-shared, with 65 percent of the costs paid by USACE and the other 35 percent paid by the non-federal sponsor; specific cost-share requirements for this project are described in Section 10.3.

6.1.6.1 Adaptive Management

As described in Section 4.4.2.3, the adaptive management measures that were identified based on the conceptual designs include modifications to the following: (1) the timing and/or amount of groundwater pumping, (2) management of the surface water outlet, (3) vegetation management efforts, and (4) the placement and/or timing of predator trapping efforts. To further evaluate the adaptive management measures that may be required for the tentatively selected plan, the potential risk and uncertainty relative to achieving the performance standards was assessed for each of the monitoring parameters. For each, potential adaptive management measures were identified. Specific measures that were considered included changes to project features or structures, operations, and/or management. As part of the assessment, the extent to which these adaptive management measures could address the potential deficiencies was considered.

In general, the results of this assessment are consistent with the adaptive management approach outlined in Section 5.4.2.1. Specifically, the key parameters that carry some degree of risk in achieving the performance standards are those related to hydrologic regime, circulation, vegetation and predation. However, the project will include an O&M program, with activities specifically addressing management of these parameters, and it is expected that potential adaptive management requirements can be reasonably addressed through modifications to the O&M program, such that no major physical changes will be required.

Specific measures that were identified as part of the adaptive management approach are listed in Table 29; these include the following:

- Modifications to wetland hydrology could be achieved through refined pumping regime (for example, changes in duration or frequency of pumping).

- Changes to vegetation species composition and/or cover could be achieved through modifications to the vegetation management effort (for example, increased weeding, transplanting, and propagation).
- Improved circulation could be achieved through modifications to pumping regime (for example, changes in the frequency and/or duration of pumping) and/or through modifications to management of outlet (for example, timing of opening/closing outlet).
- Increased predator control could be achieved through modifications to trapping program (for example, increased number of traps, different type of traps, more frequent inspection, or modified trap placement).

In general, it is anticipated that these modifications would fall within the range of activities established for the O&M program; however, there would likely be some costs associated with the higher level of effort. Therefore, based on the assessed risk level associated with achieving the performance standards, the costs for adaptive management were estimated to be approximately 20 percent of the O&M cost. If the results of the monitoring program supports the need for physical modifications to the project, the cost of the changes under the adaptive management plan would typically be cost-shared and concurred with by the non-federal sponsor; specific cost-share requirements for this project are described in Section 10.3.

6.1.7 Operations and Maintenance

As described in Section 5.4.2.8, O&M activities will be needed to maintain habitat quality and functionality over time, particularly as related to habitat for the Hawaiian stilt and coot. In general, the O&M requirements for the tentatively selected plan are expected to be comprised of the same activities and levels of effort as those described for the conceptual design development. These activities are consistent with the management actions recommended in the Recovery Plan for Hawaiian Waterbirds (USFWS, 2011a), as well as ongoing O&M activities conducted for other similar wetlands, based on input provided by USFWS, and include the following:[43]

- General site management including trash removal, fence inspection, and similar
- Water level inspection and monitoring
- Groundwater pump operations and maintenance
- Vegetation management
- Predator control including monitoring, trapping and trap replacement

The only substantial modification that was made for the 35 percent design level relates to the use of electricity to operate the groundwater pump, as opposed to solar panels (as assumed for the conceptual design). Although the level of effort required to operate and maintain the pump is not expected to be significantly different, there would be additional O&M costs incurred for running the electricity; these are estimated to be approximately $6,800 per year. This modification is reflected in the 35 percent design documents and the refined cost estimates for the tentatively selected plan, as further discussed in Section 5.2.[44]

[43] As noted in Section 4.4.2.8, the need for maintenance dredging of sediment was considered as part of the O&M activities. However, there are not expected to be any directed inputs of stormwater runoff from areas outside of the Moku`ula/Mokuhinia site. As such, the site is not expected to accumulate sediment at a rate that would require dredging over the project period.

[44] As the groundwater pump was one of the differing elements between the alternative plans in the final array, it is recognized that the switch from solar power to electrical power would affect the screening-level costs (particularly those associated with O&M), and therefore, could potentially have a bearing on the evaluation and selection process. To verify that the costs associated with these design refinements would not affect the outcome of the evaluation and selection process, the CE/ICA was re-run to provide a sensitivity analysis using costs based on electrical requirements during O&M; the results of this analysis were commensurate with those described in Section 4.4.3, such that the selection of Alternative 8A as the recommended plan is still considered a valid outcome.

TABLE 29
Performance Standards and Monitoring Requirements

Objective	Parameter[a]	Performance Criteria	Monitoring Approach	Considerations for Adaptive Management
Re-establish wetland functions and values associated with Loko o Mokuhinia	Extent of Wetland Function	Establishment of approximately 6.0 acres of wetland habitat that meets (or is on track to meet) the vegetative, hydrologic, and soils criteria indicative of basic wetland function	Identification of extent of wetland function across site using standard assessment methods for vegetative, hydrologic and soils criteria	See below; it is assumed that parameters needed to establish wetland functions are reflected in the habitat parameters for stilt and coot (particularly those related to hydrology, soils and vegetation)
Maximize foraging habitat throughout the year for the endangered Hawaiian stilt and coot	Topography	None – appropriateness of topography to be determined through construction oversight and based on documentation for as-builts	N/A	Assumes no modifications relative to topography, as design targets are based on species' habitat requirements and the appropriateness of topography will be determined through construction oversight and as-built documentation.
	Substrate	None – appropriateness of substrate determined based on documentation of naturally-occurring pond sediments within project site and evidence of relict hydric soils during previous delineation	N/A	Assumes no modifications to soils, as naturally-occurring pond sediments are known to still exist onsite within the approximate range of excavation; evidence of relict hydric soils was found during wetland delineation.
	Flooding Regime and Water Depth	Maintain average water depths between 0 to 2 feet over 80 percent of the year	Quantitative analysis of water level records collected as part of routine O&M activities	If needed, modifications to flooding regime and water depth could be achieved through refined pumping regime; modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort.
		Maintain hydrologic regime that reflects seasonal and ephemeral inundation and evaporation patterns	Qualitative analysis of water level records collected as part of routine O&M activities, with comparison to available data from other managed wetland sites (for example, Kealia and/or Kanaha Ponds)	
	Water Quality	None – salinity levels identified onsite during groundwater assessment indicated conditions that are well within range tolerated by species; based on monitoring at Kanaha Pond, salinity is not found to be a limiting factor for habitat use	N/A	Assumes no modifications to salinity, as species are known to tolerate a range of salinities (stilt have been found to preferentially utilize hyper-saline habitat at Kanaha Pond).
	Circulation	Indicators of adequate circulation are achieve at least 80 percent of the time; indicators include evidence of flowing water, with no pockets of stagnant water in designated observation locations	Visual inspection	If needed, improved circulation could be achieved through modifications to pumping regime (for example, changes in the frequency and/or duration) and management of outlet; modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort.
	Plant Species Composition	At least 75 percent of dominant species are on target species list; list of dominant species does not include any species recognized as invasive	Tie to target species list Percent cover of invasive species	If needed, changes in plant species composition and/or vegetation cover could be achieved through modifications to vegetation management (for example, increased weeding, transplanting, propagation, etc.); modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort.
	Vegetation Cover (wetland slopes)	Maintain average cover of <60 percent on wetland slopes	Quadrant sampling along established monitoring transects	
	Vegetation Cover (emergent zone)	Maintain average cover of 40 to 60 percent in emergent zone	Quadrant sampling	
	Protection from Predation	Evidence that predator control program is adequately responding to predation threats	Routine monitoring for tracks and other predator signs	If needed, increased protection from predation could be achieved through modifications to trapping program (for example, increased number of traps, more frequent inspection, modified trap placement, etc.); modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort
Provide habitat for migratory waterfowl and shorebird species	Various	Captured as part of performance standards for stilt and coot (see above)	N/A	N/A

NOTES:

[a] The monitoring plan does not specifically address the biological characteristics of the site, as they may be widely affected by external factors that cannot be controlled as part of the project. However, anecdotal information would be recorded as part of the overall monitoring effort (for example, a log documenting observations of Hawaiian stilts and coots), such that it may be considered in the decision-making process.

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Consistent with USACE requirements for CAP-authorized projects, the County would be responsible for the long-term O&M efforts for the project. This requirement has been discussed with the County and they have expressed their commitment to conducting the required O&M activities. A detailed O&M manual will be developed by the USACE as part of the final design effort.

6.2 Refined Cost Estimates

Based on the design concepts presented above, a refined cost estimate was developed for the tentatively selected plan. The costs were developed as bottom rolled-up type estimates at the 35 percent design level, using an effective price level date of October 1, 2014 (escalated to program year 2015). The refined costs are generally based on the same assumptions as those presented for the conceptual designs, with modifications to features and quantities, based on the refinements described in Section 6.1. Additional considerations that are reflected in the refined costs estimated include:

- The costs for the tentatively selected plan are based on a refined construction schedule, which generally assumes construction would require approximately 14 months to complete, with work commencing in February 2017.
- In addition to those items listed in Section 5.4.2, the PED phase includes costs for the aquifer pump test, continued regulatory requirements (for example, ESA Section 7 compliance), and archaeological monitoring.
- Contingencies were refined based on the 35 percent level of design and updates to the ACSRA. The contingency amounts reflected in the cost estimate for the tentatively selected plan include: 16.4 percent for the habitat facilities, 20.6 percent for the PED phase, and 17.6 percent for construction management.

The refined cost estimate for the tentatively selected plan is summarized in Table 30; this estimate includes a spent cost of $1,510,000 for completion of the feasibility study. A breakdown of the cost estimate, assumptions used in the development of the costs, and the ACSRA is provided in the Cost Appendix (Appendix E).

TABLE 30
Refined Cost Estimate for the Tentatively Selected Plan

	Estimated Cost (EPL October 2012)[1]	Project First Cost (EPL October 2014)[1]	Total Project Cost (Fully Funded)[1]
Tentatively Selected Plan	$9,064,000	$9,443,000	$11,465,000

NOTES:
EPL = Effective Price Level
[1] A definition of Estimated Cost, Project First Cost, and Total Project Cost is provided in Table 20.

In comparison to the screening level costs (as presented in Section 5.4.2), the cost estimate for the tentatively selected plan increased slightly, which is generally a reflection of a more detailed analysis of the cost requirements based on the refined design. More importantly, the cost estimate exceeds the total project cost threshold for this project, as determined based on the federal participation limits and cost-share percentages. Specifically, as described in Section 5.4.2, the federal participation limit for CAP Section 206 projects is $5 million per project; based on the cost-share percentages for this project (65 percent federal, 35 percent non-federal), the total project cost threshold is approximately $7.6 million. To allow the project to proceed such that the federal participation limit is not exceeded, it is anticipated that the non-federal sponsor will pay the costs that would normally be part of the federal cost share beyond this threshold. As noted in Section 5.4.2, the County of Maui has expressed their willingness to pay

these additional costs. The County of Maui's commitment is currently being formally documented, based upon which a waiver coordinated through HQUSACE and the OASA(CW) will be requested from the MSC Commander, in accordance with USACE regulations (ER 1105-2-100).

6.3 Final Design Considerations

As described throughout Section 6.1, there are several aspects of the restoration design that will require further consideration and/or will otherwise need to be addressed as part of the final design phase. Based on current information, it is not expected that any of these issues will significantly affect the basis of the design, but rather will result in further design refinements.

- **Finalize Project Boundaries**: The current project boundary is based on a 10-meter buffer around the estimated perimeter of Moku`ula (as recommended based on archaeological studies and confirmed through stakeholder input), and the estimated boundary of the area reserved for the Friends of Moku`ula. It is understood that the native Hawaiian community is working to better understand the exact location of Moku`ula, such that the buffer may be reduced. Friends of Moku`ula are also working to finalize their plans for the reserved area. The project boundaries should be confirmed as part of the final design effort, to incorporate any modifications that may result from either of these efforts.
- **Incorporate Results of Aquifer Pump Tests**: Aquifer pump tests will be conducted in the next phase of the project, as needed to validate the estimate of hydraulic conductivity used in the Hydrogeologic Assessment (Oceanit, 2009); this information should be used to refine the design of the groundwater well and pump. If appropriate, the excavation depths may also be refined to reflect any new information relative to groundwater levels.
- **Refine Location of Groundwater Well**: Siting the groundwater well at a distance from the wetland can help to reduce the potential hydraulic connection between the wetland and the well. However, based on concerns about potential burials near Waiola Church, the well is currently sited near the western edge of the area reserved for the Friends of Moku`ula. To the extent that additional information is obtained relative to the presence of burials, it is possible that the well could be relocated within this area as part of the final design effort.
- **Address Lāhainā Historic District Design Guidelines**: As the project is located in the Lāhainā Historic District, the County of Maui will need to ensure that the design complies with the historic district design guidelines (or obtain a waiver); these guidelines are listed in Chapter 2.88.080 of the Maui County Code. In particular, it is expected that the final design for the perimeter fence and pump shelter will need to consider these guidelines. Any design elements that are required beyond the federal standards for the project design would be considered betterments (and thus, any incremental increase in cost would be the responsibility of the County).
- **Coordinate Outlet Design with Ditch Upgrades**: As shown in the 35 percent design, the wetland outlet will tie into the existing ditch along the northern edge of the project site; the County is planning to upgrade this ditch to address existing drainage problems. At the current time, existing topography and design information for the ditch upgrades is not available; the 35 percent design assumes that the ditch upgrades will provide an appropriate elevation and adequate capacity to accommodate the wetland outlet. The final design effort should be closely coordinated with ditch upgrade project, such that the final design reflects the upgraded ditch design.
- **Confirm Location of Public Utilities**: The County of Maui operates public utilities within the Front and Shaw Street rights-of-way. The specific location of these lines will need to be determined and reflected in the final design, with standard BMPs (for example, appropriate setbacks) as needed to protect these lines.

- **Continued ESA Consultation:** Consultation with USFWS is expected to continue through the design phase, as needed to obtain their concurrence with USACE's determination that the proposed project may affect but is not likely to adversely affect listed species that may occur in the restored wetland, in compliance with Section 7 of the ESA. Specifically, it is expected that the USFWS consultation will include review and input to the project design, performance monitoring, and O&M plans for the site.

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7.0 Environmental Effects

Pursuant to NEPA and its implementing regulations (40 CFR Part 1500 through Part 1508), federal agencies are required to undertake an assessment of the environmental effects of their proposed actions before making decisions. Similarly, HRS Chapter 343 and its implementing rules (HAR 11-200) also require environmental review for projects that include certain regulatory triggers; in the case of this project, the County of Maui is required to comply with HRS Chapter 343 given the use of state land, use of county funds, and use within a historic site (as designated in the National Register and Hawai`i Register). The purpose of both NEPA and HRS Chapter 343 is to inform decision-makers and the public of the likely environmental consequences of the proposed action and its alternatives.

Consistent with these regulations, this section identifies the anticipated effects of the final array of alternative plans on environmental and socioeconomic conditions in the project area, as well as the mitigation measures or best management practices (BMPs) that would be implemented to avoid or minimize potential impacts. Relevant resource issues were determined according to federal law and relative impacts to the natural environment or human quality of life. Identified resources were categorized based on their potential environmental impact, using the following terminology:

- A negligible impact is defined as an environmental effect that is so small it would be difficult to measure and is insignificant enough to be disregarded.
- A minor impact is defined as an environmental effect that is measurable, yet is unlikely to adversely affect human health or the environment.
- A moderate impact is an environmental effect that is measurable and may affect human health or the environment.
- A significant impact is measurable and could cause a major impact to human health or the environment.

As previously described in Section 5.3.3, the alternative plans are similar in terms of their general location and layout, extent of ground disturbance, and type of construction activities; the primary differences relate to the depth of excavation, and the extent to which a groundwater pump would be used to supplement wetland function and contribute to site management. As such, the environmental effects of each alternative in the final array are expected to be commensurate with those described for the tentatively selected plan, unless otherwise noted. As required under NEPA, the No Action Alternative (which addresses future without-project conditions) was also evaluated for environmental effects.

Similar to the description of the affected environment, the area of concern for the evaluation of environmental effects is generally limited to the project site, as shown in Figure 3. For some resources, the project-related effects must be considered within the context of the surrounding area. For example, the evaluation of land use, aesthetics, noise, traffic, and socioeconomics includes the surrounding parcels. Potential effects relative to resources that occur across a broader area – climate, geology, and air quality – were considered at a regional scale.

7.1 Climate

7.1.1 No Action

Implementation of the No Action Alternative would not affect climatic conditions. However, various climate change factors could influence conditions at the project site under the future without-project scenario, including increasing air temperatures, decreasing annual rainfall, increasing intensity of

precipitation, and rising sea levels, as described in Section 4.1. These changes could affect onsite conditions, including groundwater availability and water quality (salinity), as further discussed in Section 7.4.

7.1.2 Tentatively Selected Plan

Implementation of the tentatively selected plan would not be expected to have a measurable effect on climate, either during construction or as a result of long-term O&M. A limited amount of greenhouse gas emissions would be associated with construction of the project resulting from the use of heavy equipment. Published EPA data indicate that 22 pounds of carbon dioxide are produced for every gallon of diesel fuel burned, and 19.4 pounds are produced for every gallon of gasoline used (EPA, 2008). However, given the scale of the project, the total amount of emissions resulting from construction would be insignificant at a regional scale, such that the project would be expected to have a negligible impact on the likelihood or extent of climate change.

Over the operational period of the project, the effects of climate change are expected to be increasingly realized at a global scale, and several climate change variables could influence the conditions within the project site. As discussed in Section 4.1, these variables could include increasing air temperatures, decreasing annual rainfall, increasing intensity of precipitation, and rising sea levels. These changes could result in specific changes in onsite conditions, including groundwater availability and water quality (salinity), as further discussed in Section 7.4. The habitat benefits associated with the tentatively selected plan are still expected to accrue in light of these changes, although adaptive management measures may be required as part of long-term O&M; a discussion of the adaptive management approach is provided in Section 6.1.6.1. These same variables and resulting changes in onsite conditions would also apply to Alternatives 4 and 8B; however, as Alternative 4 does not include a groundwater pump, there would likely be a diminished ability to address future changes in groundwater as part of adaptive management.

7.2 Land Use

7.2.1 No Action

Under the No Action Alternative, land use in the area within and surrounding the project site is expected to remain relatively unchanged. In the absence of the project, other portions of the overall site restoration effort (for example, preservation/revitalization of Moku`ula) may be completed by the County of Maui, Friends of Moku`ula, and the native Hawaiian community, but the existing land uses within the project site would be generally maintained.

7.2.2 Tentatively Selected Plan

Implementation of the tentatively selected plan would involve changes to the existing uses of land within the project site. Specifically, current uses associated with Malu`ulu o Lele Park and the Salvation Army outpost would be replaced with the restored aquatic habitat. In addition to providing habitat for endangered waterbirds and other native species, the site would continue to provide opportunities for passive recreation and cultural uses. Potential impacts associated with displacement of the recreational facilities and the Salvation Army are discussed in Sections 7.7 and 7.15, respectively.

Based on discussions with the County of Maui, it is anticipated that the proposed use of the site is consistent with the County zoning designation as a historic district. As discussed in Section 7.6, implementation of the project is not expected to negatively affect the integrity of historic district, but rather is expected to provide long-term benefits through the restoration of conditions that contribute to the defining characteristics of the historic district. It is also consistent with the goals and objectives of the Maui General Plan, which calls for an environmental and cultural restoration project at the site, as further

discussed in Section 8.4.1. Relative to the surrounding areas, implementation of the project would not be expected to negatively affect or result in changes to any of the nearby land uses, including the adjacent residential, religious, or commercial properties. As such, no adverse impacts to land use are anticipated.

7.3 Geology and Soils

7.3.1 No Action

Under the No Action Alternative, no changes would occur relative to geology and soils within the project site.

7.3.2 Tentatively Selected Plan

Implementation of the tentatively selected plan would involve excavation of approximately 36,500 cubic yards of material from the project site, as needed to accommodate the proposed wetland habitat; in contrast, Alternatives 4 and 8B would involve excavation of approximately 39,800 and 28,600 cubic yards, respectively. Based on an analysis of historical documents, the excavated material is expected to be primarily comprised of non-native fill used to cover the site in the early 20th century. Although some of the historical pond sediments may be intercepted during excavation, an analysis of historical profiles of Loko o Mokuhinia indicates that the topography associated with the proposed restoration plan would be generally consistent with the historical site conditions (see Figure 30). As the excavation generally involves removal of fill material on a localized scale, no impacts to geologic features are expected as a result of project construction and operation.

Some sediment erosion could occur during construction as a result of ground disturbance associated with vegetation clearing, excavation, grading, and the use of heavy equipment during construction. However, BMPs will be implemented to control erosion during and after construction, such that the impacts are expected to be minimal. Specific BMPs will be described as part of a Stormwater Pollution Prevention Plan (SWPPP) that will be developed for the project in fulfillment of the State's NPDES stormwater program requirements; these are expected to include sequencing of ground-disturbing activities, installation of silt fencing, and soil stabilization efforts, as further described below in Section 7.4.2.

With implementation of these BMPs, temporary construction-related impacts to soils are expected to be minor. No ground disturbing activities are planned to occur as part of project operations and maintenance of the tentatively selected plan, with the exception of localized efforts such as those associated with vegetation maintenance; as such, no impacts to soils or topography are expected over the long term.

7.4 Hydrology and Water Resources

7.4.1 No Action

No impacts to hydrologic resources are expected to occur as a result of the No Action Alternative. However, as described in Section 4.1, the project site may be influenced by various climate change factors under future without-project conditions, including increasing air temperatures, decreasing annual rainfall, increasing intensity of precipitation, and rising sea levels. An analysis of these factors over a 50-year forecast period suggests that the project site is not likely to be inundated by rising sea levels, but groundwater conditions could be affected. Specifically, future climate factors could result in changes in groundwater availability and quality (salinity). However, as described in Section 4.2, positive groundwater flows to the ocean are still expected.

7.4.2 Tentatively Selected Plan

7.4.2.1 Groundwater

As part of the tentatively selected plan (as well as Alternative 4), excavation is intended to intercept the existing groundwater; temporary impacts to the groundwater during construction would be minimized by timing excavation to occur during the period of the year when groundwater levels are expected to be lowest, with dewatering conducted as necessary. In contrast, Alternative 8B would be excavated above the groundwater table (with a groundwater pump used to provide the wetland hydrology), such that no dewatering would be conducted. Construction equipment used for excavation and other ground-disturbing activities would require the use of hazardous materials, such as oil, grease, or other contaminants, which could also affect groundwater resources. As further described in Section 7.9, only a limited amount of these materials will be present onsite, and construction personnel would follow BMPs to prevent spills or releases of hazardous materials during construction activities; BMPs would include use of proper handling procedures and daily inspection of equipment for leaks. With implementation of these measures, construction-related impacts to groundwater resources are expected to be negligible.

Over the long-term, the restored pond would be hydrologically supported by groundwater, similar to historical site conditions; previous hydrologic studies have indicated that sufficient groundwater exists to support the restored wetland (Oceanit, 2011). For the tentatively selected plan, the groundwater levels are expected to provide the desired water depths through much of the year; a groundwater pump would be used to supplement the water levels as needed to maximize the desired habitat conditions for endangered waterbird species. In contract, Alternative 4 would be excavated deeper such that no groundwater pump would be used; Alternative 8B would be excavated above the groundwater table, with a pump used to provide the wetland hydrology. Although the pumping for the tentatively selected plan (as well as Alternative 8B) would draw from the groundwater table, the water would generally remain within the onsite habitat and would at least partially infiltrate back into the groundwater. For all of the alternatives, a limited amount of water may be lost to increased evapotranspiration and/or via the wetland outlet; however, this is expected to have a negligible impact on groundwater levels.

As previously discussed, the effects of climate change are expected to be increasingly realized at a global scale. Climate change variables, including increasing air temperatures, decreasing annual rainfall, increasing intensity of precipitation, and rising sea levels, may influence groundwater conditions within the project site. As described in Section 4.2, the future availability of groundwater at the project site was estimated, and the results suggest that positive groundwater flows to the ocean will continue into the future. Groundwater quality could be affected by saltwater intrusion, with the transition to increasingly brackish water occurring at shallower depths. Although Hawaiian waterbird species are expected to be vulnerable to changes in salinity, stilts in particular are expected to be tolerant of higher salinity levels, with evidence of them using hypersaline wetland habitat at Kanaha Pond. As such, the habitat benefits associated with the tentatively selected plan are still expected to accrue, although adaptive management measures may be required as part of long-term O&M; a discussion of the adaptive management approach is provided in Section 6.1.6.1. As previously described, these same variables and resulting changes in onsite conditions would also apply to Alternatives 4 and 8B; however, as Alternative 4 does not include a groundwater pump, there would likely be a diminished ability to address changes in groundwater as part of adaptive management.

7.4.2.2 Surface Water

As no surface water features (including wetlands or other Waters of the U.S.) currently exist within the project area, construction of the proposed project is not expected to directly affect any surface hydrologic resources. Over the long term, implementation of the tentatively selected plan is expected to provide a benefit through restoration of coastal wetland habitat within the project site.

As described in Section 4.2, the majority of the site is within a 1-percent-chance floodplain (Zone AE). Historic documents indicate the water within the site previously flowed to the ocean via a drainageway in the southwest corner of the site (under Front Street, toward 505 Front Street). Given the land use and development constraints associated with these surrounding properties, the project does not contemplate restoration of this feature, but rather includes an outlet to the adjacent ditch (which flows directly to the ocean). Ethnographic interviews reference flows from the wetland draining into this ditch, which suggests that the proposed outlet reflects previous drainage patterns. The outlet would function to maintain positive flow and regulate water levels within the wetland, such that the proposed project is not expected to increase flooding hazards within the project site or adjacent properties (for example, 505 Front Street, Kamehameha Iki Park). As wetlands naturally attenuate flood waters, the restored habitat is expected to contribute to floodplain function, thus providing floodplain-related benefits.

Executive Order 11988

Consistent with the requirements of Executive Order 11988 (May 24, 1977), the USACE is required to (1) avoid development in the base (1-percent-chance) floodplain, unless such development is the only practicable alternative; (2) reduce the hazards and risk associated with floods; (3) minimize the effect of floods on human safety, health, and welfare; and (4) restore and preserve the natural and beneficial values of the base floodplain. Procedures for implementing this executive order as part of USACE projects are outlined in ER 1165-2-26 (*Implementation of Executive Order 11988 on Flood Plain Management*; 30 March 1984). These procedures include an eight-step decision-making process to demonstrate compliance. This process and a brief statement relative to the proposed project is described below:

- Step 1 (Determine if proposed action is in the base floodplain [1-percent-chance floodplain]): As described above, the majority of the site is within a 1-percent-chance floodplain (Zone AE).
- Step 2 (Identify and evaluate practicable alternatives): The planning objectives specify the re-establishment of wetland functions and values associated with Loko o Mokuhinia. As Loko o Mokuhinia was historically located in an area that is part of a 1-percent-chance floodplain, there are no practicable alternatives that respond to the planning objectives while avoiding the floodplain.
- Step 3 (Provide public review): Public review and opportunity for input has been provided through the stakeholder involvement program and NEPA process; as further described in Section 1.8, these efforts have included small-group meetings, community briefings, public meetings, and a project website.
- Step 4 (Identify beneficial and adverse impacts): As described above, the tentatively selected plan is not expected to increase the potential for flood-related hazards; nor would it induce development within the floodplain. Short-term environmental impacts associated with ground disturbance are expected during construction; however, over the long-term, the restored habitat is expected to provide floodplain-related benefits, as wetlands naturally function to attenuate flood waters.
- Step 5 (Determine if there are practicable alternatives to actions that induce development): The tentatively selected plan is not expected to induce development within the floodplain.
- Step 6 (Determine viable methods to minimize any adverse impacts): BMPs will be implemented to minimize impacts associated with ground disturbance during construction. Over the long-term, the tentatively selected plan is not expected to adversely affect floodplain function; as such, no mitigation is necessary.
- Step 7 (Advise public of the findings): The public will be notified of the findings as part of the NEPA process. It is anticipated that the NEPA process will conclude with publication of a Final Integrated Feasibility Report and EA, with a FONSI.

- Step 8 (Recommend plan most responsive to planning objectives and is consistent with the requirements of the executive order): As described in Section 5, the tentatively selected plan best responds to the planning objectives, and as documented through this eight-step process, is consistent with Executive Order 11988.

As demonstrated through the eight-step decision-making process, the tentatively selected plan is not expected to result in adverse impacts to the 1-percent-chance floodplain, and as such, is in compliance with Executive Order 11988.

7.4.2.3 Water Quality

Ground disturbance during construction could increase the amount of sediment and other pollutants in stormwater runoff, which could affect water quality in receiving waters. As construction would disturb more than 1 acre of land, it is expected that the project would be regulated under the NPDES stormwater program, which would require the contractor to develop and implement sediment, erosion, and pollution prevention measures as part of a SWPPP to obtain coverage under a NPDES permit. The following specific measures are expected to be included in the SWPPP:

- Construction activities would be sequenced to minimize the exposure time of cleared areas.
- The extent of clearing and grubbing would be minimized, and will include only those areas necessary for grading, site access, and equipment operation.
- To avoid fugitive dust emissions, soil stockpile areas that contain more than 100 cubic yards of material would be covered, or kept continuously wet.
- Disturbed soil that is not subject to re-vegetation, paving, or development would be stabilized using approved soil binders, jute netting, or other methods.
- All trucks hauling dirt, gravel, or other loose materials would be covered.
- Erosion and sediment control measures (for example, silt fences) would be installed before earth moving activities are initiated, and will be inspected and properly maintained throughout the construction period.
- Vegetation and/or other soil stabilizers would be installed as soon as practical after final grading.

Requirements of the NPDES program, including implementation of these BMPs, would be fulfilled as part of project implementation, such that construction-related impacts to water quality are expected to be minor.

As previously described, the tentatively selected plan (as well as Alternatives 4 and 8B) includes the installation of an outlet to the adjacent ditch, which would function to regulate water levels by draining surplus water from the wetland. As the wetland would be contributing flows to the adjacent ditch, the project has the potential to affect water quality in the ditch and its receiving waters (the ocean). However, the site is not expected to receive any directed inputs of stormwater runoff from areas outside of the Moku`ula/Mokuhinia site, such that significant amounts of sediment or other pollutants would be present within the wetland. Furthermore, as part of the natural functions provided by wetland habitat, the site is expected to provide at least some degree of filtration, such that the impacts to water quality in the ditch and receiving water are expected to be minor.

7.5 Biological Resources

7.5.1 No Action

Under the No Action Alternative, no significant changes are expected relative to biological resources within the project site. As described in Section 4.1, climate change factors could result in minor shifts in species composition, but it is expected that the project site would still be characterized by a suite of non-native species that typically occur in disturbed urban environments.

7.5.2 Tentatively Selected Plan

As described in Section 3.2.5, the project site is primarily vegetated with Bermuda grass, with a variety of non-native and Polynesian-introduced species around the perimeter of the park. Wildlife species generally include those that are typical of urbanized areas. As part of construction, the vegetation will be cleared and wildlife species within the project site will be displaced. To the extent possible, mature trees (for example, coconut trees) that occur in areas not affected by excavation (for example, around perimeter of site) will be maintained in place; those that are removed may be considered for relocation by the County, as appropriate. As the vegetation and wildlife species that will be affected during construction are generally comprised of non-native or otherwise common species, construction is not expected to result in adverse effects. Over the long-term, the project would involve planting of native vegetation, which is expected to benefit biological resources.

No special-status species are known to occur within the project site. However, there is a possibility that special-status species could be present during construction or over the lifetime of the project; potential impacts are further described below. No designated critical habitat or other protected habitat occurs within or directly adjacent to the project site. Protected areas that occur in the project vicinity include the West Maui Forest Reserve and the Marine Resource/Watershed Zone in the watershed above Lāhainā town; these areas would not be affected by the project. As such, no impacts to critical habitat or other protected areas are anticipated as a result of project implementation.

7.5.2.1 Special-Status Species

Based on input from the USFWS, it is expected that the only endangered or threatened species that could potentially occur in the project site is the Hawaiian hoary bat. However, as described in Section 3.2.5, species records from the Hawai`i Natural Heritage Program as published in *Hawai`i's Comprehensive Wildlife Conservation Strategy* shows a single record of the Hawaiian hoary bat near Lāhainā, as well as a single record near Olowalu, approximately 6 miles south of Lāhainā; documentation of the species distribution state there is no evidence of a breeding population on Maui (Mitchell et al., 2005). Although it is possible that Hawaiian hoary bats could forage within the project site, it is highly unlikely, given the low probability of species occurrence in the project vicinity, the nature of the available habitat and the degree disturbance within and surrounding the project site. Regardless of the extremely low probability of occurrence, potential impacts to Hawaiian hoary bats would be minimized by restricting removal of any woody vegetation with heights that exceed 15 feet to outside the season when lactating or non-volant bats could be present (June 1 through September 15). With implementation of this measure, the project is not expected to impact the Hawaiian hoary bat.

No other threatened or endangered species are known to potentially exist within or adjacent to the project site. As the site does not currently support any aquatic habitat, construction activities would not affect any of the listed Hawaiian waterbird species. However, potential long-term impacts to Hawaiian waterbird species associated with the wetland restoration are referenced in a letter from the USFWS (dated April 19, 2010); see Appendix B. Specifically, the concern is that predation from non-native predators and increased human interaction could lead to non-productivity because of failed nests

and/or botulism outbreaks could contribute to waterbird mortality. In an effort to address these potential impacts, the project planning and conceptual design development was closely coordinated with USFWS technical staff, resulting in incorporation of the following measures:

- Focus of the restoration plan on suitable foraging habitat for Hawaiian stilt and coot, avoiding conditions that encourage nesting
- Concentration of suitable foraging habitat in those portions of the project site that do not interface with areas that are regularly accessed by the public (for example, away from existing roads and sidewalks)
- Construction of an outlet to increase groundwater exchange and improve circulation, thereby reducing the potential for botulism outbreaks
- Installation of a fence around the entire perimeter of the site to provide predator control
- Inclusion of specific predator management activities, including monitoring and trapping, as part of O&M

Specific O&M activities, including those related to predator management efforts, will be described in a detailed O&M plan; this plan will be developed as part of the final design phase, and will incorporate ongoing input from USFWS.

With implementation of these measures, potential impacts to endangered waterbirds are expected to be avoided and/or minimized, such that implementation of the project would provide a long-term net benefit to the species by increasing the availability of suitable habitat. In particular, the project is expected to contribute to the network of available habitat within the species' range by providing habitat for foraging and resting in an area that was historically used and is still transited by the species as they move between other areas of suitable habitat on Maui and Molokai.

ESA Section 7 Consultation

Pursuant to Section 7 of the ESA, the USACE has been informally consulting with the USFWS regarding potential impacts to threatened and endangered species and designated or proposed critical habitat. Based on this ongoing consultation, and consistent with the summary of impacts and mitigation described above, the USACE evaluated the potential impacts of the proposed project and presented the results in a letter to the USFWS (dated April 11, 2013), requesting concurrence with their determination that the tentatively selected plan may affect but is not likely to adversely affect listed species. As detailed in response letters dated April 25, and June 18, 2013, USFWS stated that the USACE has largely addressed their concerns related to the potential impacts, but explained that informal consultation must continue until detailed site management plans have been finalized (particularly as needed to address predator control, and botulism prevention and management), which is anticipated to occur during the final design phase. The letter specifies that the USFWS anticipates that as the planning process progresses, they will likely be able to agree with the USACE determination that the proposed project may affect but is not likely to adversely affect listed species that are expected to occur in the restored habitat. A copy of the correspondence with USFWS is contained in Appendix B.

7.6 Archaeological, Historic and Cultural Resources

7.6.1 No Action

Under the No Action Alternative, Loko o Mokuhinia would remain in its current condition, with the former pond covered by fill material. Restoration of the aquatic habitat would not occur, such that none of the associated archaeological or historic resources would be affected, but nor would the opportunity for cultural revitalization be realized.

7.6.2 Tentatively Selected Plan

As described in Section 3.2.6, the project site is a component of King Kamehameha III's Royal Residential Complex (National Register No. 97000408 and SIHP 50-50-03-2967), and is part of the Lāhainā Historic District (National Register No. 66000302 and SIHP No. 50-50-03-3001). In addition, the site falls within Historic District No. 1, as designated by the County of Maui. Given the inclusion of the project site in these historic districts, the area of potential effects (APE) for the proposed project has been defined as the entire National Historic Landmark District, which is the most expansive of the designated districts; the boundaries of the district are shown in Figure 19.

Relative to the APE, it is expected that the project could directly affect resources within the boundaries of the project site (that is, portions of Malu`ulu o Lele Park), with potential indirect effects occurring in other portions of the APE (that is, within the larger historic district); these potential effects are described below. In accordance with the requirements of NHPA Section 106, the analysis in this EA considers input obtained from consulting parties, including SHPO and NHOs. Based on the studies conducted to date, the archaeological resources that have been identified within the project site consist of the historic pond sediments of Loko o Mokuhinia, which include a mixed deposit of late historic era artifacts and faunal remains (Klieger, 1995). No human burials have been identified within the boundaries of the project site. The majority of the archaeological features identified by Kleiger (1995) were directly associated with Moku`ula and/or its adjacent holding ponds. These features would be avoided, as the project area does not include any portion of Moku`ula. As survey-grade data are not available for the boundaries of Moku`ula, the project boundary incorporates a 10-meter buffer around the estimated boundary of the island and its associate holding ponds, to further minimize the potential for inadvertent impacts to the features associated with Moku`ula.

Although the exact depth to the historic pond sediments is not known across the entire site, it is expected that excavation would occur in the general depth range of these sediments, such that they may be encountered across portions of the project site during construction. Based on the proposed excavation depths, Alternative 8B has a higher likelihood and Alternative 4 has a lower likelihood of encountering the pond sediments, as compared to the tentatively selected plan. These pond sediments have the potential to contain significant archaeological data on the historic and prehistoric environment surrounding Loko o Mohuhinia and Moku`ula and on subsistence and settlement pattern within the coastal areas of this portion of Lāhainā District and Maui Island. Thus, excavation of the pond sediments has the potential to have an adverse impact to significant archaeological resources. To minimize the potential for adverse impacts to archaeological resources associated with the historic pond sediments, the following measures would be implemented:

- An Archaeological Monitoring Plan (AMP) would be developed and approved by SHPD prior to the start of any ground disturbing activities. The AMP would provide details on how the monitoring shall be performed; identification and collection of cultural layers and materials; collection and analysis of other cultural material such as charcoal samples for radiocarbon dating, bulk midden samples, and artifacts; and performance of standard documentation, including scaled maps, profiles, photographs, detailed soil and provenience descriptions, and interpretation.
- Excavation of soil greater than 2 feet bgs would be conducted in 6-inch increments, using GPS-mounted machinery, to allow for careful removal and inspection of the material.
- A qualified archaeological monitor would be present during all ground-disturbing activities. In the event that the monitor identifies archaeological materials, work in that area would be stopped immediately to allow the monitor to investigate the nature of the discovery. In the event that human remains are identified, SHPD shall be immediately notified and no further work would occur in the

area unless specifically requested by SHPD. Additional details regarding the handling of any archaeological features would be outlined as part of the AMP.

With implementation of the measures described above, none of the alternatives would be expected to adversely impact archaeological resources. It is important to note that the southwest corner of the site (including the areas occupied by the Salvation Army and a portion of the existing parking lot) has not undergone subsurface investigations. It is anticipated that, if present, archaeological resources in these areas would be similar in nature to those that occur in previously investigated portions of the project site. An archaeological investigation of these areas may be conducted before construction, in consultation with SHPD, and treatment of resources of these areas would be consistent with the approach described above, such that no adverse impacts are anticipated.

In addition to the archaeological resources within the project site, a variety of other resources occur within the APE, as part of both King Kamehameha III's Royal Residential Complex and as part of the larger Lāhainā Historic District. Implementation of the tentatively selected plan is not expected to directly affect any of the resources that occur outside of the project site. Construction activities could indirectly affect these resources; indirect impacts could include noise or disruption of views from other portions of the historic district toward or across the site during construction. However, these impacts would be temporary and measures would be implemented to avoid and minimize the impacts to the extent practicable as discussed in Sections 7.8 and 7.11. Over the long-term, project implementation is expected to benefit the overall historic district, through restoration of features that are consistent with the defining characteristics that contribute to the overall significance of the site.

Relative to cultural practices, the results of the CIA indicate that the project site is considered to be a sacred cultural site and continues to be part of the living culture of the native Hawaiian community. A variety of cultural practices historically used areas within and surrounding the site, and although Mokuhinia is currently filled, the site is still actively used by some individuals for cultural practices, including the worship of Kihawahine. It is expected that cultural practices that occur within the project site may be temporarily affected during construction, as access to the site will likely be limited during ground-disturbing activities. However, these impacts would be temporary, and cultural practices may continue in areas adjacent to the site, including Moku`ula. In recognition of the cultural importance of the site, the following measures would be implemented:

- Require that consultants and contractors be briefed on the nature of the site prior to the commencement of work
- Allow for Native Hawaiian cultural protocol to be performed prior to the start and at the end of any ground disturbing activity.

In response to cultural aspects of the site that were identified through the CIA, the proposed project has sought to minimize impacts to these features to the extent possible. Specifically, the restoration design incorporates a maintenance path in the vicinity of the historic path that runs adjacent to Waiola Church, such that the corridor will be maintained and excavation will be limited in this area. In addition, the design accommodates the stone steps near Waiola Church by including a symbolic "canoe corridor" between the vicinity of the steps and Moku`ula. With implementation of these measures, impacts to cultural resources are expected to be minor. Over the long-term, the proposed project is expected to have a beneficial impact on cultural practices through restoration of features that relate to cultural use of the site. Although some individuals feel the site is better left filled, the majority of the individuals consulted for the CIA voiced support for the proposed project and their belief that the restoration will be beneficial to Hawaiian cultural practices and cultural awareness. In particular, it was noted that restoration of Mokuhinia would provide modern day Hawaiians with a tangible connection to a place that was historically important to ancient Hawaiian history and politics.

SHPD Section 106 Consultation

In compliance with NHPA Section 106, consultation with the SHPO was initiated in a letter dated February 22, 2010. Ongoing consultation was conducted with SHPO, as well as other Section 106 consulting parties over the course of the planning process. Based on this ongoing consultation, and consistent with the summary of impacts and mitigation described above, the USACE determined that the project would result in no adverse effects to historic properties. This determination, with a request for concurrence, was provided to the SHPO in a letter dated July 1, 2013. No response has been received to date; a summary of the SHPO's response will be provided in the Final Integrated Feasibility Report and EA. A copy of the correspondence with SHPD is contained in Appendix J.

7.7 Recreation

7.7.1 No Action

The existing recreational facilities and opportunities related to the project site are not expected to be affected as a result of the No Action Alternative.

7.7.2 Tentatively Selected Plan

As described in Section 3.2.7, the project would be implemented within the existing Malu`ulu o Lele Park, which is managed by the County of Maui; implementation of the project would result in a change in the character of the park from active recreation to more passive uses (for example, wildlife watching, educational interpretation, and similar). The primary recreational uses of the park currently include basketball, baseball/softball, tennis, and occasionally gateball. In anticipation of this project, the County has been working to address the future displacement of these activities through the following efforts:

- Basketball: the County recently resurfaced and provided lighting at the basketball courts at the Lāhainā Aquatic Center (approximately 0.25 mile east of Malu`ulu o Lele Park).
- Baseball/Softball: Four new baseball fields were recently constructed at the Lāhainā Aquatic Center by Kā`anapali Land Management Corporation; these fields were dedicated to the County of Maui.
- Tennis: Recognizing the need for a minimum number of courts to hold tournaments (based on input provided by the Maui District Tennis Association), the County recently added three new courts (with lighting) to the existing courts near the Lāhainā Civic Center, approximately 2.5 miles north of Malu`ulu o Lele Park.
- Gateball: The new fields at the Lāhainā Aquatic Center, provided by Ka`anapali Land Management Corporation and dedicated to the County of Maui, accommodate gateball players.

As these efforts are expected to result in similar or improved recreational facilities within a short distance of the project site, displacement of the recreational facilities at Malu`ulu o Lele Park is expected to result in a minor impact. Relative to recreational opportunities associated with the guided tours through the historic district, the restored wetland is expected to serve as an added attraction, thus providing a long-term benefit.

7.8 Visual and Scenic Resources

7.8.1 No Action

No changes to the visual and scenic resources are expected to occur in the project vicinity as a result of the No Action Alternative.

7.8.2 Tentatively Selected Plan

Construction of the proposed project would be expected to temporarily impact views toward and across the project site. Visible features associated with construction would include construction equipment, exposed soils, and staged materials. However, visual impacts associated with these activities are expected to be minor and temporary in nature.

Over the long-term, implementation of the proposed project is expected to positively affect aesthetics in the project vicinity. Although the site currently provides views of open space associated with Malu`ulu o Lele Park, the project would restore the site to a state that is expected to be similar to historical conditions, which is generally expected to be more aesthetically pleasing. In particular, restoration of aquatic habitat (including native vegetation) will enhance views of the project site. The project is not expected to restrict any existing view planes, including those east toward the West Maui Mountains (for example, from Kamehameha Iki Park), west toward the Pacific Ocean (particularly those views from Waiola Church), and/or along Front and Shaw Streets.

The resulting changes are expected to be consistent with the visual character of the historic district. As noted in Section 6.3, the specific guidelines established for the historic district (as contained in Section 19.52 of the Maui County Code) will be considered during development of the final restoration design to maximize consistency with the desired aesthetics of the historic district.

7.9 Hazardous, Toxic, and Radioactive Waste

7.9.1 No Action

No changes to HTRW are expected to occur in the project vicinity as a result of the No Action Alternative.

7.9.2 Tentatively Selected Plan

As described in Section 3.2.9, a series of assessments were conducted to investigate the potential for HTRW on or near the site. Although the preliminary HTRW assessment and associated soil sampling indicated potentially elevated levels of arsenic within the project site, the subsequent site investigation suggested that the arsenic levels are within the published range of background concentrations for soil arsenic in Hawai`i, and no further investigation was warranted (Oceanit, 2011). Given the results of these previous studies, implementation of the tentatively selected plan is not expected to uncover or otherwise expose any HTRW materials within the project site. Construction would require the use of some hazardous materials, including fuels (for example, gasoline and diesel fuel) and lubricants. However, only a limited amount of these materials will be present onsite, and construction personnel would follow BMPs, including use of proper handling procedures and daily inspection of equipment for leaks, as needed to prevent spills or releases of hazardous materials during construction activities. With implementation of these measures, no HTRW-related impacts are expected to occur.

7.10 Air Quality

7.10.1 No Action

Implementation of the No Action Alternative would not be expected to result in any changes in air quality.

7.10.2 Tentatively Selected Plan

Construction of the tentatively selected plan would involve ground disturbing activities, including demolition, site preparation, excavation, and grading. Use of heavy equipment and earthmoving operations conducted as part of these activities would generate temporary fugitive dust and internal combustion engine emissions, resulting in temporary impacts on local air quality. Potential air pollutants

associated with these emissions include hydrocarbons (HC); carbon monoxide; nitrogen, carbon, and sulfur dioxide; and PM_{10} and $PM_{2.5}$. In general, these emissions would be temporary, intermittent, and localized in nature. In comparison to overall emissions in the region, these contributions are relatively small and would not be expected to affect attainment of the federal or state ambient air quality standards. Furthermore, construction would be conducted in compliance with HAR Title 11 Chapter 60.1 (Air Pollution Control), which specifies that the best practical operation or treatment be implemented such that there is not discharge of visible fugitive dust beyond the property lot line. To comply with these requirements and to minimize any other adverse effects of air quality, the following BMPs would be implemented during construction:

- All construction equipment would be maintained in proper tune according to manufacturer's specifications.
- To the extent feasible, construction would use diesel construction equipment that meets current certification standards.
- The extent of ground disturbance will be minimized where possible.
- Water trucks will be used to minimize the amount of airborne dust associated with the site.
- Dirt stockpile areas containing more than 100 cubic yards (76.5 cubic meters) of material will be kept covered or continuously wet.
- Vehicle speed for all construction vehicles moving on any unpaved surface at the construction site will be limited to 15 miles per hour or less.
- All trucks hauling dirt, sand, soil, or other loose materials will be covered.

Because emissions during construction would be temporary and would be minimized through implementation of the BMPs listed above, construction of the tentatively selected plan is expected to have a minor impact on air quality.

Over the long-term, operation of the project would result in minimal emissions from use of vehicles for monitoring and O&M activities. These emission levels are very low, and similar to those associated with construction, would be expected to have a negligible impact on air quality.

7.11 Noise

7.11.1 No Action

No changes in ambient noise levels would occur as a result of the No Action Alternative.

7.11.2 Tentatively Selected Plan

Construction of the tentatively selected plan would require operation of heavy equipment for various activities, including demolition, site preparation, excavation, and grading, which would be expected to result in temporary impacts to noise levels in the project area. Earth-moving equipment is expected to be the loudest equipment used during construction; examples of typical sound levels produced by construction equipment are listed in Table 31. These sound levels are based on an inventory of equipment noise emissions that were compiled by the Federal Highways Administration (FHWA) as part of their Construction Noise Handbook (USDOT, 2006).

TABLE 31
Example of Sound Levels Emitted from Construction-Related Equipment

Type of Equipment [a]	Lmax at 50 feet (dBA, slow) [b]	Type of Equipment [a]	Lmax at 50 feet (dBA, slow) [b]
Backhoe	80	Excavator	85
Compactor (ground)	80	Flat bed truck	84
Concrete saw	90	Front end loader	80
Drill rig truck	84	Grader	85
Dozer	85	Pick-up truck	55
Dump Truck	84	Tractor	84

SOURCE:
USDOT, 2006 (http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm)

NOTES:
[a] This is an abbreviated list for example purposes; a more complete list of construction-related equipment is available at the above-referenced source.
[b] The sound levels shown are specification limits for each piece of equipment expressed as an L_{max} level in dBA "slow" at a reference distance of 50 foot from the loudest side of the equipment.

The State of Hawai`i has adopted statewide noise standards, set forth in HAR §11- 46 ("Community Noise Control"); these are administered by DOH. The stated purpose of the standards is to "provide for the prevention, control, and abatement of noise pollution in the state from the following noise sources: stationary noise sources (such as air-conditioning units, exhaust systems, generators, compressors, and pumps) and equipment related to agricultural, construction, and industrial activities" (HAR §11-46). The noise standards are the maximum permissible sound levels (as measured from the property line) and vary according to land use district. The maximum permissible sound levels for each class of land uses are listed in Table 32. The proposed project is located in the historic zoning district, and as such, is expected to be subject to the maximum permissible sound levels associated with the Class A zoning district.

TABLE 32
Maximum Permissible Sound Levels By Zoning District

Zoning District	Maximum Permissible Sound Levels [dB(A)] [a]	
	Daytime (7am—10pm)	Nighttime (10pm—7am)
Class A: All areas equivalent to lands zoned residential, conservation, preservation, public space, open space or similar type	55	45
Class B: All areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type	60	50
Class C: All areas equivalent to lands zoned agriculture, country, industrial, or similar type	70	70

NOTES:
[a] These maximum permissible sound levels apply to the following excessive noise sources: stationary noise sources; and equipment related to agricultural, construction and industrial activities (HAR §11-46-4).

Based on the typical noise levels emitted by construction equipment (as listed in Table 31), construction noise levels would be expected to exceed the State's maximum permissible property line noise levels.

Pursuant to HAR §11-46-7, a permit would be obtained from the DOH to allow the operation of construction-related equipment. Factors that are considered in granting of such permits include whether the activity is in the public interest and whether the best available noise control technology and measures have been incorporated into the activity. Specific measures that would implemented to reduce noise levels, particularly for noise-sensitive receptors including nearby residents, are expected to include:

- Proper tuning and balancing of construction equipment, and maintenance in accordance with the manufacturer's specifications
- Use of noise barriers and/or mufflers on diesel and gasoline engines
- Restriction of construction activities to typical working hours
- Keeping unnecessary noise to a minimum

Given the short duration and temporary nature of the construction activities, and with implementation of these measures, implementation of the tentatively selected plan is expected to have only a minor impact on noise.

7.12 Transportation and Traffic

7.12.1 No Action

No changes in transportation and traffic would occur as a result of the No Action Alternative.

7.12.2 Tentatively Selected Plan

Implementation of the tentatively selected plan would not be expected to affect regional transportation services or traffic patterns; however, construction could result in short-term impacts relative to both vehicular and pedestrian traffic. Impacts could include short-term increases in traffic or road closures when trucks are importing or hauling material from the site. These impacts would be minimized to the extent practicable through implementation of traffic controls, including signage, flagging, or appropriate methods. With implementation of these measures, traffic-related impacts are expected to be minor.

Temporary roadway impacts could also occur on Mokuhinia Way, during trenching for the outlet from the wetland to the adjacent ditch. However, this work would occur beyond the access locations to the adjacent properties, and the roadway would be repaired to its existing conditions using similar materials, such that impacts to local residents are expected to be negligible. None of the adjacent streets, including Mokuhinia Way, would be affected over the long-term.

Pedestrian traffic around the perimeter of the site would also be limited during construction; however, other pedestrian routes (for example, along the *makai* side of Front Street) would still be available in the project vicinity, such that pedestrian-related impacts are expected to be minor. Over the long-term, the project is not expected to significantly affect traffic levels or pedestrian movement, which is generally focused along Front and Shaw Streets. However, the number of pedestrians visiting the site may increase in response to interest in the biological and cultural features of the site (for example, as part of the self-guided tour of the *Ala Hele Mo`olelo O Lāhainā*).

7.13 Public Utilities

7.13.1 No Action

Under the No Action Alternative, no public utilities would be affected.

7.13.2 Tentatively Selected Plan

Construction of the tentatively selected plan would require removal of onsite utilities, including water and wastewater lines associated with the public restrooms and the Salvation Army outpost. The electrical service would be maintained, as needed to power the groundwater pump. These activities are not expected to affect the functionality or extent of public utilities in the project vicinity. Utility lines operated by the County of Maui are located within the Front Street and Shaw Street rights-of-way; the specific location of these lines will be determined as part of the next phase and will be reflected in the final design. Standard BMPs, including appropriate setbacks, would be implemented during construction to protect these lines, such that construction activities are not expected to impact these utilities.

As part of the restoration plan, the project would include installation of an outlet that would tie into the adjacent ditch, which serves as part of the County's drainage network. As described in the Lāhainā Town Drainage Master Plan, the lower sections of this ditch frequently clog with sand, which restrict flows; the County identified the need to upgrade this ditch to a double-box (10-foot-by-4-foot) culvert to address these existing drainage problems (Belt Collins, 2005). At the current time, design information for the ditch upgrade project is not available. Based on information presented in the Drainage Master Plan, it is assumed that the upgrades will provide an appropriate elevation and adequate capacity such that positive flows could be maintained from the wetland to the ditch and the inputs from the wetland would not exceed the ditch capacity. Design efforts for the restoration plan will be coordinated with the ditch upgrade project, such that the final design reflects the upgraded culvert design.

As noted in Section 1.8.2, the wastewater pump station located along Front Street is not part of the project site; the County is exploring options to relocate the pump station as part of the revitalization of the overall Moku`ula/Mokuhinia site. Implementation of the project is not expected to affect the current functionality and/or potential future relocation of the pump station.

7.14 Health and Human Safety

7.14.1 No Action

Implementation of the No Action Alternative would not affect health and human safety.

7.14.2 Tentatively Selected Plan

As described in Section 3.2.9, the site was investigated for the presence of HTRW, and more specifically for the presence of arsenic. The results of these investigations did not reveal any HTRW or other contaminants at levels of concern. As such, implementation of the tentatively selected plan is not expected to result in release of contaminants or other pollutants that would affect human health.

As described in Section 3.2.4, the project site is located within an area designated by FEMA as being subject to inundation during the 1-percent-annual-chance flood event (Zone AE). The restoration design includes installation of an outlet, which would function to maintain positive flow and regulate water levels within the wetland, such that the proposed project is not expected to increase flooding hazards within the project site or adjacent properties (for example, 505 Front Street and Kamehameha Iki Park).

Other health and human safety concerns could include exposure to ponded water and/or mosquitoes, which may transmit diseases. Although designed to specifically address predator control, the perimeter fence would help to minimize uncontrolled access to areas of ponded water, thereby providing a degree of safety. As discussed in Section 6.1.3, the tentatively selected plan also specifically addresses the need for circulation. Positive water circulation would be used to maintain surface water quality and minimize potential for stagnant water conditions, which is expected to minimize the potential for mosquitoes. As

such, no human health or safety-related impacts are expected to occur as a result of project implementation.

7.15 Socioeconomic and Environmental Justice

7.15.1 No Action

There are no effects in regards to socioeconomics or environmental justice in relation to the No Action Alternative.

7.15.2 Tentatively Selected Plan

In general, it is expected that the area to be most directly affected by the project would be those areas within the immediate neighborhood and the surrounding areas of Lāhainā town, although it is possible that some indirect impacts could extend beyond Lāhainā to the entire island, state, or even the nation. Factors considered in determining whether the proposed project would significantly affect environmental justice included the extent or degree to which its implementation would (1) change any social, economic, physical, environmental, or health conditions so as to disproportionately affect any particular low-income or minority group or (2) disproportionately endanger children in areas within or near the project site. These factors are also consistent with the requirement for compliance with Executive Order 12898 (Environmental Justice) and Executive Order 13045 (Protection of Children from Environmental Health Risks and Safety Risks).

As described in Section 3.2.15, the project site is located in Census Tract 314.04, within the Lāhainā Census Designated Place (CDP).[45] The population in this census tract is comprised of approximately 3,250 people, while the population in the larger Lāhainā CDP is approximately 11,704 people. The races that are represented by the population in the census tract vary from those for the surrounding areas of Lāhainā town, Maui County, and the State of Hawai`i; in particular, the percentage of Caucasians is much higher and the percentage of Asians is much lower; in general, the percentage of native Hawaiians is comparable to these broader areas. The median age of the resident population is approximately 37.8 years old, and approximately 10.6 percent of the population is over 65 years old. These values are generally comparable with those for the population within the Lāhainā CDP, the County of Maui, and the State of Hawai`i. Educational attainment and employment rates within the census tract are commensurate with the surrounding areas of Lāhainā town, the County of Maui, and the State of Hawai`i. The median household income in the census tract is lower than those for the surrounding areas of Lāhainā town, the County of Maui, and the State of Hawai`i, although the poverty rates are similar. Based on these data, the project area does not appear to include a disproportionately high percentage of a minority or economically disadvantaged population. However, as further discussed below, the project would require relocation of the Salvation Army's Lāhainā Outpost, which services low-income individuals and families. Based on the presence of several nearby schools, there are also expected to be a high percentage of children present in the project vicinity.

As documented in Section 7.9, the project is not expected to affect human health through discharge of pollutants or contaminants. Construction activities are expected to result in impacts related to air quality, noise, and traffic, which could affect the local population, including children that may be present in the area. However, these impacts are expected to be temporary and the measures described in Sections 7.10, 7.11, and 7.12 would be implemented to minimize these impacts, such that they are expected to be minor. Furthermore, these impacts are not expected to disproportionately affect children, or any minority

[45] Census Tract 314.04 generally includes the portion of Lāhainā town from Puamana Park north to Keawe Street, and *makai* of Honoapi`ilani Highway.

or economically disadvantaged population. As described in Section 7.14, the project would involve the presence of ponded water, which could pose an increased safety risk to children; however, the restoration design includes a perimeter fence that would limit access to the wetland, such that the proposed project is not expected to pose human safety risks that would disproportionately affect children.

The local population may also be affected by the relocation of Salvation Army, particularly economically disadvantaged residents who rely on Salvation Army services. However, to minimize the impact on these low-income residents, the County of Maui is working with Salvation Army to relocate the facility to another nearby location, such that the outpost can continue operations and services will still be readily available to the local population. Specific relocation plans are being discussed by the County of Maui and the Salvation Army, with specific consideration given to the location and amenities required for the relocated facility; as further discussed in the REPR (Appendix F), it is expected that the two Salvation Army parcels will be eligible for benefits under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646). With implementation of these measures to relocate the Salvation Army facilities, the proposed project is not expected to adversely impact the low-income population.

Over the long-term, the project is expected to improve the site through restoration of historical conditions and provide a long-term cultural benefit for residents of Lāhainā (and of the county and state, as a whole), particularly the native Hawaiian community. Overall, implementation of the tentatively selected plan is not expected to disproportionately affect children, or any low-income or minority group within or near the project site, and may provide long-term benefits associated with the cultural revitalization of Moku`ula/ Mokuhinia. As such, the proposed project is not expected to result in an environmental justice impact, and is in compliance with Executive Orders 12898 and 13045.

7.16 Other Required Analyses

Under the NEPA and HRS Chapter 343 review processes, analysis of the significance of potential environmental effects should consider the sum of the effects on the quality of the environment; in addition to direct impacts, the analysis should also consider indirect impacts, cumulative effects, as well as short-term and long-term effects of the proposed action.

7.16.1 Indirect and Secondary Effects

Indirect effects are defined in 40 CFR Part 1508 (and similarly in HAR §11-200-2) as those “which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.”

Potential indirect effects of the proposed action are generally described throughout Section 7. The environmental resources that could be indirectly impacted by implementation of the proposed project include (1) water resources as a result of erosion and sedimentation, (2) air quality as a result of temporary construction activities, (3) noise as a result of temporary construction activities, and (4) traffic as a result of temporary construction activities. However, with implementation of avoidance and minimization measures (as described in the respective sections), these indirect impacts are all expected to be less than significant.

While the proposed project’s construction and operation expenditures may provide a direct benefit to the local economy, the amounts are relatively too small to cause significant secondary effects in the local economy. The proposed project would not lead to secondary or indirect changes related to land use and development in Lāhainā. No other secondary impacts are anticipated as a result of project implementation.

7.16.2 Cumulative Impacts

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Principles of cumulative effects analysis in the Council on Environmental Quality (CEQ) guide *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ, 1997) states: "for cumulative effects analysis to help the decision maker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully."

The potential for cumulative impacts to the environment from the proposed action was evaluated by reviewing other projects and activities in the region that could affect the same environmental resources as the proposed action. Actions that were considered include projects that were recently completed, are currently underway, or are programmed to occur in the foreseeable future, as summarized in Table 33.

TABLE 33
Projects and Activities Considered in the Cumulative Impact Analysis

Project Name	Description	Project Sponsor	Status
Area Reserved for Friends of Moku`ula	To be determined	Friends of Moku`ula	Design being refined
Revitalization/ Preservation of Moku`ula	Preservation and/or revitalization of archaeological and cultural features associated with Moku`ula (and its ponds)	Friends of Moku`ula and the Native Hawaiian community	To be determined
Lāhainā Town Drainage Master Plan	Comprehensive drainage master plan, including a systematic development of storm drainage improvements for Lāhainā town from Kahoma Stream to Kaua`ala Stream	County of Maui, Department of Public Works and Environmental Management	Plan completed in 2005; specific projects identified in plan to be implemented on individual basis
Lāhainā Watershed Flood Control Project	Construction of a floodwater diversion system above Lāhainā town to reduce flooding and erosion	NRCS, West Maui Soil and Water Conservation District, and the County of Maui	Construction started in January 2010
Lāhainā Bypass Highway	Realignment of Honoapi`ilani Highway through Lāhainā	State of Hawai`i, Department of Transportation	Construction on the second phase of the project began in October 2010
West Maui Watershed Plan (Ka`anapali to Honolua)	Feasibility study for watershed plan to address impacts to stream resources, impacts to groundwater quality and quantity, watershed degradation, impacts to coral reef/nearshore waters, flooding and sedimentation, and general concerns associated with climate change, land ownership, transparency of regulations, and education and outreach	USACE and State of Hawai`i	Initiated Feasibility Phase in September 2010

Of these, the actions that are expected to be most relevant to the analysis of cumulative impacts in combination with the proposed project, based on the potential to affect the same resources, are the cultural revitalization of Moku`ula and the Lāhainā Town Drainage Master Plan.[46]

The Lāhainā Drainage Master Plan identifies proposed drainage system improvements throughout Lāhainā, as part of which, upgrades to the ditch adjacent to the project site is identified as the highest

[46] Future activities within the area reserved for the Friends of Moku`ula were not considered as part of the cumulative impact analysis as the nature and extent of any activities are currently undefined.

priority for implementation (Belt Collins, 2005). Completion of the ditch upgrade project will be included as a requirement of the PPA, such that it will be completed before construction of the proposed project. At this time, it is not known if and when the other components of the plan would be implemented. Design details are not yet available for the ditch upgrade project, but it is expected to involve installation of 10-foot concrete box culvert and associated drain inlets, as well as extending the wing walls into the ocean; impacts that would be anticipated include construction-related impacts to stormwater, noise, air quality, and traffic.

Relative to the revitalization/preservation of Moku`ula, little is currently known about the specific activities that would be conducted. However, the effort would involve restoration of existing historic resources within the 1-acre island; if excavation is conducted, it is expected to be low-impact (for example, conducted by hand). Potential environmental impacts, if any, would likely be minor impacts to stormwater runoff during excavation activities.

Considering the potential impacts of these projects, in combination with the probable impacts of the proposed action, it is anticipated that potential cumulative impacts would relate to stormwater, noise, air quality, and traffic. However, standard BMPs would be implemented to avoid and minimize the impacts of the proposed actions; it is expected that similar measures would be implemented for the other projects under consideration. As such, cumulative impacts are expected to be less than significant.

7.16.3 Short-Term Uses Versus Long-Term Productivity

The analysis of short-term uses versus long-term productivity considers the relationship between local short-term uses by humans of the environment and the maintenance and enhancement of long-term productivity. This should include a discussion on the extent to which the proposed project involves tradeoffs among short-term and long-term gains and losses, as well as whether future options are foreclosed, whether the range of beneficial uses of the environment are narrowed, and whether the proposed project poses long-term risks to health and safety.

Implementation of the proposed project would restore the aquatic habitat associated with Loko o Mokuhinia; the restored conditions are expected to be similar to those that historically occurred onsite. In general, it is anticipated that restoration of the site would increase the beneficial use of the environment and maintain the long-term productivity of the site. Implementation of the project does not foreclose on any future uses of the site. As summarized in Section 7.14, the proposed project is not expected to pose any long-term risks to health and safety.

7.16.4 Irreversible and Irretrievable Commitments of Resources

The analysis of irreversible and irretrievable commitments of resources includes a description of the extent to which the proposed project makes use of non-renewable resources (including labor, materials, natural, and cultural resources) or irreversibly curtails the range of potential uses of the environment.

Construction of the proposed project would consume some non-renewable resources, such as construction materials and fuel for vehicles. During operation of the project, the primary resource required for the project is manpower, as well as electricity to run the groundwater pump. However, the project is expected to restore conditions that historically occurred onsite, thereby maintaining the range of potential uses of the environment. Fuel consumed, manpower expended, and the commitment of construction materials and equipment is considered irreversible. No other aspects of the proposed action are considered to be irreversible.

7.16.5 Summary of Unavoidable Adverse Impacts

Implementation of the project would result in unavoidable construction-related impacts. However, as described in Section 7 and summarized below, these impacts would be minimized through the

implementation of avoidance and minimization measures, such that the impacts would be considered less than significant. The project is not expected to result in any significant environmental impacts.

- Stormwater impacts related to increased sediment and other pollutants could result from vegetation clearing, excavation, grading, and the use of heavy equipment during construction. These impacts would be minimized through the implementation of BMPs such as silt fencing.
- Historic pond sediments may be encountered during construction, and the excavation activities could affect archaeological resources contained within those pond sediments. Impacts to these resources will be minimized through the use of GPS-mounted equipment, in combination with an archaeological monitor. Specific details regarding the handling of any archaeological features would be outlined as part of an AMP, which would be prepared and submitted to SHPD for review and approval before construction.
- Air quality may be temporarily impacted by dust generated during construction and exhaust emissions from construction equipment. These impacts would be minimized through the implementation of BMPs, including dust minimization measures.
- Temporary noise impacts are expected as a result of operation of heavy equipment during project construction. Noise impacts will be minimized by limiting construction work to daylight hours, and through the implementation of BMPS (for example, mufflers on construction equipment).
- Traffic in the project vicinity may be temporarily affected during construction. These impacts would be minimized to the extent practicable through implementation of traffic controls, including signage, flagging, or appropriate methods.

7.16.6 Unresolved Issues

Consistent with the information provided throughout this report, the unresolved issues that relate to the proposed project are summarized below. As noted, it is anticipated that each of these issues can be adequately resolved before implementation of the project.

- Specific design issues that are listed in Section 6.3 will need to considered in the development of the final design for the project; these relate to the project boundaries, the groundwater well design and location, the outlet design (relative to the ditch upgrades), public utilities within the Shaw and Front Street rights-of-way, and the need to address the Lāhainā Historic District design guidelines. Based on the information currently available, it is anticipated that each of these issues can be adequately addressed through the design phase of the project, such that the preliminary designs may be finalized for implementation, consistent with the design concepts presented in this document.
- USFWS has not yet concurred with USACE's determination of "*may affect, but not likely to adversely affect.*" Consultation is expected to continue through the design phase, as needed to obtain their concurrence; specifically, it is expected that the USFWS consultation will include review and input to the O&M plans for the site.
- The SHPO has not yet concurred with USACE's determination of "*no adverse effects to historic properties.*" The USACE will continue coordination, with additional measures to avoid, minimize and/or mitigate incorporated into the project, as needed. If SHPO does not concur with USACE's determination, an MOA will be pursued.
- The County of Maui is still negotiating acquisition of the Salvation Army parcels. It is understood that a site has been identified for relocation of the Salvation Army facilities, and it is anticipated that the acquisition will be completed before implementation.

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8.0 Environmental Compliance Requirements

There are a variety of federal, state, and local regulations and policies with which project implementation will need to comply; the key regulations that relate to the project are summarized below.[47] In addition, in accordance with the requirements of HAR §11-200-17, this chapter discusses the relationship of the proposed action to land use plans, policies, and controls.

8.1 Federal Regulations and Policies

8.1.1 National Environmental Policy Act

NEPA establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals (42 United States Code [U.S.C.] 4321 et seq.). NEPA requires federal agencies to incorporate environmental considerations in their planning and decision-making process through a systematic interdisciplinary approach. Specifically, all federal agencies are to prepare detailed statements that assess the environmental impact of and alternatives to federal actions that could significantly affect the environment.

This draft integrated Feasibility Report and EA has been prepared in compliance with NEPA and its implementing regulations (40 CFR Part 1500 through 1508). Pursuant to these regulations, the document describes the existing environmental conditions within the project site, the proposed action and alternatives, potential environmental impacts of the proposed project, and measures to minimize environmental impacts. No significant adverse effects have been identified.

8.1.2 Clean Water Act

The purpose of the CWA is to "restore and maintain the chemical, physical and biological integrity of the nation's waters" [33 U.S.C. §1251(a)]. Section 404 of the CWA provides the authority for a program to permit the otherwise unlawful discharge of dredged or fill material into Waters of the U.S., which are defined to include rivers, streams, estuaries, the territorial seas, ponds, lakes, and wetlands; the USACE retains primary responsibility for this permit program. USACE does not issue itself a permit under this program, but rather demonstrates compliance with the substantive requirements of the CWA through preparation of a 404(b)(1) evaluation. As described in Section 7.5, the project site does not currently support any Waters of the U.S. and therefore, no impacts are expected; as such, a 404(b)(1) evaluation is not expected to be required.

Under Section 401 of the CWA, applicants for a federal permit to conduct any activity that may result in a discharge of dredged or fill material to Waters of the U.S. must also obtain certification from the state in which the discharge will originate that any such discharge would comply with State water quality standards. The State of Hawai`i DOH implements the Section 401 water quality certification program, as authorized under HRS §342D. As the project does not involve discharge or dredged or fill material to Waters of the U.S., Section 401 water quality certification is not required.

Section 402 of the CWA establishes the NPDES permit program, which regulates point source discharges of pollutants and stormwater discharges into Waters of the U.S. An NPDES permit sets specific discharge

[47] Each of the laws and policies that are specifically called out in HAR 11-200 for which the proposed activities should be evaluated for consistency were reviewed; only those that are relevant to the project are discussed in detail. Specific laws and policies that were considered to not be relevant include HRS 128D (Hawai`i Environmental Response Law), HRS 342C (Ozone Layer Protection) , HRS 342E (Nonpoint Source Pollution Management and Control), HRS 342G (Integrated Solid Waste Management), HRS 342H (Solid Waste Pollution), HRS 342I (Special Wastes Recycling), HRS 342J (Hazardous Waste), HRS 342L (Underground Storage Tanks), HRS 342N (Repealed), and HRS 342P (Asbestos and Lead).

limits for point sources and establishes monitoring and reporting requirements. It is expected that an NPDES Permit will be required for the project, as further described in Section 7.4.

8.1.3 Endangered Species Act

The Endangered Species Act (ESA) of 1973, as amended, declares that all federal agencies "…utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to Section 4 of this Act." Section 7 of the ESA requires federal agencies to ensure that any agency action is not likely to jeopardize the continued existence of any species listed as threatened or endangered (or any species proposed for listing).

Pursuant to Section 7 of the ESA, the USACE initiated informal consultation with the USFWS as part of a request for information regarding threatened and endangered species and designated critical habitat in the vicinity of the proposed project site. USFWS provided a response letter dated April 19, 2010, which stated that no threatened or endangered species are known to exist within or adjacent to the project site (with the exception of Hawaiian hoary bat that occurs in the project vicinity), but expressed concerns regarding the potential impacts associated with restoring waterbird habitat in an urbanized environment (for example, predation, human disturbance and possible botulism outbreaks). Throughout the planning process, USACE coordinated closely with USFWS staff, incorporating their specific input to the conceptual restoration design and O&M approach as needed to address these concerns. Based on this ongoing consultation, the USACE evaluated the potential for the proposed action to affect federally listed species, and presented the results in a letter to the USFWS, requesting concurrence with the USACE's determination that the proposed action may affect but is not likely to adversely affect listed species. As detailed in response letters dated April 25 and June 18, 2013, USFWS stated that the USACE has largely addressed their concerns related to the potential impacts, but states that informal consultation must continue until detailed site management plans have been finalized (particularly as needed to address predator control, and botulism prevention and management), which is anticipated to occur during the final design phase. The letter specifies that the USFWS anticipates that, as the planning process progresses, they will likely be able to agree with the USACE determination that the proposed project may affect but is not likely to adversely affect listed species that are expected to occur in the restored habitat. As such, informal Section 7 consultation is expected to continue through the final design phase, as needed to obtain USFWS concurrence. A copy of the correspondence with USFWS is contained in Appendix B.

8.1.4 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661) was established to provide for the protection of fish and wildlife as part of federal water resource development projects. Compliance with the FWCA is required "whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose." As the proposed project would not involve modification of an existing water body, FWCA compliance is not required.

Although FWCA compliance is not required for the project, ongoing coordination has been conducted with the USFWS. Specifically, the USFWS has provided technical support for the habitat evaluation and conceptual restoration design efforts, so as to incorporate lessons learned on other restoration and wetland management efforts in Hawai`i, as well as measures to avoid or minimize potential impacts to federally listed and other wildlife species. Their recommendations have been integrated into the plan formulation process, as presented in this report.

8.1.5 Migratory Bird Treaty Act

Native migratory birds of the United States are protected under the MBTA of 1918, as amended (16 U.S.C. 703-712 et. seq.); the list of birds protected under MBTA implementing regulations is provided at

50 CFR 10.13. This Act states that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product. "Take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect (16 U.S.C. 703-712)." Consistent with the analysis provided relative to the Endangered Species Act, the project is not expected to adversely affect migratory species, such that any take would occur.

8.1.6 National Historic Preservation Act

The NHPA (Public Law 102-575; 16 U.S.C. 470), as amended, governs the preservation of cultural and historic resources in the U.S. With respect to the proposed undertaking, the most pertinent section of NHPA is Section 106, which requires federal agencies to take into account the effects of their undertakings on properties that are listed in the National Register of Historic Places (or that meet the criteria for listing in the National Register), and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. As described in 36 CFR Part 800.1, which are the implementing regulations for the historic preservation review process, the Section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties. The goal of consultation is to obtain input as needed to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties. Consulting parties that should be involved in the Section 106 process include the SHPO, NHOs, jurisdictional agency representatives, and other interested parties.

Relative to the proposed project, USACE initiated Section 106 consultation with ACHP and SHPO in 2010; documentation of this correspondence is contained in Appendix J. In compliance with the requirements of the Section 106 process, USACE has consulted with these entities as well as other consulting parties throughout the planning process, as further detailed in Section 1.8; consultation is expected to continue through construction. Through the consultation process conducted to date, the USACE has identified potential effects of the proposed project on historic properties, and measures that would serve to minimize or mitigate those effects. A summary of the potential effects and proposed mitigation is summarized in Section 7.6; a letter requesting concurrence with the USACE's determination of no adverse effect to historic properties has been submitted to the SHPO. A response has not been received to date, but is expected to be received and will be summarized as part of the final report. Based on their response, the need for a Memorandum of Agreement will be determined in consultation with SHPO (and ACHP, as necessary).

8.1.7 Native American Graves Protection and Repatriation Act

Under the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (25 U.S.C. 3001), consultation is required with Indian tribes (including Alaska Native villages) or NHOs before the intentional excavation or removal after inadvertent discovery of various cultural items (including human remains and objects of cultural patrimony) for activities conducted on federal lands. For activities on Native American or Native Hawaiian lands, which are defined in the statute, NAGPRA requires the consent of the Indian tribe or NHO before the removal of cultural items. The law also provides for the repatriation of such items from federal agencies and federally assisted museums and other repositories. As the proposed project is not located on federal or tribal land, it is understood that NAGPRA would not apply; the proposed activities would be subject to state burial laws (HRS Chapter 6E), including the jurisdiction of the Maui/Lanai Island Burial Council, which are discussed in the following section.

8.1.8 Coastal Zone Management Act

In response to the increasing pressure of development on coastal resources, the United States Congress enacted the Coastal Zone Management Act (CZMA) in 1972 and the Coastal Zone Act Reauthorization Amendments in 1990. These laws make federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program. Hawai`i's CZM program was approved as HRS Chapter 205A in 1977; components of the State's program are further described in Section 8.2.3.

With participation in the development of a state management program, Section 307(c)(1)(A) of the CZMA mandates that federal actions that affect any land or water use or natural resources of the coastal zone be conducted in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved state management program. A review and evaluation process (implemented through regulations at 15 CFR Part 930) ensures such "federal consistency." Consistent with these requirements, the USACE has evaluated the proposed project for consistency with the policies of the Hawai`i CZM program. Based on this evaluation, a consistency determination has been submitted to the Office of Planning for their certification. A copy of the USACE's determination is contained in Appendix K; if documentation of concurrence is provided by the Office of Planning, a copy will be provided in the Final Integrated Feasibility Report and EA.

8.1.9 Executive Orders

Executive Orders that are relevant to the proposed project include the following. Each of these has been considered in the feasibility planning and restoration plan development process, as noted.

- **Executive Order 11514, Protection and Enhancement of Environmental Quality**: The objective of this executive order is to protect and enhance the quality of the Nation's environment to sustain and enrich human life. As summarized in this document, the potential effects of the project were assessed, in consultation with project stakeholders; compliance with all applicable environmental regulations is being obtained.
- **Executive Order 11988, Floodplain Management**: The objective of this executive order is to avoid, to the extent possible, long- and short-term adverse impacts associated with the occupancy and modification of the base flood plain, and avoid direct and indirect support of development in the base flood plain whenever there is a practicable alternative. Compliance with this executive order, based on the procedures outlined in ER 1165-2-26 (*Implementation of Executive Order 11988 on Flood Plain Management*; 30 March 1984), is discussed in Section 7.4.2.2.
- **Executive Order 11990, Protection of Wetlands**: The objective of this executive order is to minimize the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. The proposed project involves the restoration of coastal wetland habitat functions and values.
- **Executive Order 12898, Environmental Justice**: The objective of this executive order is to make it a high priority to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs, policies and activities on minority and low-income populations. An assessment of environmental justice is provided in Section 7.2.15.
- **Executive Order 13045, Protection of Children From Environmental Health Risks and Safety Risks**: The objective of this executive order is to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. An assessment of risks that may disproportionately affect children is provided in Section 7.2.15.

- **Executive Order 13112, Invasive Species**: The objective of this executive order is to prevent the introduction of invasive species, provide restoration of native species and habitat conditions in ecosystems that have been invaded, and promote public education and the means to address invasive species. The proposed project involves the restoration of native species as part of the wetland habitat, with O&M activities intended to specifically address control of invasive species.
- **Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management**: The objective of this executive order is to implement sustainable practices, energy efficiencies, water conservation, renewable energies, pollution and waste prevention as part of any federal activity. Although some long-term management is expected to be required relative to maintenance of suitable waterbird habitat, to the extent possible, the proposed project has been designed to be as sustainable as possible.
- **Executive Order 13514, Federal Leadership in Environmental, Energy and Economic Performance**: The objective of this executive order is to contribute to a clean energy economy through such actions as increasing energy efficiency; conserving and protecting water resources through efficiency, reuse and stormwater management; and waste elimination, recycling, and pollution prevention. The focus of the project is to restore and protect wetland habitat.

8.1.10 USACE Environmental Operating Principles

As part of the Department of the Army, the USACE embraces the four pillars of the Army's environmental strategy: (1) compliance, (2) pollution prevention, (3) conservation, and (4) restoration. Within this context, the USACE reaffirmed their commitment to the environment by formalizing a set of seven environmental operating principles that apply to all USACE decision-making and programs. As specified in ER 200-1-5, the purpose of these principles is to identify the ways in which the USACE missions should be integrated with natural resource laws, values, and sound environmental practices, as well as to acknowledge the roles and responsibilities of the USACE in the sustainable use, stewardship, and restoration of natural resources (USACE, 2003b). The seven principles, and a statement of how the project complies with each, are as follows:

- Foster sustainability as a way of life throughout the organization.
  - *Sustainable practices have been incorporated by the PDT, through practices including use of reuseable and recycled products, carpooling to meetings, and minimization of hard copies of documents (through use of electronic copies).*
- Proactively consider environmental consequences of all Corps activities and act accordingly.
  - *The environmental consequences of the proposed project have been considered, and avoided and minimized to the extent possible, as documented in this report.*
- Create mutually supporting economic and environmentally sustainable solutions.
  - *As part of the feasibility planning process, the alternatives formulation process accounted for and sought to respond to both environmental and economic considerations through screening and reformulation.*
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
  - *The proposed project is in compliance with applicable laws and regulations related to human and natural environmental impacts, as documented in this report.*

- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
  - *Consistent with current USACE policies, the project incorporated a risk-based decision-making framework into the feasibility planning process. Risks and uncertainties were considered over the full project lifecycle, including those related to the surrounding environment; they have been (and will continue to be) addressed as part of the project's risk register (and decision management plan).*
- Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.
  - *The feasibility planning process incorporated relevant scientific and social information into the restoration design, including wetland restoration and waterbird management experience of USFWS staff, as well as social knowledge gained from project stakeholders.*
- Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.
  - *A focused stakeholder engagement effort was incorporated into the planning and project development process, so as to ensure that the key stakeholder perspectives were considered as part of the proposed restoration plan.*

8.2 State Regulations

8.2.1 Hawai`i Environmental Impact Review Law (HRS Chapter 343)

HRS Chapter 343 is designed to "establish a system of environmental review which will ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations." The regulations identify nine specific activities that trigger the need for compliance. The proposed action involves two activities that are triggers for compliance with HRS Chapter 343: (1) use of State or County lands or funds and (2) use within any historic site as designated in the National Register or Hawai`i Register. The proposed project site is located on State-owned lands and is part of two historic sites that are designated on the National and Hawai`i Register (King Kamehameha III's Royal Residential Complex and the Lāhainā Historic Landmark); in addition, project implementation would use County funds. This EA has been prepared in compliance with HRS Chapter 343; the County of Maui is the proposing agency.

8.2.2 Hawai`i State Environmental Policy (HRS Chapter 344)

The purpose of HRS Chapter 344 is to "establish a State policy which will encourage productive and enjoyable harmony between people and their environment, promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, and enrich the understanding of the ecological systems and natural resources important to the people of Hawai`i." It specifies that the programs, authorities, and resources of the State be used to conserve natural resources and improve the quality of life. Particular aspects of the policy that relate to the project includes a focus on communities which "provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian." The project further complies with the guidelines through the maintenance of cultural park space, promotion of open space, and the fostering of native species.

8.2.3 Coastal Zone Management (HRS Chapter 205A)

In response to the federal CZMA (16 U.S.C. §1451-1456), Hawai`i's CZM program was enacted as HRS Chapter 205A in 1977, and is administered by the State of Hawai`i Department of Business, Economic Development and Tourism (DBEDT) Office of Planning. The CZM area encompasses the entire state, including all marine waters seaward to the extent of the State's police power and management authority, including the 12-mile U.S. territorial sea and all archipelagic waters. The Hawai`i CZM program integrates decisions made by state and county agencies such as the Land Use Commission, DLNR, DOH, Department of Transportation, and Department of Agriculture to provide greater coordination and compliance with existing laws and rules. Specifically, the program focuses on ten policy objectives:

- Recreational Resources. To provide coastal recreational opportunities accessible to the public and protect coastal resources uniquely suited for recreational activities that cannot be provided elsewhere.
- Historic Resources. To protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.
- Scenic and Open Space Resources. To protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.
- Coastal Ecosystems. To protect valuable coastal ecosystems, including reefs, from disruption and to minimize adverse impacts on all coastal ecosystems.
- Economic Uses. To provide public or private facilities and improvements important to the state's economy in suitable locations; and ensure that coastal dependent development such as harbors and ports, energy facilities, and visitor facilities, are located, designed, and constructed to minimize adverse impacts in the coastal zone area.
- Coastal Hazards. To reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.
- Managing Development. To improve the development review process, communication, and public participation in the management of coastal resources and hazards.
- Public Participation. To stimulate public awareness, education, and participation in coastal management; and maintain a public advisory body to identify coastal management problems and provide policy advice and assistance to the CZM program.
- Beach Protection. To protect beaches for public use and recreation and locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements because of erosion.
- Marine Resources. To implement the state's ocean resources management plan.

Key components of the CZM program include (1) regulation of development within the SMA, a designated area extending inland from the shoreline, (2) a Shoreline Setback Area, which serves as a buffer against coastal hazards and erosion, and protects view planes, and (3) a Federal Consistency provision, which requires that federal activities, permits, and financial assistance be consistent with the Hawai`i CZM program. As discussed throughout this document, the proposed project would not significantly affect the resources addressed under CZM policy, and as such, is considered to be consistent with the CZM program; this determination has been submitted to the Office of Planning.

The project site is located entirely within the SMA and will require an SMA Use Permit. The purpose of the SMA Use Permit is to regulate any use, activity, or operation that qualifies as a "development" and has a

valuation in excess of $500,000, or may have a significant or cumulative adverse environmental or ecological effect within the SMA. Authority for this permit program is delegated to the various counties; for the island of Maui, the approving agency is the Planning Commission and the implementing rules are contained in the Maui County Rules §12-02-202. Consistent with the requirements of these regulations, an SMA Use Permit will be obtained for the proposed project.

8.2.4 HRS Chapter 6E (Historic Preservation)

HRS Chapter 6E establishes a comprehensive historic preservation program that is intended to preserve, restore and maintain historic and cultural properties. The regulations are implemented by SHPD, and require review of any project that is funded or permitted by the State. This process is the State counterpart to the Section 106 consultation requirement to identify historic properties potentially affected by a proposed project and can be an additional avenue of information gathering for fulfilling the Section 106 consultation mandate.

Specifically, HRS Chapter 6E (§6E-8 and §6E-42) requires that: “Before any agency or officer of the State or its political subdivisions commences any project which may affect historic property, aviation artifact, or a burial site, the agency or officer shall advise the department and allow the department an opportunity for review of the effect of the proposed project on historic properties, aviation artifacts, or burial sites, consistent with Chapter 6E-43, especially those listed on the Hawai`i register of historic places. The proposed project shall not be commenced, or in the event it has already begun, continued, until the department shall have given its written concurrence.” HRS Chapter 6E-43 governs burial sites, and gives authority to the appropriate island burial council relative to treatment of burial sites.

The implementing rules for the historic property review process are contained in HAR Chapter 13-275; these rules apply to “all state or county agencies funding or directly undertaking a project, or having a project undertaken on lands under its ownership or control which may affect historic properties” (§13-275-1b). They address the specific requirements relative to conducting archaeological, ethnographic and/or architectural inventory surveys. Consistent with these requirements, HRS Chapter 343 includes a requirement to consider cultural practices as part of an environmental review of the effects of a proposed action; a cultural impact assessment is typically prepared to address this requirement.

As described in Section 3.2.6, archaeological studies have been previously conducted for the project site; SHPD has been consulted relative to the findings of these studies, as well as the potential effect of the proposed project on historic properties. In addition, a cultural impact assessment was completed for the project. A summary of the potential effects and proposed mitigation is summarized in Section 7.6. The County of Maui will be responsible for completing the consultation process with SHPD, in compliance with HRS Chapter 6E.

8.2.5 HRS Chapter 174C (State Water Code)

HRS Chapter 174C, the State Water Code, was enacted into law by the 1987 Hawai`i State Legislature for the purpose of establishing a comprehensive water resource planning program to protect Hawai`i's water resources. It is intended to obtain maximum beneficial use of the waters of the State, while providing for protection of traditional and customary Hawaiian rights, protection and procreation of fish and wildlife, and other uses in the public interest. The regulations also provides for the legal basis and establishment of the CWRM and its authorities and responsibilities. The rules for implementing HRS Chapter 174C are provided in HAR 168 (Water Use, Wells and Stream Diversion Works), HAR 169 (Protection of Instream Uses of Water), HAR 170 (Hawai`i Water Plan), and HAR 171 (Designation and Regulation of Water Management Areas.

Specific to the proposed project, the most relevant of these rules includes HAR 168 (Water Use, Wells, and Stream Diversion Works). This chapter addresses the maximum beneficial use of ground and surface

waters by establishing rules for reporting and gathering meaningful data on all water uses and sources. The rules provide for the declaration and certification of all existing uses of surface and ground water; the registration of all existing wells and existing stream diversion works; the reporting of current uses of surface and ground water; the permitting of wells; the permitting of pump installations and repairs; and the permitting of stream diversion works. Specifically, 168-12 requires a permit for construction, alteration or repair of wells, as well as installation of any pump or pump equipment; standards related to well construction and pump installation are presented in 168-14. 168-12 also specifies that application for a well construction and pump installation permit requires a pump test. In compliance with these requirements, a permit for well construction and pump installation will be requested from CWRM; as required, a pump test will be completed during the next phase of the project.

8.2.6 HRS Chapter 195D (Conservation of Aquatic Life, Wildlife and Land Plants)

Any species of aquatic life, wildlife, or land plant that has been determined to be threatened or endangered species pursuant to the ESA is also considered to be threatened or endangered under the state law, and subject to the conditions of HRS §195D-4. These regulations specify that take of any threatened or endangered species within the state is unlawful, except as provided in subsections (f), (g), and (j), which allows for consultation with the endangered species recovery committee and issuance of incidental take licenses. Consistent with the analysis provided in Section 7.5, and as referenced relative to the ESA, the USACE has determined that the project is not likely to adversely affect threatened or endangered species. The County of Maui will be responsible for completing any requirements in compliance with HRS Chapter 195D.

8.2.7 HRS Chapter 342B (Air Pollution Control)

Air quality in the State of Hawai`i is regulated by the Clean Air Branch of DOH, as authorized under HRS §342B (Air Pollution Control). HAR Title 11, Chapter 59 (Ambient Air Quality Standards) establishes state ambient air quality standards, which in some cases are more stringent than the comparable federal standards or address pollutants that are not covered by the federal standards. These standards are monitored and enforced by the Clean Air Branch.

HAR Title 11, Chapter 60.1 (Air Pollution Control) states that “no person, including any public body, shall engage in any activity which causes air pollution or causes or allows the emission of any regulated or hazardous air pollutant without first securing approval in writing from the director.” According to Chapter 60.1, an Air Pollution Control Permit is required before constructing, reconstructing, modifying, or operating a stationary air pollution source. Certain air pollution sources are exempt from these requirements including vehicles, trucks, cranes, graders, and loaders (HAR §11-60.1-62d). Stationary sources with potential emissions of less than 1.0 ton per year for each air pollutant are also exempt from Air Pollution Control Permit requirements. Because of the type of equipment anticipated for use during construction and operation of the project, and the low levels of emissions anticipated as described in Section 7.10, the proposed action is not expected to require an Air Pollution Control Permit from the Clean Air Branch.

8.2.8 HRS Chapter 342D (Water Pollution)

Authorized under CWA Section 402, Hawai`i’s NPDES program is delegated to DOH Clean Water Branch. HRS Chapter 342D governs the NPDES program; the implementing rules are contained in HAR 11-55. Specifically, HAR 11-55-04 states that “before discharging any pollutant, or beginning construction activities that disturb one or more acres of land, or substantially altering the quality of any discharges, or substantially increasing the quantity of any discharges, a person shall submit a complete NDPES permit application…, submit a complete notice of intent…, or for certain storm water discharges, meet all

requirements for a conditional "no exposure" exclusion." The NPDES permit program provides for both general and individual permits. General permits are for activities that have similar nature of discharge (minor or non-controversial), which discharge initially entering either Class 2 Inland Water or Class A Marine Water. If a discharge does not quality for general permit coverage, an individual permits is required; these are custom permits and are good for up to 5 years. As the project will result in disturbance of more than one acre of land, and will involve discharge through the adjacent ditch, it is anticipated that an NPDES permit will be required. The waters off Lāhainā are identified as Class A waters (DOH, 1987), such that it is expected that the project will qualify for general permit coverage. The specific requirements will be determined in coordination with DOH and the permit will be obtained before construction.

8.2.9 HRS Chapter 342F (Noise Pollution)

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978 [42 U.S.C. Parts 4901-4918]), delegates the authority to regulate environmental noise to each state. For Hawai`i, regulations to prevent, control, and abate noise pollution are set forth in HRS Chapter 342F. The implementing rules, which include statewide noise standards, are provided in HAR §11-46 ("Community Noise Control"); these are administered by HDOH. The stated purpose of the standards is to "provide for the prevention, control, and abatement of noise pollution in the State from the following noise sources: stationary noise sources (such as air-conditioning units, exhaust systems, generators, compressors, and pumps); and equipment related to agricultural, construction, and industrial activities" (HAR §11-46). The noise standards are the maximum permissible sound levels (as measured from the property line) and vary according to land use district. It is anticipated that noise levels during construction could exceed the maximum permissible sound levels; pursuant to HAR §11-46-7, a permit would be obtained from HDOH, as needed.

8.3 County Regulations

8.3.1 Maui County Code Title 19, Article III (Maui County Historic Districts)

Chapter 19.50 of the Maui County Code establishes Historic District No. 1, which is comprised of portions of the town of Lāhainā. As shown in Figure 19, the project site is located entirely within the County Historic District No. 1. The use regulations within this historic district are provided in Chapter 19.52.090, which allows for a variety of specified uses, including "parks and playgrounds – community, public or privately operated." Based on discussions with the County of Maui, it is anticipated that the proposed project would be consistent with this permitted use within the historic district, such that a Conditional Permit or Special Use Permit will not be required.

However, pursuant to Chapter 19.52.020, any plans to construct, alter, repair, move or demolish any structure, or modification of existing structures and appurtenances within the historic district must be reviewed and approved; County building permits are not granted until a certificate of approval has been issued. The approving agencies are the County of Maui Planning Department and the Cultural Resource Commission. Specific guidelines that are considered as part of the review process by the commission are listed in Chapter 2.88.080. Consistent with the requirements of these regulations, historic district approval will be requested for the proposed project.

8.3.2 Maui County Code Chapter 19.62 (Flood Hazard Areas)

Chapter 19.62.050 specifies requirements for development within flood hazard areas, with the intent of protecting human life and health and promoting the general welfare. Development is defined as "any manmade change to improved or unimproved real estate, including walls, buildings, or other structures, filling, grading, excavation, mining, drilling operations, dredging, paving, or storage of equipment or

materials." The regulations establish special flood hazard areas, based on the FIRM data prepared by FEMA. FIRM data shown on State of Hawai`i Flood Hazard Assessment Tool indicate that the majority of the project site is within Zone AE, which is defined by the County of Maui to be a special flood hazard area. Chapter 19.62.050 requires that a flood hazard area development permit be obtained before construction of any development begins within any special flood hazard area. Consistent with these requirements, a flood development permit will be obtained from the County of Maui Planning Department.

8.4 Local Plans and Policies

8.4.1 Maui County General Plan

The Maui County General Plan was adopted in 1980 and updated in 1990 (Maui County, 1980 and 1990); the plan is now being revised as the 2030 General Plan. In general, major themes of the general plan include the use of county land for the social and economic betterment of residents, protecting environmental resources, preserving agricultural land, making the county more self-sufficient in energy use, providing public utilities that meet community needs, and improving the quality of public facilities. Specific components of the General Plan include the following:

- Countywide Policy Plan (adopted in March 2010)
- Maui Island Plan (adopted in December 2012)
- Community Plans (West Maui Community Plan, 1996)

The Countywide Policy Plan is the most broad-reaching of these plans, providing a policy framework for the Maui Island Plan and nine Community Plans. The Countywide Policy Plan communicates the goals, objectives, policies, and implementing actions that represent the desired direction of the County's future. The Maui Island Plan, under the umbrella of the Countywide Policy Plan, assesses the existing conditions, trends, and issues that are specific to Maui Island. It provides direction for the use and development of land, the extension and improvement of transportation services and infrastructure, the development of community facilities, the expansion of the island's economic base, the provision of housing, and the protection of natural and cultural resources. It is intended to provide a foundation for decision-making through the development, implementation, and application of policies and regulations (for example, zoning and other ordinances, guidelines, and area-specific plans that describe what kind of development is allowed). The West Maui Community Plan, which reflects the current and anticipated conditions in West Maui, provides specific recommendations to address the goals, objectives and policies established for the County and island, while recognizing the values and unique attributes of the region.

In general, restoration of Mokuhinia is consistent with the goals, objectives, and policies set forth in each component of the General Plan. Specifically, the Countywide Policy Plan includes as objectives "*Improve the opportunity to experience the natural beauty and native biodiversity of the islands for present and future generations*" (Objective A1) and "P*reserve and restore significant historic architecture, structures, cultural sites, cultural districts, and cultural landscapes"* (Objective B4); policies that relate to the project include the following:

- 1c. Restore and protect forests, wetlands, watershed, and stream flows and guard against wildfires, flooding, and erosion.
- 4e. Support programs that protect, record, restore, maintain, provide education about, and interpret cultural district, landscapes, sites, and artifacts in both natural and museum settings.
- 4g. Seek solutions that honor the traditions and practices of the host culture while recognizing the needs of the community.
- 4l. Foster partnerships to identify and preserve or revitalize historic and cultural sites.

The other components of the General Plan reiterate these policies directed at protection of natural and cultural resources. Objectives presented in the Maui Island Plan (2012) include "*Preserve existing wetlands and improve or restore degraded wetlands*" (Objective 2.3.3) and "*Enhance the island's historic, archaeological, and cultural resources"* (Objective 2.1.3). Specific policies that relate to the project include:

- 2.3.3.b. Support and fund wetland protection and improvement, and restoration of degraded wetlands.
- 2.1.3.d. Promote the rehabilitation and adaptive reuse of historic sites, buildings, and structures.
- 2.1.3.f. Support opportunities for public involvement with the intent to facilitate the protection and restoration of historic and archeological sites, including consultation with stakeholders.

The Maui Island Plan establishes a variety of protected areas, which are intended to ensure that future development does not compromise Maui's unique and fragile natural resources. The proposed project falls within the Moku'ula, Loko o Mokuhinia Preservation Area, which includes TMKs (2)4-6-007:1 and 2 (Malu`ulu o Lele Park), TMK (2)4-6-007:36 (Friends of Moku`ula parking lot), and TMK (2)4-6-002:1 (Kamehameha Iki Park, *makai* of Front Street). Given the project objectives and constraints, the proposed project boundaries do not correspond exactly with the Preservation Area boundaries. Specifically, the proposed project would not involve any activities within the portion of the Preservation Area *makai* of Front Street (within Kamehameha Iki Park), but would extend beyond the Preservation Area boundaries to include the two Salvation Army parcels. The proposed project supports the intent of the Moku'ula, Loko o Mokuhinia Preservation Area, which is envisioned as an environmental and cultural restoration project that will reconstruct the royal compound and "redevelop the site as a cultural park/preserve."

The West Maui Community Plan includes as goals: "*A clean and attractive physical, natural and marine environment in which.....important scenic and open space resources are preserved and protected for public use and enjoyment*" and "*To preserve, protect and restore those cultural resources and sites that best represent and exemplify the Lāhainā region's pre-contact, Hawaiian Monarchy, missionary and plantation history*." Specific objectives and policies that relate to the project include:

- 1. Protect all waters and wetland resources. Such resources provide open space and habitat for plant and animal life in the aquatic environment. They are also important for flood control and natural landscape.
- 4. Establish programs to restore, maintain, and interpret significant cultural districts, sites and artifacts in both natural and museum settings.
- 5. Promote distinct cultural resources as an identifying characteristic of the region.
- 14. Encourage the development of "cultural parks" for visitation and education.
- 15. Encourage cultural and educational programs to perpetuate Hawaiian and other ethnic heritages.

The West Maui Community Plan lists important site types and areas in the West Maui region, which specifically includes Moku'ula Island. Furthermore, it establishes as a specific objective for Lāhainā Town "the restoration of and improvements to Malu`ulu o Lele Park and Moku`ula Island at the corner of Front and Shaw Streets."

8.5 Permit Requirements

Implementation of the proposed project would require permits from a variety of federal, state, and local agencies. The potential permits or approvals that are expected to be required, or could potentially be required, are presented in Table 34.

TABLE 34
Permits and Approvals Required for the Mokuhinia Ecosystem Restoration Project

Permit/Approval	Agency/Entity	Status
FEDERAL		
Endangered Species Act, Section 7 Compliance	USFWS	Initiated with consultation letter dated March 17, 2010; in progress
NEPA Compliance	USACE	In progress; this EA published on August 23, 2013
NHPA Section 106 Compliance	SHPO	Initiated with consultation letter dated February 22, 2010; in progress
CZMA Federal Consistency Determination	DBEDT, Office of Planning	Determination submitted for concurrence on August 7, 2013; in progress
NPDES Permit (CWA Section 402; HRS 342B)	DOH	To be obtained before construction
STATE OF HAWAI`I [a]		
State of Hawai`i Chapter 343 Compliance	County of Maui	In progress; this EA published on August 23, 2013
HRS Chapter 6E Compliance (SHPD Notification and Review)	SHPD	To be completed by the County of Maui
Well Construction/Pump Installation Permit[b] (HRS 174C)	CWRM	To be obtained before construction
Community Noise Permit[b]	DOH	To be obtained before construction, as needed
MAUI COUNTY		
SMA Use Permit[b]	County of Maui, Planning Commission	To be obtained before construction
Historic District Approval[b]	County of Maui, Historic Commission	To be obtained before construction
Flood Hazard Area Development Permit[b]	County of Maui Planning Department	To be obtained before construction
Construction Permits[b,c]	County of Maui, Public Works	To be obtained before construction

NOTES:

[a] Three of the TMKs that comprise the project site are owned by the State of Hawai`i and have been assigned to the County of Maui by State Executive Order. It is expected that some form of review and concurrence will be required from the State of Hawai`i Land Board for use of the parcels for the project.

[b] The USACE is not subject to regulation under these State and County regulations; therefore, compliance with the regulations will be the responsibility of the County of Maui.

[c] The County of Maui issues a variety of construction permits, including (but not limited to) building permits, driveway permits, and grading and grubbing permits. At a minimum, it is anticipated that a grading and grubbing permit will be required; the need for any other construction permits will be verified and obtained as needed.

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9.0 Stakeholder and Agency Consultation

9.1 Stakeholder and Agency Consultation

Stakeholder engagement efforts have been conducted to comprehensively address both the USACE policies relative to public involvement and the specific regulatory requirements for stakeholder consultation. In particular, NEPA and HRS Chapter 343 require public involvement as part of the environmental review process. In addition, Section 106 of NHPA requires consultation with interested parties and NHOs, as part of a federal agency's consideration of the effects of their proposed undertaking on historic properties.

As described in Section 1.8, and referenced through this document, a variety of stakeholder involvement efforts have been conducted throughout the planning process to date; specific stakeholder engagement events are listed in Table 35. The timing and focus of the various engagement events was determined in response to project-related needs and stakeholder interests and desires. Ongoing efforts to communicate and engage with project stakeholders are planned as part of the remainder of the project implementation process.

In addition to these stakeholder engagement efforts, agencies with regulatory authority relative to the project have also been consulted over the planning process. Agencies that have been consulted include USFWS, SHPD, the Office of Hawaiian Affairs, and the County of Maui. Copies of correspondence with these agencies are contained in Appendices B and J.

TABLE 35
Summary of Stakeholder Engagement Efforts

Date	Stakeholder	Topics Addressed
5/6/2010	Maui County Cultural Resource Commission	Meeting to obtain input relative to HTRW assessment
6/24/2010	Maui/Lanai Islands Burial Council	Meeting to obtain input relative to HTRW assessment
2/24/2011	Maui/Lanai Islands Burial Council	Meeting to obtain input relative to HTRW assessment
11/23/2011	Knowledgeable individuals, community members and cultural practitioners	Four small-group meetings to obtain input to planning process
12/9/2011	County of Maui	Briefing to provide project update, and obtain input to planning process
1/12/2011	County of Maui and Friends of Moku`ula	Strategy meeting for addressing issues on wetland restoration project
1/12/2011	Community members, cultural practitioners and lineal descendents	Five small-group meetings to seek input on stakeholder needs/desires
2/27/2012	County of Maui	Briefing to provide project update, and obtain input to planning process
3/1/2012	Maui County Cultural Resource Commission	Meeting to provide update on results of HTRW sampling
3/16/2012	Community members and cultural practitioners	Small-group meeting to obtain stakeholder input to planning process
4/24/2012	Na Kupuna o Maui	Meeting to obtain stakeholder input to planning process
4/24/2012	Waiola Church	Meeting to obtain stakeholder input to planning process
4/24/2012	Community members, cultural practitioners and lineal descendents	Three small-group meetings to obtain stakeholder input to planning process

TABLE 35
Summary of Stakeholder Engagement Efforts

Date	Stakeholder	Topics Addressed
5/15/2012	Na `Aikane o Maui	Meeting to provide project update, and obtain input to planning process
5/16/2012	Friends of Moku`ula	Briefing to provide project update, and obtain input to planning process
5/30/2012	Maui/Lanai Islands Burial Council	Meeting to update on results of soil sampling and obtain input to planning process
5/30/2012	County of Maui Planning Department	Meeting to discuss Chapter 343 and permitting requirements
5/30/2012	Public Scoping Meeting	Public meeting to obtain stakeholder input to planning process
8/29/2012	County of Maui Community Visioning Group[1]	Meeting to obtain input to planning process
9/13/2012	County of Maui Community Visioning Group	Meeting to obtain input to planning process
9/26/2012	County of Maui Community Visioning Group	Meeting to obtain input on wetland restoration measures
11/1/2012	County of Maui	Meeting to obtain input on conceptual alternatives
11/1/2012	USFWS staff for Kealia Pond	Meeting to obtain input on conceptual alternatives
11/1/2012	Friends of Moku`ula	Meeting to obtain input on conceptual alternatives
11/1/2012	County of Maui Community Visioning Group	Meeting to obtain input on conceptual alternatives
11/13/2012	County of Maui Community Visioning Group	Meeting to obtain input on conceptual alternatives
1/3/2013	Maui County Cultural Resource Commission	Meeting to obtain input on conceptual alternatives and potential impacts
1/18/2013	County of Maui	Meeting to obtain input on conceptual alternatives and potential impacts
2/4/2013	State Historic Preservation Division	Meeting to obtain input on conceptual alternatives and potential impacts
2/4/2013	Friends of Moku`ula	Meeting to obtain input on conceptual alternatives and potential impacts
2/4/2013	Na `Aikane o Maui	Meeting to obtain input on conceptual alternatives and potential impacts
3/25/2013	Office of Hawaiian Affairs	Meeting to obtain input to planning process
Spring 2013	As listed in the CIA (see Appendix D)	Interviews to obtain input on conceptual alternatives and discussion of potential impacts in support of Cultural Impact Assessment

NOTES:

[1] The County of Maui Community Visioning Group was convened by the County of Maui to obtain community input relative to the overall restoration of the Moku`ula/Mokuhinia site.

9.2 Distribution of Draft EA

The distribution list for the draft integrated Feasibility Report and EA is listed in Table 36. In addition, a limited number of documents will be provided as loan copies in libraries.

TABLE 36
Distribution List for Draft Integrated Feasibility Report and EA

Federal Agencies	
Department of the Interior, U.S. Fish and Wildlife Service	Department of the Interior, National Parks Service
U.S. Fish and Wildlife Service, Kealia Pond National Wildlife Refuge	Advisory Council on Historic Preservation
Department of Commerce, National Marine Fisheries Service	Dept. of Agriculture, Natural Resources Conservation Service
U.S. Geological Survey, Pacific Islands Water Science Center	U.S. Environmental Protection Agency, Pacific Islands Office
State Agencies	
Department of Accounting and General Services (DAGS)	Department of Land and Natural Resources (DLNR)
DAGS, Archives Division	DLNR, Division of Forestry and Wildlife
Department of Business, Economic Dev. and Tourism (DBEDT)	DLNR, Historic Preservation Division
DBEDT, Research Division Library	DLNR, Historic Preservation Division (Maui Office)
DBEDT, Office of Planning	Office of Hawaiian Affairs
Department of Education	University of Hawai`i, Water Resources Research Center
Department of Hawaiian Home Lands	University of Hawai`i, Environmental Center
Department of Health, Environmental Health Administration	University of Hawai`i, Maui College Library
County of Maui	
Department of Fire and Public Safety	Department of Public Works
Department of Environmental Management	Department of Transportation Services
Department Housing & Human Concerns	Department of Water Supply
Department of Parks and Recreation	Police Department
Department of Planning	
Libraries	
Legislative Reference Bureau	Lāhainā Public Library
Hawai`i State Library, Hawai`i Documents Center	Wailuku Public Library
Kahului Public Library	
Elected Officials	
US Senator Mazie Hirono	State Representative Angus McKelvey
US Senator Brian Schatz	Governor Neil Abercrombie
US Representative Tulsi Gabbard	Mayor Alan Arakawa
US Representative Colleen Hanabusa	County Councilperson Elle Cochran
State Senator Rosalyn Baker	
Organizations	
Aha Moku Council	Maui District Tennis Association
Association of Hawaiian Civic Clubs	Maui Lanai Island Burial Council
Friends of Moku`ula	Maui Native Hawaiian Chamber of Commerce
Hui Mālama I Na Kūpuna O Hawai`i Nei	Maui Nei

TABLE 36
Distribution List for Draft Integrated Feasibility Report and EA

Hui o Wa`a Kaulua	Na `Aikane o Maui
Kaanapali Beach Hotel Pookela Program	Na Kia`i o Waniee Committee
Kuleana Kuikahi	Na Kupuna o Maui
Lāhainā Hawaiian Civic Club	Office of Hawaiian Affairs
Lāhainā Restoration Foundation	Polanui Community Marine Managed Area Group
Lāhainā Town Action Committee	Waiokama-Waine`e Lineal Descendants Working Group
Maui County Cultural Resources Commission	Waiola Church
Interested Individuals	
Alberta Hoku	Keoki Freeland
Alyka Nakoa-Clark	Keoki Sousa
Anela Rosa	Kurt Miller
Archie Kalepa	Lani Minihan
Ben Pu`ou	Lehua Hough
Blossom Feiteira	Leiohu Ryder
Charlie Lindsey	Leslie Kuloloio
Charlie Makekau	Levan Keola Sequeira
Chris Hart	Lisa Agdeppa
Christina Currie	Lynette Chun
Cornelio Bancao	Makalapua Kanuha
David Hall	Mapuana Pali
Deann Kaina	Marty Stevenson
Don Lehman	Mary Helen Lindsey
Donna Sterling	Moani Whittle Wagner
Ed Kaahui	Nameaaea Hoshino
Ekolu Lindsey	Norm Bezane
Foster Ampong	Orpha Kaina
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Hokulani Holt-Padilla	Richard McCarty
Inez Okamura	Rita Medina
Jackie Hala	Roselle Bailey
James Gale	Sam Ahia
Jan and Grady Booch	Sam Sueo Kadotani

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Distribution List for Draft Integrated Feasibility Report and EA

Janet Bostick	Stan Manuia
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Kalapana Kollars	Thelma Shimaoka
Kamaunu Kahaiali`i	Uilani Kapu
Ke`eaumoku Kapu	Victoria Kaluna
Kehau Ka`auwai	W. Kmentt
Keka Filimoeatu	William Smith
Kekoa Yap	Zasha Jimenez
Kent Stewart	
Adjacent Landowners	
Alano Club of Lāhainā	Lāhainā Shores
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Donald and Natsuko Okano	RHS Enterprises, Ltd.
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Faraz Azizsoltani	State of Hawai`i
Franita Gomez and Angeline Dolfo	State of Hawai`i
Haleleilani	Steve and Diana Walton
Hoaloha Na Eha, Ltd.	Ueleni Hala`apiapi and Nicole Groen Hala`aipaipi
Holy Innocents Episcopal Church	Wainee Protestant Church (Waiola Church)
Honpa Hongwanji Mission	Walter and Monica Chihara
JDI Limited Partners	
News Media	
Honolulu Star Advertiser	Lāhainā News
Maui News	

9.2.1 Agency and Public Comments and Responses

A summary of the comments received on this draft integrated Feasibility Report and EA, and the response provided to each, will be provided in the final document.

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10.0 Summary and Conclusions

10.1 Summary of Impacts

Table 37 summarizes the impacts of the proposed action and the measures that would be implemented to avoid or minimize these impacts. The proposed measures are anticipated to avoid and minimize the potential impacts identified in this EA such that implementation of the proposed action would result in no significant impacts to human health or the environment.

TABLE 37
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Category	Degree of Impact			Mitigation Measures to Avoid or Minimize Impact
	Significant	Less Than Significant	No Impact	
Climate		x		The proposed action would be expected to have a negligible impact relative to climate; n avoidance or minimization measures are proposed.
Land Use			x	The proposed action would not be expected to adversely impact land use; no avoidance o minimization measures are proposed.
Geology and Soils		x		To avoid and minimize erosion-related impacts associated with ground disturbance, BMPs would be implemented during and after construction. Specific BMPs will be described as part of a SWPPP, and are expected to include those listed below for hydrology and water resources.
Hydrology and Water Resources		x		Measures to avoid and minimize construction-related impacts to groundwater include: • Excavation would be timed to occur during the period when groundwater levels are expected to be lowest, with dewatering conducted as necessary. • Proper handling procedures would be used for fuel and lubricants required for construction equipment. • Vehicles and equipment would be inspected daily for leaks and/or contamination. Measures to avoid and minimize sedimentation and other stormwater-related impacts will be described as part of a SWPPP, and are expected to include the following: • Construction activities would be sequenced to minimize the exposure time of cleared areas. • The extent of clearing and grubbing would be minimized, and will include only those areas necessary for grading, site access, and equipment operation. • To avoid fugitive dust emissions, soil stockpile areas that contain more than 100 cubic yards of material would be covered, or kept continuously wet. • Disturbed soil that is not subject to re-vegetation, paving, or development would be stabilized using approved soil binders, jute netting, or other methods. • All trucks hauling dirt, gravel, or other loose materials would be covered. • Erosion and sediment control measures (for example, silt fences) would be installed before earth moving activities are initiated, and will be inspected and properly maintained throughout the construction period. • Vegetation and/or other soil stabilizers would be installed as soon as practical after final grading.
Biological Resources		x		Measures to avoid and minimize construction-related impacts to the Hawaiian hoary ba include: • Removal of any woody vegetation with heights that exceed 15 feet would be restricted to outside the season when lactating or non-volant bats could be present (June 1 through September 15). Measure to avoid and minimize long-term impacts to Hawaiian waterbirds that could utilize th restored wetland habitat include:

TABLE 37
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Category	Degree of Impact			Mitigation Measures to Avoid or Minimize Impact
	Significant	Less Than Significant	No Impact	
				• Focus of the restoration plan on suitable foraging habitat for Hawaiian stilt and coot, avoiding conditions that encourage nesting. • Concentration of suitable foraging habitat in those portions of the project site that do not interface with areas that are regularly accessed by the public (for example, away from existing roads and sidewalks). • Construction of an outlet to increase groundwater exchange and improve circulation, thereby reducing the potential for botulism outbreaks. • Installation of a fence around the entire perimeter of the site to provide predator control. • Inclusion of specific predator management activities, including monitoring and trapping, as part of O&M; specific O&M activities, including those related to predator management efforts, will be described in a detailed O&M plan (to be developed as part of the final design phase, with ongoing input from USFWS).
Archaeological, Historic, and Cultural Resources			x	Measures to avoid and minimize impacts to archaeological resources include: • A 10-meter buffer would be maintained around the estimated boundary of Moku`ula • An Archaeological Monitoring Plan (AMP) would be developed and approved by SHPD prior to the start of any ground disturbing activities. The AMP would provide details on how the monitoring shall be performed; identification and collection of cultural layers and materials; collection and analysis of other cultural material such as charcoal samples for radiocarbon dating, bulk midden samples, and artifacts; and performance of standard documentation, including scaled maps, profiles, photographs, detailed soil and provenience descriptions, and interpretation. • Excavation of soil greater than 2 feet bgs would be conducted in 6-inch increments, using GPS-mounted machinery, to allow for careful removal and inspection of the material. • A qualified archaeological monitor would be present during all ground-disturbing activities. In the event that the monitor identifies archaeological materials, work in that area would be stopped immediately to allow the monitor to investigate the nature of the discovery. In the event that human remains are identified, SHPD shall be immediately notified and no further work would occur in the area unless specifically requested by SHPD. Additional details regarding the handling of any archaeological features would be outlined as part of the AMP. Measures to avoid and minimize impacts to cultural resources include: • Placement of maintenance path in restoration design, such that corridor is maintained along historic path that runs adjacent to Waiola Church • Accommodation of stone steps near Waiola Church by including a symbolic "canoe corridor" (between the vicinity of the steps and Moku`ula) in restoration design • Require that consultants and contractors be briefed on the nature of the site prior to the commencement of work • Allow for Native Hawaiian cultural protocol to be preformed prior to the start and at the end of any ground disturbing activity
Recreation		x		In anticipation of the overall restoration of the site, the County of Maui has already conducte the following measures: • Resurfacing and providing lighting at the basketball courts at the Lāhainā Aquatic Center • Construction of four new baseball fields at the Lāhainā Aquatic Center • Addition of three new tennis courts to the existing courts near the Lāhainā Civic Center
Visual and Scenic Resources		x		The proposed action would be expected to have minor construction-related impacts, with long term benefits relative to visual and scenic resources; no avoidance or minimization measure are proposed.
Hazardous,			x	Measures to avoid and minimize the potential for HTRW-related impacts include:

TABLE 37
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Category	Degree of Impact			Mitigation Measures to Avoid or Minimize Impact
	Significant	Less Than Significant	No Impact	
Toxic and Radioactive Waste				• Use of proper handling procedures for construction equipment fuel and lubricants • Daily inspection of vehicles and equipment for leaks and/or contamination
Air Quality				Measures to avoid and minimize potential impacts on air quality include: • All construction equipment would be maintained in proper tune according to manufacturer's specifications. • To the extent feasible, construction would use diesel construction equipment that meets current certification standards. • The extent of ground disturbance will be minimized where possible. • Water trucks will be used to minimize the amount of airborne dust associated with the site. • Dirt stockpile areas containing more than 100 cubic yards (76.5 cubic meters) of material will be kept covered or continuously wet. • Vehicle speed for all construction vehicles moving on any unpaved surface at the construction site will be limited to 15 miles per hour or less. • All trucks hauling dirt, sand, soil, or other loose materials will be covered.
Noise		x		Measures that would be implemented to avoid and minimize potential noise-related impact include: • Proper tuning and balancing of construction equipment, and maintenance in accordance with the manufacturer's specifications • Use of noise barriers and/or mufflers on diesel and gasoline engines • Restriction of construction activities to typical working hours • Keeping unnecessary noise to a minimum
Transportation and Traffic		x		Measures that would be implemented to avoid and minimize potential traffic-related impact include implementation of traffic controls, including signage, flagging or other appropriat methods.
Public Utilities			x	The specific location of utility lines within the Front Street and Shaw Street rights-of-way will b determined as part of the next phase and will be reflected in the final design. Standard BMPs t protect these lines, including appropriate setbacks, would be implemented during construction.
Health and Human Safety			x	No human health or safety-related impacts are anticipated; no avoidance or minimizatio measures are proposed.
Socioeconomic Characteristics			x	No socioeconomic or environmental justice impacts are anticipated; no avoidance o minimization measures are proposed.
Cumulative Impacts		x		When considered in combination with other actions, the proposed project could potiantiall have cumulative impacts to geology and soils, air quality, water resources, hazardous materials noise, and visual resources. However, avoidance and minimization measures would b implemented, such that cumulative impacts would be insignificant.

10.2 NEPA and HRS Chapter 343 Determination

Based upon the findings of the EA process, implementation of the proposed action is not expected to result in a significant adverse direct, indirect or cumulative impact on the quality of the environment. The proposed action would restore aquatic habitat associated with Loko o Mokuhinia, including conditions that historically occurred onsite. The project would provide suitable foraging habitat for endangered Hawaiian waterbirds and migratory/shorebird species. In addition to re-establishing ecosystem functions

and process, the project would also provide a foundation for the subsequent cultural revitalization of the overall Moku`ula/Mokuhinia site.

As the lead agency under NEPA, and based upon the analysis of potential impacts as presented in this document, the USACE has determined that the proposed action would not constitute a major federal action affecting the quality of human health or the environment. Because there would be no significant impact resulting from project implementation, the USACE anticipates rendering a Finding of No Significant Impact (FONSI) for the proposed project. As such, an Environmental Impact Statement (EIS), the next higher level of environmental impact investigation under NEPA, is not required for this action.

Pursuant to HRS Chapter 343, the County of Maui also anticipates the determination for this project to be a FONSI, in accordance with HAR Section 11-200-9. This assessment is based on an evaluation of the project impacts in relation to the significance criteria specified in HAR 11-200-12(b), as summarized in Table 38.

TABLE 38

Evaluation of Significance Criteria (from HAR Section 11-200-12)

Significance Criteria	Project Evaluation
Involves an irrevocable commitment to loss or destruction of any natural or cultural resource	The proposed project is not expected to destroy any cultural or natural resources; the project would restore aquatic ecosystem functions and values, and is expected to provide opportunities for future cultural revitalization of the site.
Curtails the range of beneficial uses of the environment	The proposed project will restore wetland habitat that historically occurred onsite, thus maintaining the beneficial uses of the environment.
Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders	The proposed project is consistent with the environmental goals and objectives of the State of Hawai`i, particularly through augmentation of natural resources and safeguarding of unique natural environmental characteristics in a manner that balances human welfare and nature.
Substantially affects the economic welfare, social welfare, and cultural practices of the community or State	The proposed project would not substantially affect economic or social welfare; it is expected to be beneficial to Hawaiian cultural practices and cultural awareness by providing a tangible connection to a culturally sacred place.
Substantially affects public health	The proposed project would not adversely affect public health.
Involves substantial secondary impacts, such as population changes or effects on public facilities	The proposed project is not expected to induce changes in land use, population size or public facilities.
Involves a substantial degradation of environmental quality	The proposed project would not result in substantial degradation of environmental quality; it involves restoration of wetland habitat that historically occurred onsite.
Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions	The project is one part of a larger effort to restore the site Moku`ula/Mokuhinia site, but implementation would not create a commitment for other actions by another party. When considered in combination with other actions, the proposed project could potentially have cumulative impacts to stormwater, noise, air quality and traffic. However, avoidance and minimization measures would be implemented, such that cumulative impacts would be insignificant.

TABLE 38

Evaluation of Significance Criteria (from HAR Section 11-200-12)

Significance Criteria	Project Evaluation
Substantially affects a rare, threatened, or endangered species, or its habitat	Construction of the proposed project is not expected to affect any rare, threatened, or endangered species, or its habitat. It would provide suitable foraging habitat for the endangered Hawaiian stilt and coot; the potential for long-term impacts to these species (for example, because of predation and/or a botulism outbreak) have been addressed through avoidance and minimization measures, such that implementation of the project would provide a long-term net benefit to the species.
Detrimentally affects air or water quality or ambient noise levels	The proposed project could result in impacts to air or water quality and noise levels during construction. However, these impacts are expected to be temporary and would be minimized through the implementation of standard BMPs.
Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters	The project site is located within the 1-percent-annual-chance flood zone. Although there is a potential for flooding within the site, these conditions would not be expected to adversely affect functionality of the restored wetland. As wetlands naturally function to attenuate flood waters, implementation of the project is not expected to worsen flooding conditions.
Substantially affects scenic vistas and viewplanes identified in county or state plans or studies	Implementation of the proposed project is expected to positively affect aesthetics in the project vicinity. It is not expected to restrict any existing view planes, including those east toward the West Maui Mountains, west toward the Pacific Ocean (particularly those views from Waiola Church), and/or along Front and Shaw Streets.
Requires substantial energy consumption	The proposed project would not require substantial energy consumption. While there would be short-term construction-phase energy consumption, over the long-term, the project would require relatively low levels of energy (primarily associated with operation of the groundwater pump).

10.3 Cost-Sharing and Implementation Responsibilities

Under the cost-share agreement for this project, the non-federal sponsor is responsible for providing all LERRDs, 100 percent of OMRR&R, and cash to equal not less than 35 percent of total project cost (see ER 1105-2-100; Appendix F Amendment #2 (31 January 2007), paragraphs F-3.h and F-30.b).[48] As the project costs are anticipated to exceed the cost threshold (based on federal participation limits and the cost-share percentages for this project), costs beyond the federal participation limit will also be the non-federal sponsor's responsibility. The value of LERRDs can be applied towards the non-federal sponsor's cost-share responsibility. Up to 100 percent of the non-federal sponsor share can be provided as in-kind services. The remaining non-federal share is provided in cash after credit is applied for LERRD and in-kind services. Potential in-kind services will be outlined and agreed upon before signature of the PPA. The specific cost-shared amounts of the preliminary total project costs are summarized in Table 39; these costs will be further refined in the design and implementation phase.

[48] The value of LERRDs can be applied towards the non-federal sponsor's cost-share responsibility. Up to 100 percent of the non-federal sponsor share can be provided as in-kind services. The remaining non-federal share is provided in cash after credit is applied for LERRD and in-kind services. Potential in-kind services will be outlined and agreed upon before signature of the PPA.

TABLE 39
Cost Share Summary

Items	Total ($)	Federal Share ($)	Non-Federal Share ($)
Preliminary Restoration Plan[1]	$10,000	$10,000	$0
Feasibility Study (65/35)	$1,510,000	$981,500	$528,500
Preconstruction Engineering and Design (65/35)	$1,007,000	$654,550	$352,450
Construction (65/35)	$7,151,000	$4,648,150	$2,502,850
LERRDs	$1,787,000	$0	$1,787,000
Work In-Kind[2]	$0		$0
Total Project Cost Share Adjusted for Statutory Federal Participation Limits[3]	**$11,465,000**	**$5,000,000**	**$6,465,000**

NOTES:
[1] The preliminary restoration plan that is prepared for the reconnaissance study is 100 percent federally funded.
[2] The County of Maui may provide some work in-kind for the project; this work would be identified and accounted for as part of the final feasibility report.
[3] The non-federal total includes the cost of the LERRDs. A total of $4,678,000 in cash and or in-kind services is required for the cost sharing agreement. Potential work-in-kind services will be outlined and agreed upon before signature of the PPA.

The total cost share that the County would need to provide is $6,465,000, including the LERRDs, and $4,678,000 in any in-kind services and cash.

10.4 Views of the Non-Federal Sponsor

As the non-federal sponsor, the County of Maui has expressed their full support for the proposed project and acknowledged their financial and other implementation responsibilities. In particular, they have identified this as a priority project and have accepted responsibility for the additional costs beyond the federal participation limits. These views were expressed in a letter of support to the USACE dated May 3, 2013.

Recommendation

I have considered all significant aspects of the project, including the cultural, environmental, social, and economic effects, engineering feasibility, economic feasibility, and the overall public interest. I recommend that the plan selected herein (Alternative 8A) to restore wetland habitat for endangered Hawaiian waterbirds and migratory/shorebird species in Lāhainā, Hawai`i, be authorized for implementation with such modifications thereof as in the discretion of the Commander, U.S. Army Corps of Engineers, may be advisable.

Authorization is subject to cost-sharing and financing arrangements with the non-federal sponsor, the County of Maui, and is based on the cost-sharing and financing requirements of Section 206 of the WRDA of 1996, as amended. The total project cost (fully funded) of the tentatively selected plan is $11,465,000. Based on the statutory federal participation limits, the federal share of the total project cost is $5,000,000 and the estimated non-federal share is $6,465,000. The non-federal costs include LERRDs, which is estimated to be $1,787,000. Before carrying out any project under Section 206, the non-federal sponsor must enter into a binding agreement to provide all LERRDs necessary to carry out the project; agree to pay 100 percent of the OMRR&R costs associated with the project; hold the U.S. government harmless from any claim or damage that may arise from carrying out the project, except any claim or damage that may arise from negligence of the federal government or a contractor of the federal government; and agree to operate and maintain the project after construction. This recommendation is subject to agreement by the non-federal sponsor to perform the required items of cooperation; these include, but are not limited to:

- Provide not less than 35 percent of total project costs as further specified below:
  - Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material, perform or ensure performance of all relocations, and construct improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material that the Government determines to be required or to be necessary for construction, operation, and maintenance of the project
  - Perform all post-construction monitoring activities necessary to determine if predicted outputs of the project are being achieved
  - Provide, during design and construction, any additional funds necessary to make its total contribution not less than 35 percent of total project costs
  - Be responsible for all costs in excess of the Section 206 project limit on USACE's total financial obligations for the planning, design, construction, and monitoring of the project and pay any such costs in accordance with the applicable provisions of the project partnership agreement
- Shall not use funds from other federal programs, including any non-federal contribution required as a matching share therefor, to meet any of the non-federal obligations for the project unless the federal agency providing the federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized
- Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function

- Shall not use the project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project
- Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act
- For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, at no cost to the federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable federal and state laws and regulations and any specific directions prescribed by the federal government
- Give USACE a right to enter, at reasonable times and in a reasonable manner, upon property that the County now or hereafter owns or controls for access to the project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, rehabilitating, or replacing the project
- Hold and save USACE free from all damages arising from design, construction, monitoring, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of USACE or its contractors
- Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project for a minimum of three years after completion of the accounting for which such books, records, documents, or other evidence were required, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 CFR Section 33.20
- Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c)
- Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that USACE determines to be required for construction, operation, and maintenance of the project
- Be responsible, as between USACE and the County, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that USACE determines to be required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination

- Agree, as between USACE and the County, that the County shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA
- Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element
- Be responsible for all costs associated with any betterments included in the design or construction of the project
- At no cost to the federal government, and prior to initiation of construction of the project, complete planned upgrades to the ditch along the northerly boundary of the project site as described in the Lāhainā Town Drainage Master Plan

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are authorized for implementation funding.

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Lt. Colonel Thomas D. Asberry
District Engineer, Honolulu District

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11.0 List of Preparers

The primary persons responsible for contributing to, preparing and reviewing this report are listed in Table 40.

TABLE 40
List of Preparers and Reviewers

Name	Primary Responsibility
Athline Clark; USACE Honolulu District	Project manager
Jarrett Hara; USACE Honolulu District	Hydrology and hydraulics
Kanalei Shun; USACE Honolulu District	Cultural and archaeological resources
Raymond Kong; USACE Honolulu District	Geotechnical engineering
Mike Sakai; USACE Honolulu District	Real estate
Bob Finch; USACE Honolulu District	Economics
Tracy Kazunaga; USACE Honolulu District	Cost Engineering
Sarah Falzarano; USACE Honolulu District	GIS data management and mapping
Joe Bonfiglio; USACE Honolulu District	Public relations
Dawn Chang; Ku`iwalu	Stakeholder involvement
Lisa Kettley; CH2M HILL	Plan formulation; biological resources
Paul Luersen; CH2M HILL	Program manager
Rob Healy; CH2M HILL	Hydrology and hydraulics
Henriette Emond; CH2M HILL	Hydrology and hydraulics; conceptual restoration design
Phil Pasteris; CH2M HILL	Climate change
Chrissy Thom; CH2M HILL	Cost benefit analysis
Lauren Chamblin, CH2M HILL	Cost benefit analysis
Peggy O'Neill, CH2M HILL	Conceptual restoration design
Tanya Lee-Greig; Cultural Surveys Hawai`i	Cultural and archaeological resources
Ray Mangan; Critigen	GIS data management and mapping
Leslie O'Connor; CH2M HILL	Technical editor

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APPENDIX A

Final Hydrogeologic Assessment Report

Hydrogeologic Assessment Report
Lahaina, Maui

MOKUHINIA/MOKUULA
ECOSYSTEM RESTORATION PROJECT
Contract No.: W9128A-06-D-0001

Prepared for:

United States Army Corps of Engineers
Programs and Project Management Division
Civil and Public Works Branch
Honolulu, HI

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1 Executive Summary

The U.S. Army Corps of Engineers Honolulu District, in partnership with the Maui County Department of Planning and the Friends of Mokuʻula, are proposing to restore a pond and surrounding wetland system called Mokuhinia in Lahaina, Maui, Hawaiʻi. The pond included the sacred island of Mokuʻula and both the pond and island were covered in the early 1900's. The original wetland was sustained by fresh water from surface and groundwater sources. Since current drainage plans call for diverting all surface drainage away from the Mokuhinia Pond study area, there is a need to better understand the groundwater flow in the area and determine if the groundwater flows are sufficient to sustain the proposed pond and surrounding wetland system.

The calculated groundwater flow through the study area, based on twelve months of water level data, is adequate to sustain the restored Mokuhinia Pond and surrounding wetland system. The average total summer (May through September) groundwater and rainfall input to the pond was calculated to be about 53,000 gallons per day. Of this value, 25,000 gallons per day will be lost to evapotranspiration. Therefore, about 28,000 gallons per day will flow through the pond and eventually as groundwater to the Pacific Ocean during the summer. During the winter (October through April) an average of 69,000 gallons per day will flow through the pond as groundwater. The proposed pond and surrounding wetland is not expected to interfere with existing groundwater uses in the area.

Water levels in the pond will vary from about 3 feet above sea level in summer to over 6 feet above sea level during heavy rains. The pond should not be deeper than seven to eight feet below ground surface (-2 ft mean sea level) as there is an abrupt increase in salinity at about -4 feet MSL in the deepest monitor well. Pond salinity is expected to vary from 2.1 to 9.8 ppt. Supply wells will not be necessary to maintain water levels in the wetland but may be necessary to maintain circulation in the pond.

2 Introduction

The U.S. Army Corps of Engineers Honolulu District, in partnership with the Maui County Department of Planning and the Friends of Moku‘ula, are proposing to restore a pond and its surrounding wetlands with significant cultural and ecological significance within the grounds of the Malu ‘Ulu o Lele County Park in Lahaina, Maui, Hawai‘i. Historically, the wetlands at the current Malu ‘Ulu o Lele County Park, areas known as Moku‘ula or Mokuhina, included a main pond, an island, natural springs, lo‘i kalo, and native sedges. The original wetlands were probably sustained by fresh water from surface and groundwater sources. These wetlands were intentionally covered with fill material in the early 1900s.

Present-day fresh water sources available for the Moku‘ula/Mokuhina wetland restoration are limited. Current drainage plans for Lahaina call for diverting all surface water away from the Moku‘ula/Mokuhinia area. Drainage from the landward (mauka) areas will be diverted around Lahaina and local drainage will be conveyed past Moku‘ula/Mokuhinia. Without surface water, the only other source of fresh or brackish water for wetland restoration and maintenances is groundwater. This hydrogeologic assessment analyses the potential for groundwater sources to restore and sustain Moku‘ula/Mokuhina wetlands on their original site.

2.1 Purpose

The purpose of this assessment is to study the feasibility of using groundwater in Mokuhina Pond to restore and sustain the previously existing wetlands. The goal of the wetland restoration is to achieve the previously existing natural ecosystem functions and processes, to create aquatic habitat for native and endangered water fowl species, and to regain recognition of the historical and cultural significance of the site. Excavation is recommended as the method to reestablish the pond, island, natural springs, lo‘i kalo, and native sedges that surrounded the wetland.

2.2 Scope

The scope of this hydrogeological assessment is to analyze the groundwater and fresh water characteristics to determine if the local groundwater system will be adequate and sufficient to restore and sustain the proposed wetland. Also, the analyses contained herein will address whether or not the wetland restoration would interfere with existing groundwater uses.

The following sections discuss the Moku‘ula/Mokuhina study area (Section 3), the hydrogeologic analysis (Section 4), discussion of results (Section 5), and recommendations (Section 6).

3 Study Area Description

The study area is within the present boundaries of Malu ‘Ulu o Lele Park located at 504 Front Street, Lahaina, Maui, Hawai‘i, on the southwest coastline of the Island of Maui (Latitude 20.869 N, Longtitude156.675 W; TMK 2-4-6-07:002). The project location map is provided in Figure 3-1. The property is zoned HD1, Historic District. Land use restrictions within this zoning category are extensive.

The topography of the site is flat, approximately five to seven ft above sea level with few obstructions (Figure 3-2). The total property area being considered under this investigation is about 7.5 acres. The study area is mostly grassed and includes tennis courts, basketball courts, baseball diamonds and parking lots.The property is mauka, or northeast, of Front Street just across the street from the Kamehameha Iki County Park. The upper (northeast) side of the property is bordered by churches fronting Waine‘e Street. The northwest boundary consists of a small ‘auwai, or water filled ditch, running along Mokuhina Place. There are several homes and an adult day care center across the ‘auwai. The southeast boundary consists of a vacant lot leased by the Friends of Moku’ula, two private residences one of which is occupied by The Salvation Army and a paved parking lot, all facing Shaw Street.

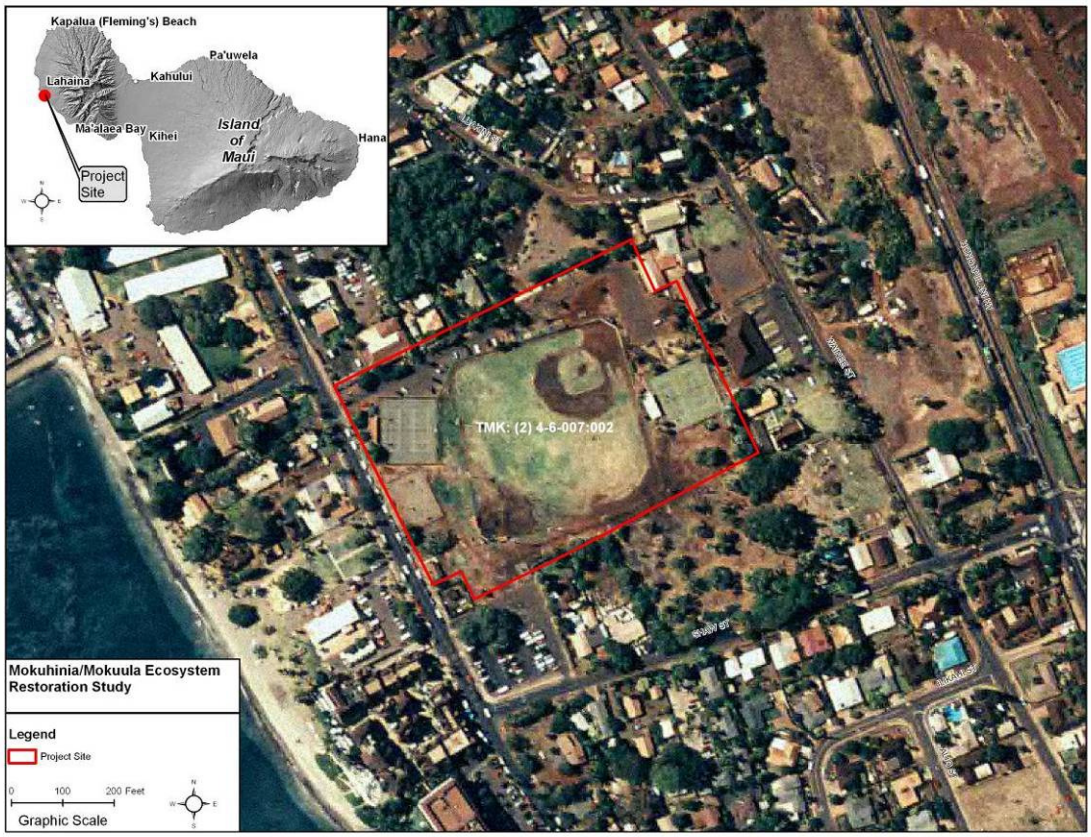

Figure 3-1. Location Map of Mokuhinia/Moku'ula Study Area; Maui, Hawai'I (Imagery from NOAA 2002)

Figure 3-2. Mokuhinia/Moku'ula Study Area, Looking West Towards the Ocean (Photo Taken 8-5-08)

3.1 Geology

The study area is located on a thin wedge of alluvium on the west flank of the West Maui Volcano. The volcanic rocks of West Maui have been divided into the Wailuku Basalt, the Honolua Volcanics and the Lahaina Volcanics (Figure 3-3). The Wailuku Basalt is located under the thin wedge of alluvium immediately underlying the study area. The Wailuku Basalt is a thin-bedded shield-stage tholeiitic basalt with an average age of 1.32 million years (Langenheim and Clague 1987). The Wailuku Basalt has an unusually steep dip of about 10 degrees (Stearns and Macdonald 1942). The Honolua Volcanics and Lahaina Volcanics are younger post-shield stage lavas. The Honolua Volcanics outcrop about 1.7 miles northeast of the study area and the Lahaina Volcanics outcrops about 1 mile north of the study area. They occur near the study area but these rocks do not outcrop in the study area and are unlikely to affect the local hydrogeology.

Terrestrial and marine sedimentary deposits cover the Wailuku Volcanics in the Lahaina area in a relatively thin wedge shaped deposit near the coast. The coastal wedge of sediment is covered with carbonate beach and by alluvium that

contains a large fraction of silt and mud. In Hawai'i, this wedge of sedimentary material is often referred to as caprock. It is mapped as alluvium on the Figure 3-3. Caprock can be composed of many materials but commonly it includes sand, coral limestone, rock fragments, silty marsh deposits or alluvial soil deposits. The sediments and weathered top portion Wailuku Basalt probably act as a leaky confining layer to the Wailuku Basalt aquifer and impede groundwater discharge somewhat.

Near the coast, drilling logs show that the sediments overlying Wailuku Basalt are as much as several tens of feet thick. This is supported by drilling records from well no 5240-05 (Figure 3-4). The well, located in Lahaina, about 0.5 miles northwest of the study area is 78 feet deep and approximately 700 ft from the shore and is completed in the Wailuku Basalt and extends through the caprock.

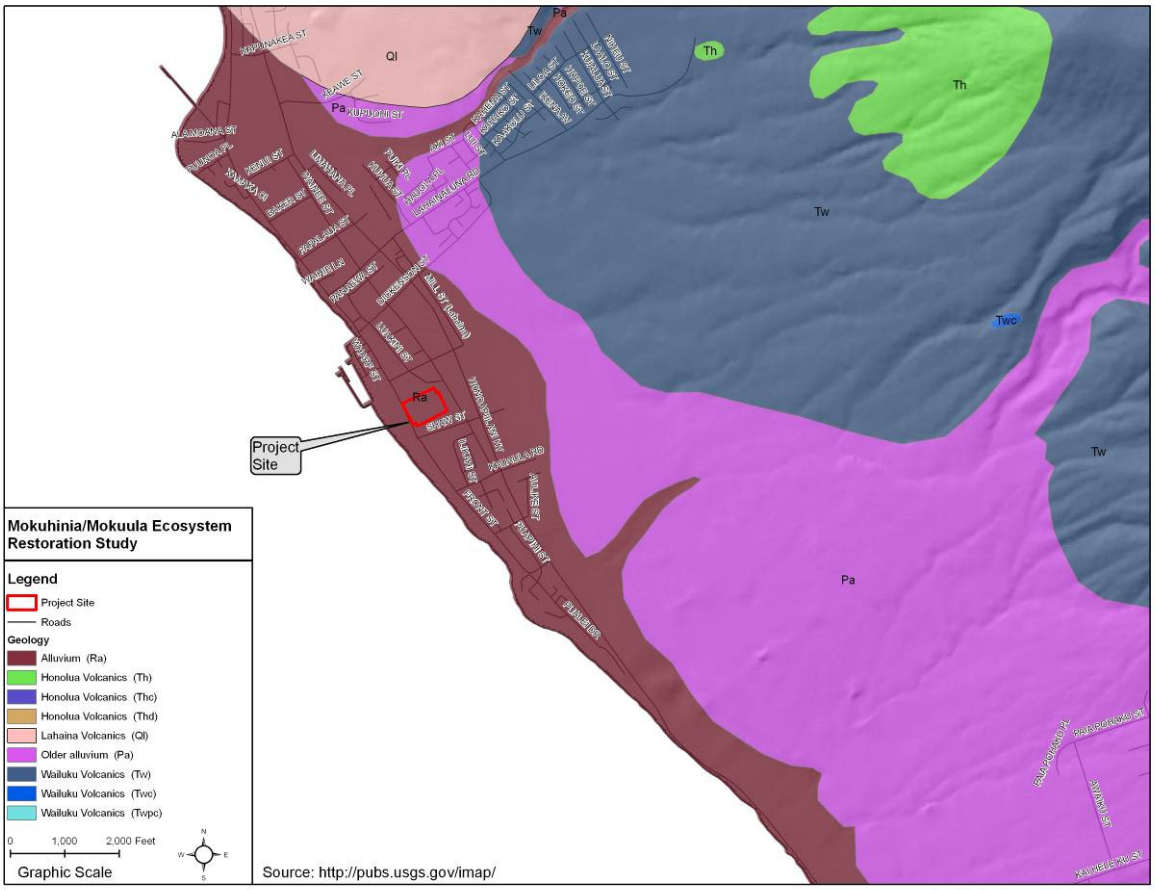

Figure 3-3. Geological Map of Mokuhinia/Moku'ula Study Area

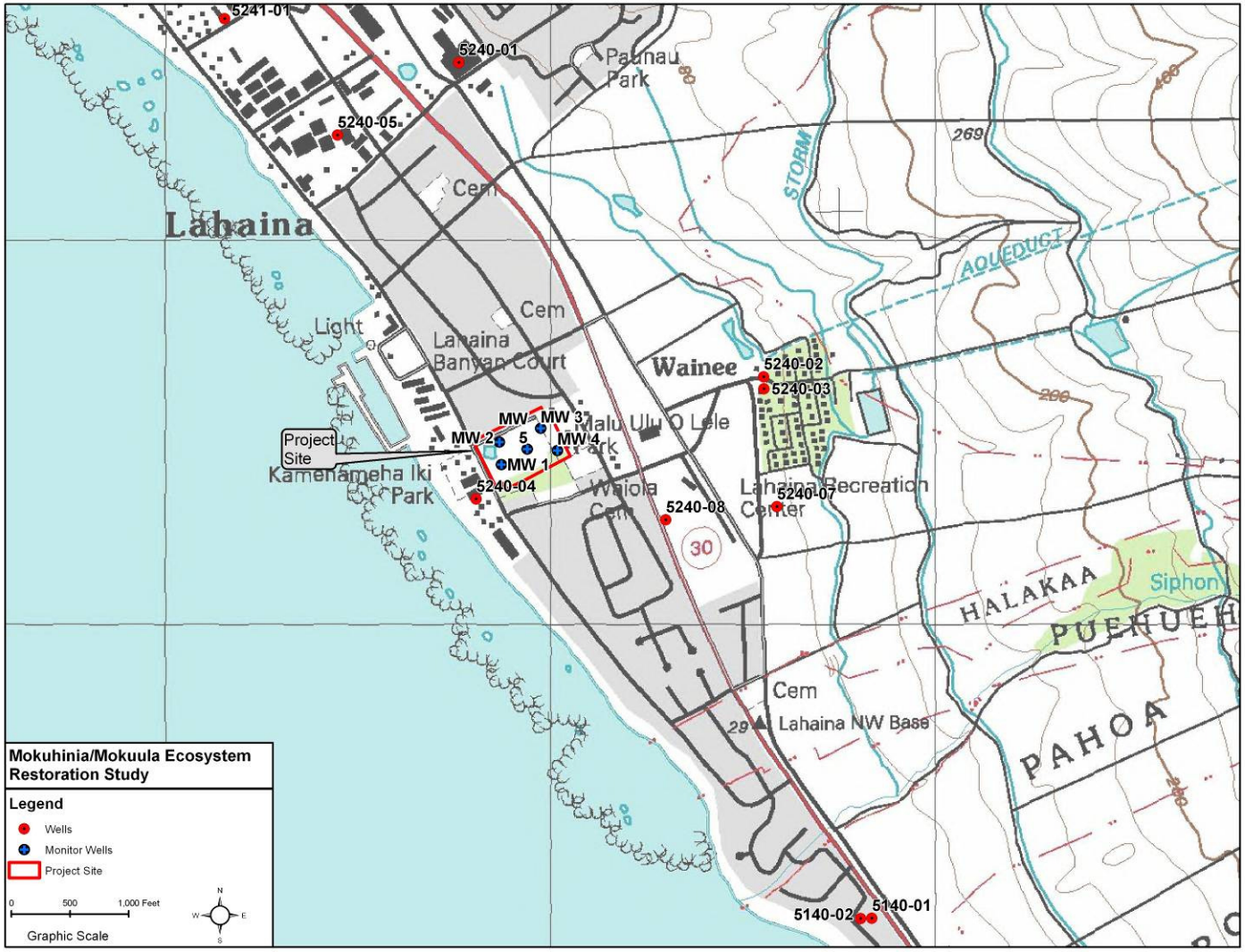

Figure 3-4. Map of Wells in the Immediate Vicinity of the Mokuhina/Moku'ula Study Area

3.2 Hydrology

3.2.1 Groundwater

Groundwater in West Maui occurs primarily in a fresh water lens system, often referred to as basal groundwater in Hawai'i. Also, in the inland areas adjacent to the rift zones there are high-level dike-impounded groundwater systems. In a basal or fresh water lens system lower density (lighter) fresh water can be thought of as floating on higher density (heavier) salt water. The fresh and salt water are separated by a mixing or transition zone where salinity gradually increases from near fresh to near sea water quality. The quantity of available fresh water is partially a function of the dynamics of the transition zone. Factors such as tides, pumpage, variable recharge or low groundwater flow can result in thickening of the transition zone and a brackish lens. Aquifers with relatively thick transition zones (relative to the vertical thickness of the fresh water zone) are generally more brackish.

Most of the basal groundwater in West Maui occurs in the Wailuku Basalt. There are also smaller basal groundwater bodies in the caprock and valley fill deposits (Stearns and Macdonald 1942). Salinity in the basal caprock aquifers is generally higher than the water salinity in the basal Wailuku Basalt aquifer. Water levels in the basal aquifers are generally lowest near the coast and gradually increase further inland. The groundwater flow gradient is often very low with water levels declining very gently towards the coast. Basal groundwater can discharge into the ocean through three different paths: (1) Under the caprock and directly into the ocean from the basalt; (2) into the caprock and then into the ocean; or (3) into the caprock and then into the soil or any remaining coastal wetland systems. The basal basalt aquifer is primarily recharged by rainfall in the mountainous interior of the island. Recharge to the smaller caprock aquifers is primarily from the basalt aquifer. Local rainfall is probably only a significant source of recharge during heavy winter storms.

During the dry summer months the former wetlands in the Lahaina area were probably sustained by groundwater inflow that originated from the Wailuku Basalt aquifer. The groundwater inflow discharged into the thin wedge of caprock and then probably surfaced in the wetlands as springs. Figure 3-5 shows a conceptual model of groundwater flow. Historical records indicate that the ponds and wetlands system in the Lahaina area was extensive (Kleiger and others 1995; Figure 3-6). Records also indicate that springs were found in the area (U.S. Army Corps of Engineers 2004).

Mokuhinia is located in the Launiupoko Aquifer System Area of the Lahaina Sector (Figure 3-7). The sustainable yield of fresh water in this area is 8 million gallons per day (mgd). There are 29 wells, tunnels and shafts in the aquifer system. The total reported pumpage from the aquifer system is 0.690 mgd (2006 data from the Commission on Water Resource Management [CWRM]; Table 3-1)

with the majority of the water pumped by the Maui Department of Water Supply. Pumpage in the aquifer system area is probably higher than indicated here because many water users do not report their pumpage to CWRM. For example, the Lahaina Recreation Center wells (5240-07 and 08) are currently in use for turf irrigation but there is no official record of well pumpage. These wells have a combined pump capacity of 210 gallons per minute. Well 5240-07 is 0.34 mile from the study area and well 5240-08 is 0.20 mile from the study area.

Owner	Well No.	2006 Pumpage (gal/day)
Maui Department of Water Supply	5359-01, 02, 03, 04	527,778
Laniupoko Water Company	5137-01, 5138-01	96,820
Puamana Community	5140-01, 02	63,992
Lahaina Surf	5241-01	2,298
Total Laniupoko		690,888

Table 3-1. Laniupoko Aquifer System Reported Pumpage

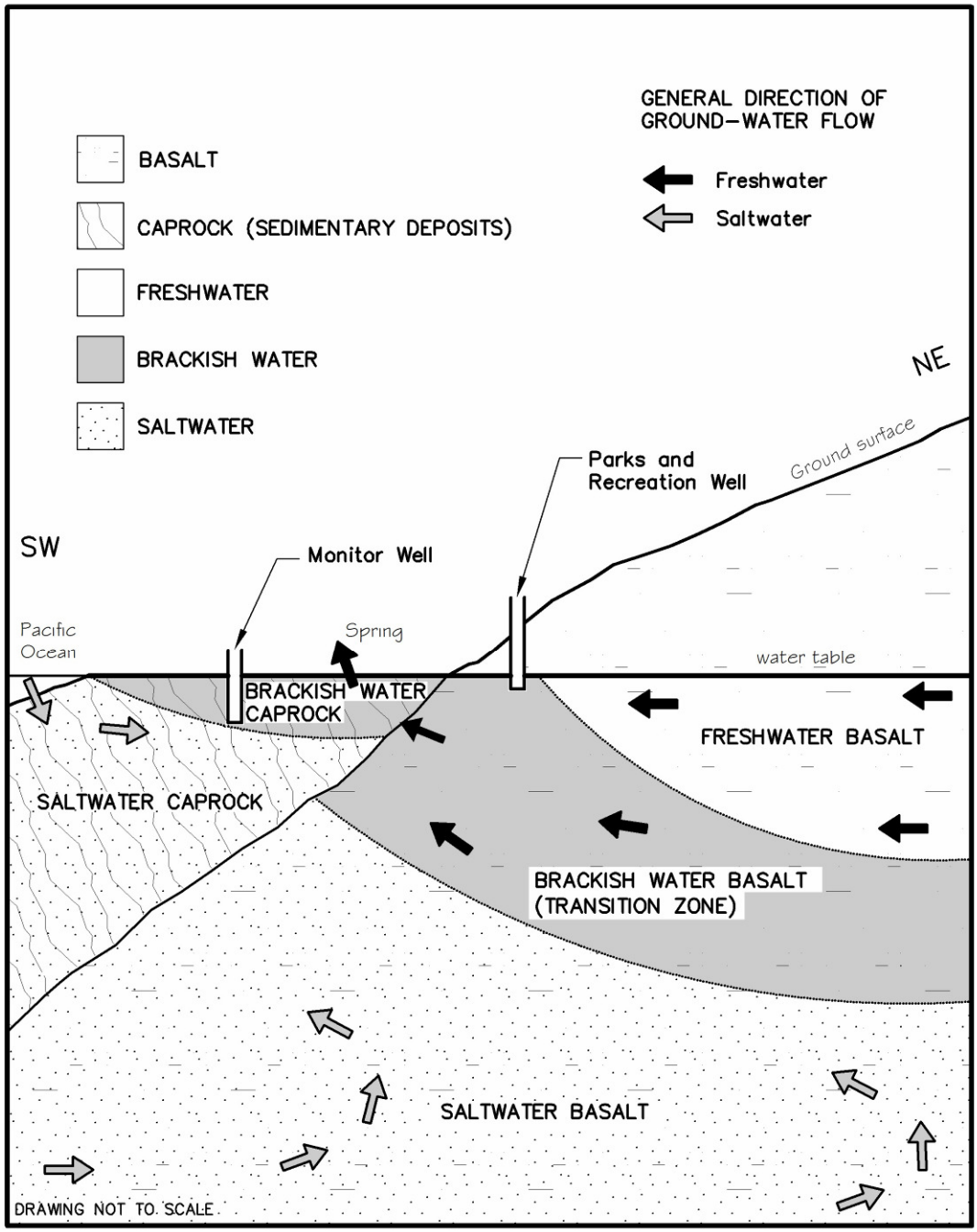

Figure 3-5. Shows a Conceptual Model of Groundwater Flow

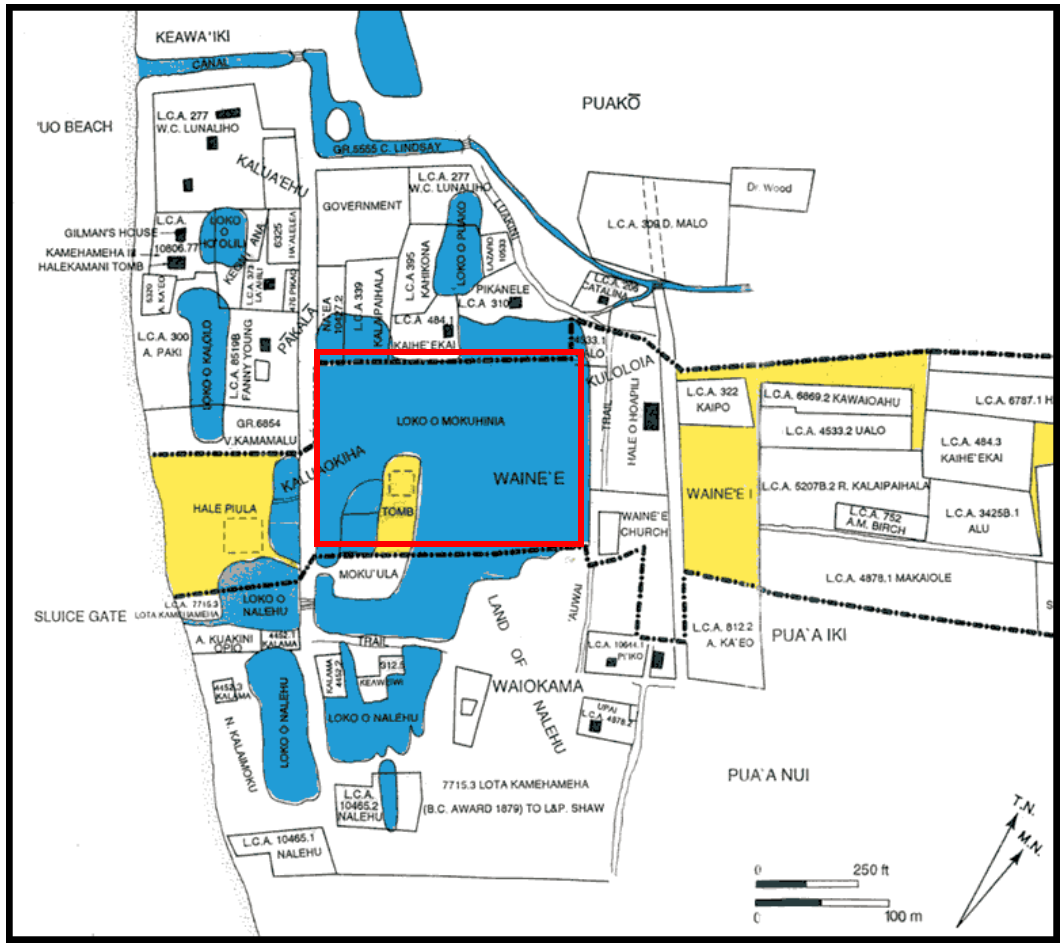

Figure 3-6. Map of Former Wetlands and Ponds near the Mokuhinia/Moku'ula Study Area
The study area is roughly delineated by the red rectangle and encompasses most of the Loko o Mokuhinia. Blue designates wetlands or ponds and yellow designates crown lands. From http://www.mokuula.com/archive/map.php and Klieger and others 1995.

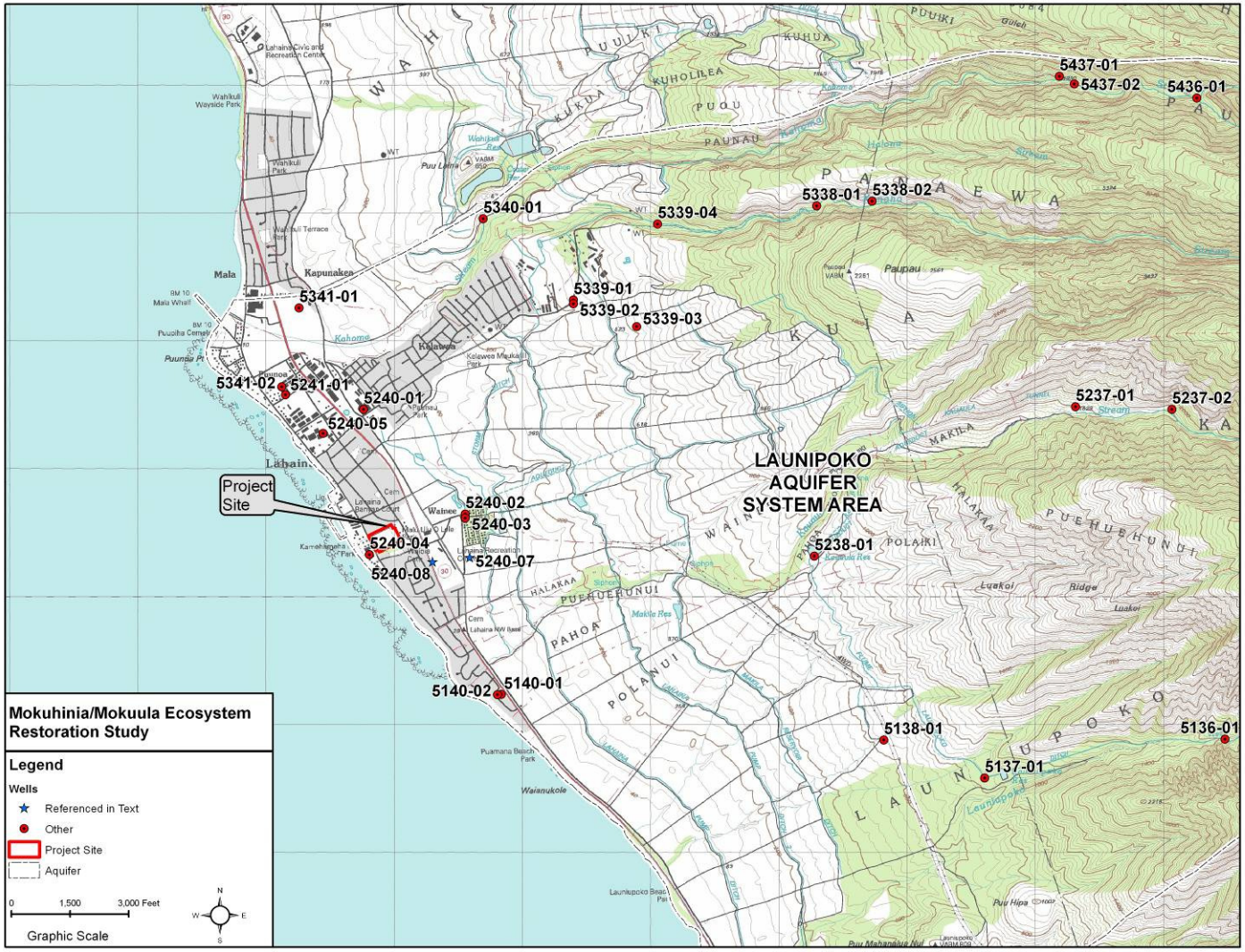

Figure 3-7. Map of Laniupoko Aquifer System with Wells

3.2.2 Surface Water

No perennial streams discharge into or near the Mokuhinia study area. Two intermittent streams flow into the ocean to the north and south of Lahaina (Figure 3-8). Kohoma Stream enters the ocean at Mala about 7000 ft north of the study area and Kaua‘ula Stream enters the ocean about 4000 ft south of the study area. Both of these streams are perennial in mauka areas and intermittent near the coast (Hawai‘i Cooperative Park Service Unit 1990).

Currently, there is a temporary diversion system above Lahaina that prevents overland flow and water from small unnamed drainages from flowing into the town (Belt Collins 2005). This diversion channel is located about 3000 ft inland of the study area (Figures 3-8 and 3-9). The Lahaina Watershed Flood Control Project (Belt Collins 2005) calls for the construction of a permanent diversion channel along roughly the same alignment to minimize flooding in Lahaina. This channel would divert surface water to Kaua‘ula Stream, south of the study area.

The local drainage system is also planned to bypass the study area. In 2003, the County of Maui and the Friend of Moku‘ula agreed that runoff from the Lahaina Town should be kept separate from the proposed wetland (Belt Collins 2005). A double 10 ft by 4 ft box culvert is planned to divert flow around the study area along the alignment of Mokuhinia Place (Figure 3-10). Currently, existing and planned future drainage structures will prevent surface water flows from entering the study area from adjacent properties. Local and regional surface water hydrology will not have a significant impact on the proposed wetland.

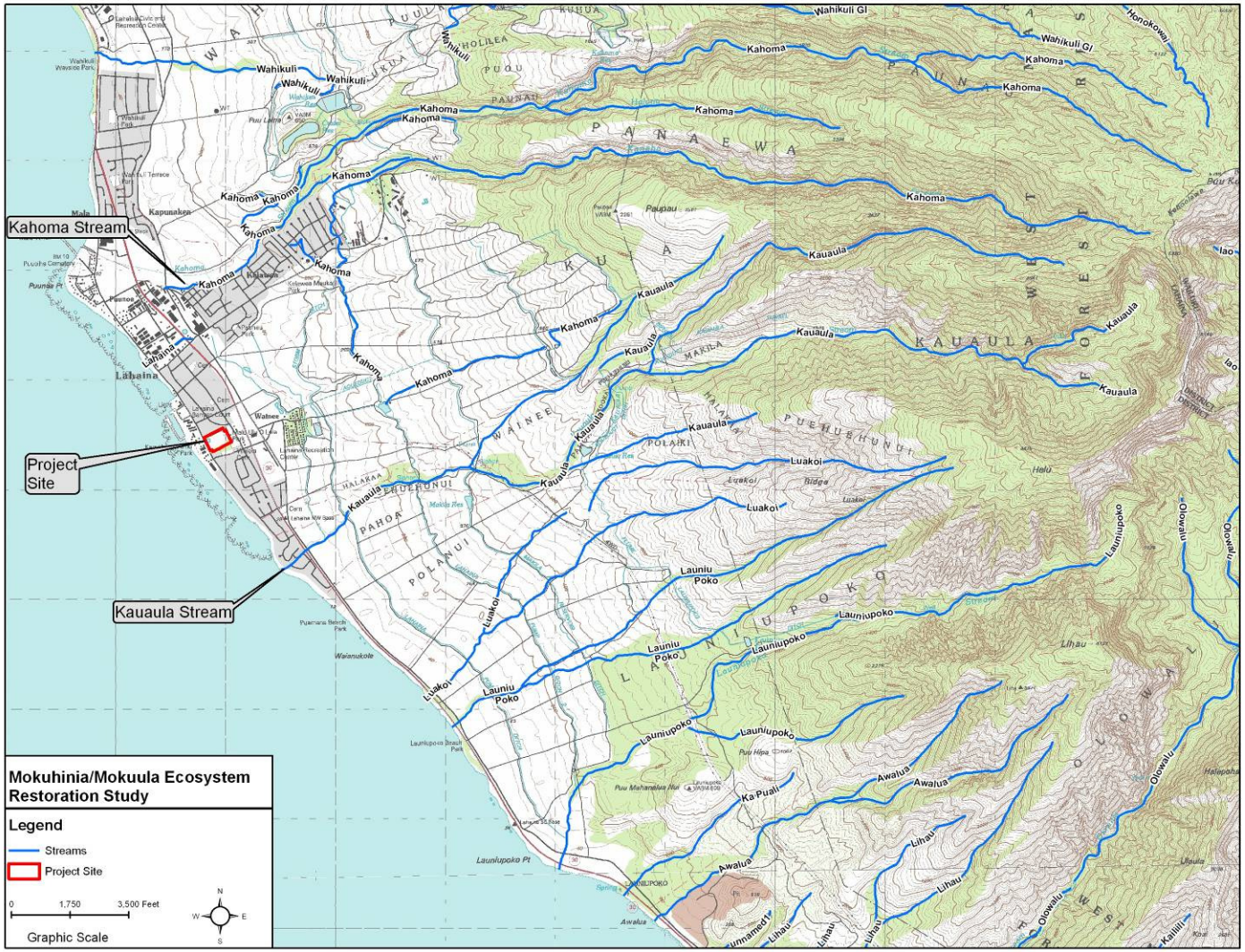

Figure 3-8. Streams in the Study Area

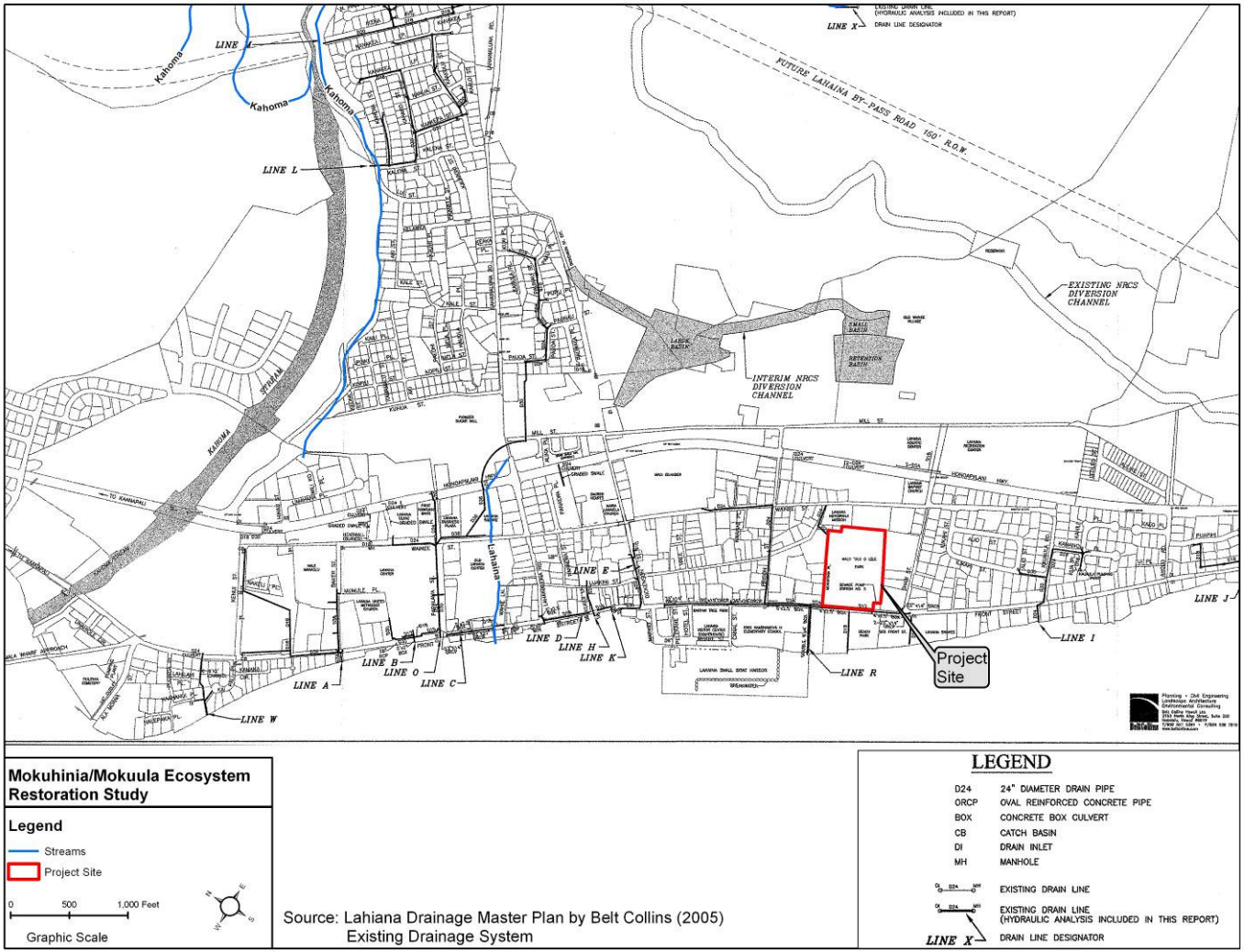

Figure 3-9. Existing Drainage System for Study Area

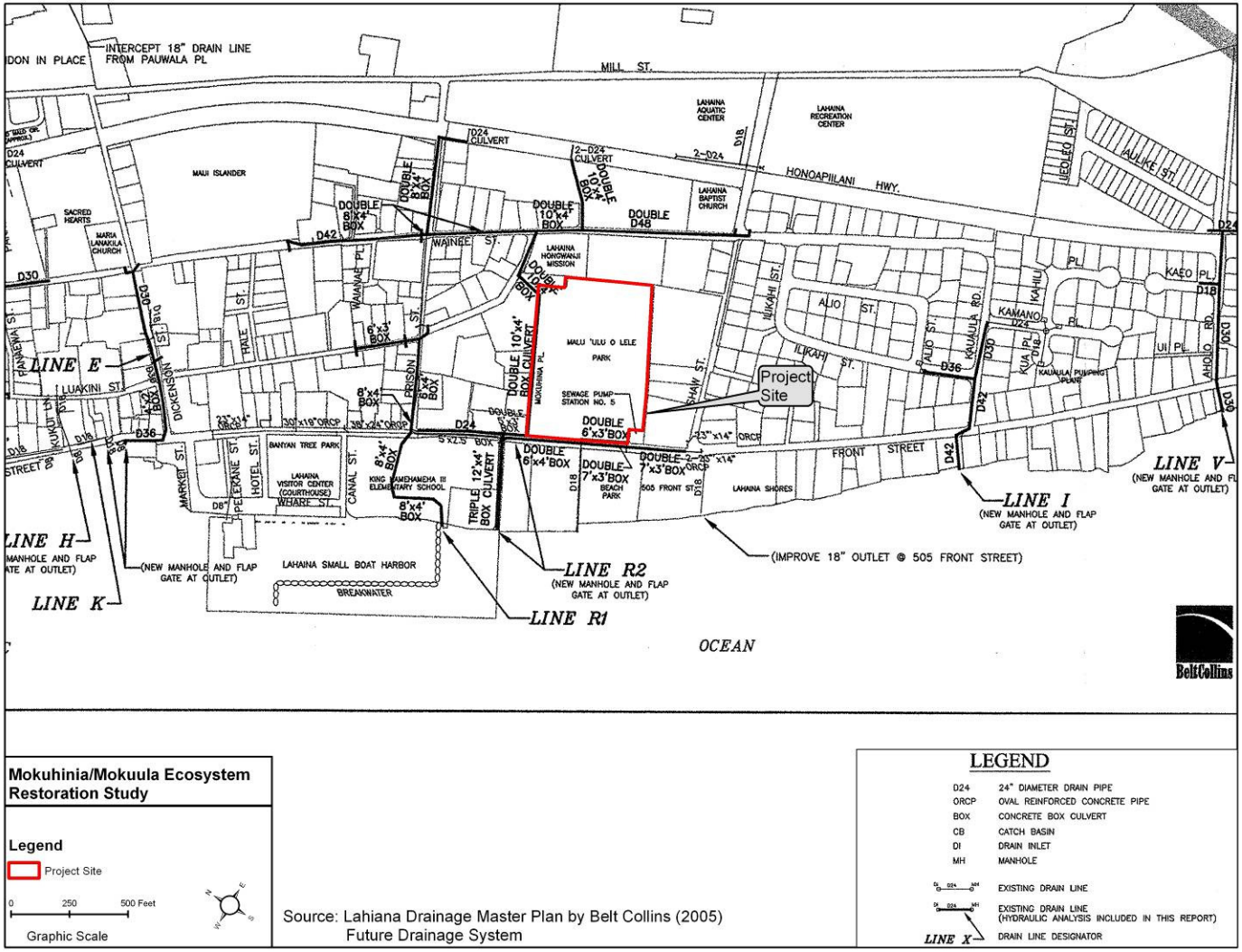

Figure 3-10. Future Drainage System for Study Area

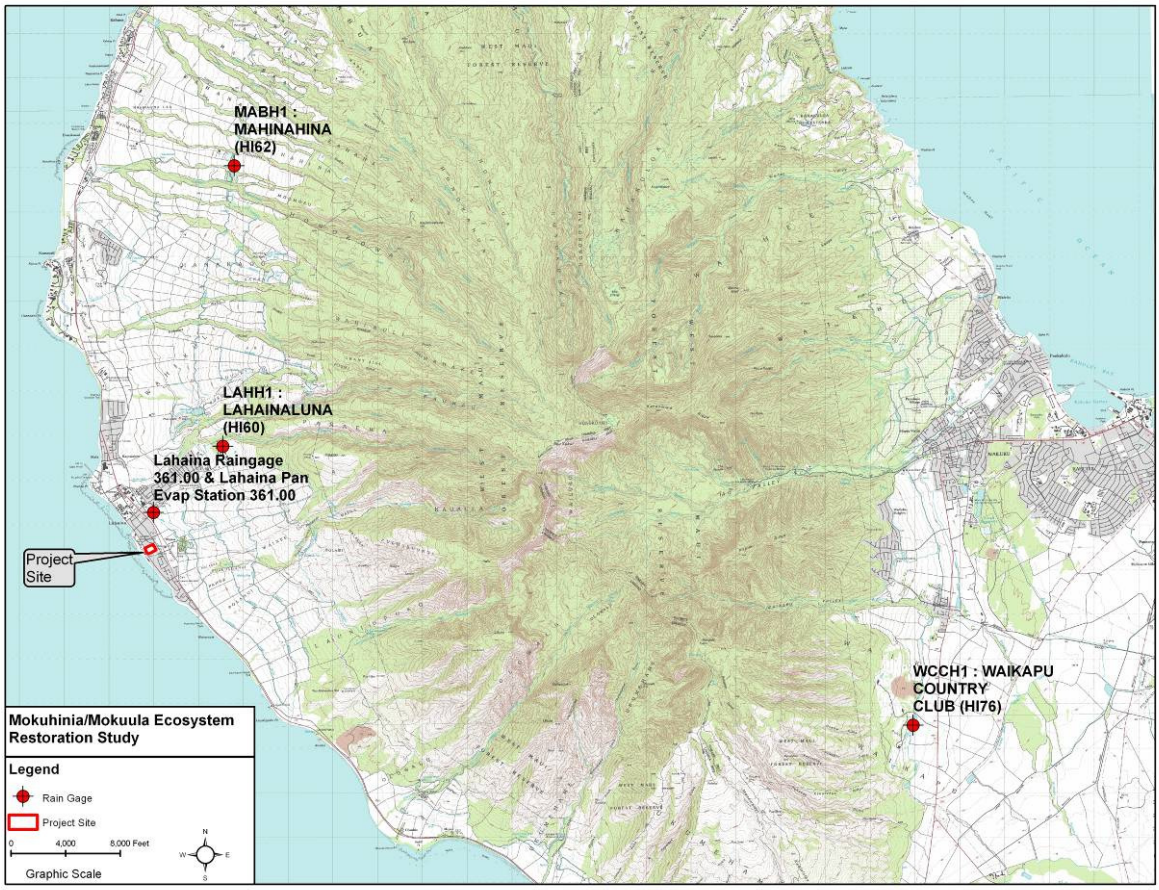

Figure 3-11. Rain Gage Map of Study Area

3.3 Rainfall

Rainfall averages were also necessary to calculate the water balance. Rainfall data were obtained from the National Weather Service Hydronet system (National Weather Service 2008). Fifteen minute rainfall data were obtained for gages at HI-62 Māhinahina (5.5 miles from study area), HI-60 Lahaina Luna (1.8 miles from study area) and HI-76 Waikapū Country Club (10.5 miles from study area) for the period from August 2007 to July 2008. The 15 minute data were converted to daily totals for the purposes of this study. The study area and all three rain gages are on the leeward side of Maui (shown in Figure 3-11).

The Lahaina Luna rain gage is closest to the study area and would normally be considered an appropriate source of data. Data from the other gages were included to try to explain spikes in groundwater levels. On November 3 and 4, 2007, water levels in the monitor wells rose by about 2.5 ft indicating a rainfall recharge event. The Lahaina Luna gage showed no rainfall during that period. The gages at Waikapū and Māhinahina showed small accumulations of rain. Although the three rain gages in the region showed little rainfall, it is probable that there was significant rainfall at the study area. Rainfall in Hawai‘i and specifically Kona storm rainfall has considerable spatial variability

The period of record for the National Weather Service Hydronet data (1994 to present) was not adequate to calculate long term averages for the water balance. Average monthly data were obtained for the Lahaina rain gage 361.00 from Giambelluca and others (1986) for the period from 1916 to 1983. This gage is about 0.5 miles from the study area (Figure 3-11). The data are presented in Table 3-2. The water balance was calculated seasonally so summer and winter rainfall totals are separated. It is generally accepted that there are two seasons in Hawai‘i: Winter (October through April and summer (May through September; Giambelluca and Schroeder 1998).

Month	Average monthly rainfall (in) Lahaina Gage 361.00
January	3.39
February	2.05
March	1.93
April	1.06
May	0.43
June	0.08
July	0.12
August	0.28
September	0.35
October	0.83
November	1.50
December	2.56
Total	14.57
Total Summer (May to Sept)	1.26
Total Winter (Oct to Apr)	13.31

Table 3-2. Monthly Average Rainfall Data from Lahaina Raingage 361.00

3.4 Evapotranspiration

Evapotranspiration (ET) information is a necessary component of a water balance for the study area. When constructed the study area will probably be composed of a combination of open water and native dry land vegetation. The actual ET was calculated for open water and for dry land areas using different methodology.

The open water actual evapotranspiration was estimated from measured pan evaporation data. Actual evapotranspiration is used to describe the evapotranspiration that occurred under real field conditions. Monthly data were obtained from Ekern and Chang (1985) from the Lahaina Pan Evaporation Station 361.00 (Table 3-3; Figure 3-12).

Month	Lahaina Station 361.00 Pan Evaporation (in)
January	4.9
February	4.76
March	6.81
April	6.9
May	7.91
June	8.16
July	8.65
August	8.56
September	8.24
October	6.45
November	5.27
December	4.55
Total	81.16

Table 3-3. Monthly Average Pan Evaporation Data from Lahaina Station 361.00

The next step is to convert the pan evaporation data to actual evapotranspiration for open water. This is commonly done by multiplying the pan evaporation by a pan coefficient. Ekern and Chang (1985) recommended a pan coefficient of 0.80 for reservoirs. This recommendation was based upon limited research on North American temperate climate reservoirs. More recent researchers have been using a pan coefficient of 1.00 for Hawaiian reservoirs (Engott and Vana 2007; Oceanit 2008; Oceanit 2008a). A pan coefficient of 1.00 will be used in this report for open water and the actual ET will be equal to the pan evaporation.

The actual evaporation figures from open water were weighted by season. It is generally accepted that there are two seasons in Hawai‘i: Winter (October

through April and summer (May through September; Giambelluca and Schroeder 1998). The actual ET data was divided according to these seasons (Table 3-4).

Season	Months	Actual ET (in)	Percent in each season	Actual ET (in/mo)
Summer (May - September)	5	41.52	51%	8.30
Winter (October - April)	7	39.64	49%	5.66

Table 3-4. Actual Evapotranspiration for Open Water Weighted by Season

Actual ET for the dry land area was estimated by multiplying the available moisture (precipitation) by a coefficient. Factors that affect actual ET include radiation, wind, temperature, humidity, soil type, vegetation type and available moisture (precipitation). In Lahaina the annual precipitation is 14.57 inches per year (Giambelluca and others 1986; Lahaina Raingage Station 361.00). The moisture available for evapotranspiration is the limiting factor when estimating actual evapotranspiration in this system. Actual evapotranspiration losses on the dry land soil and vegetation were estimated by assuming that 50% of the average annual rainfall is lost to evapotranspiration. This means the actual ET is 7.29 inches per year. The actual evapotranspiration estimates from dry land were not weighted seasonally. This was done to provide a more conservative estimate of actual ET during summer.

3.5 Tides

The tidal data were used to calculate aquifer diffusivity in the water balance. Aquifer diffusivity was used to calculate groundwater parameters. Tidal data were obtained from the tide station in Kahului Harbor, Maui. Kahului tidal data can be adjusted to Lahaina by applying the following corrections: Times: High Tide +1 hr. 18 min., Low Tide +1 hr. 1 min., Heights: High Tide *0.89, Low Tide *0.81. In order to simplify the calculations, average adjusted values were used. The times were corrected by adding 1 hr. 9 min. and the heights were adjusted by multiplying by 0.85. This is not expected to have a significant impact on the calculations because of the very slight errors (plus or minus 9 minutes) in the time portion of the data. Also, the calculations in this report do not use the tidal magnitude (height).

4 Hydrogeologic Analysis

4.1 Monitor Well Data

As a part of this study, five monitoring wells were installed at Malu ‘Ulu o Lele Park (Table 4-1; Figures 4-1 and 4-3) on August 6 and 7, 2007. A direct push (DPS) system was used to install the monitor wells and obtain samples for the Hazardous, Toxic, and Radioactive Waste Study (HTRW; Oceanit 2008). The DPS system does not use a rotary bit. The bit is actually pushed or driven into the ground using a hydraulic ram and a percussion hammer. A drawback of the DPS system is that the formation is “smeared” at the edge of the borehole. This results in artificially low permeability at the edge of the annulus.

Four of the wells were drilled to about seven ft below ground surface and one well was drilled to 15.8 ft below ground surface. Soil and water samples were taken from the four shallower wells to augment the reconnaissance level HTRW study. The deeper well was installed to better delineate the stratigraphy and to provide a deeper profile of salinity.

All the wells were completed with 2-inch solid and slotted PVC casing and grouted with bentonite-water slurry. Bentonite grout was used because the wells were intended to be temporary and to be somewhat easy to remove. An eight inch steel traffic rated monitor well cover flush with the ground surface was installed around the casing of each well (Figure 4-1).

MW	Distance from Ocean (ft)	Top of casing elevation (ft MSL)	Total depth (ft)	Bottom elevation (ft MSL)	Slotted casing interval (ft MSL)	Average aquifer penetration (ft)
1	594	5.5	7.3	-1.8	3.2 to -1.8	4.7
2	694	5.52	7.1	-1.6	3.4 to -1.6	4.5
3	1055	6.97	8.3	-1.3	3.7 to -1.3	5.5
4	1060	5.92	6.9	-0.9	4.1 to -0.9	3.9
5	852	5.7	15.8	-10.1	-0.1 to -10.1	13.6

Table 4-1. Study Area Monitor Wells

Figure 4-1. A Typical Monitor Well (MW5, 8/5/08)
The surface installation of each well is nearly identical.

It was necessary to establish water levels relative to mean sea level (MSL) so wellhead benchmark elevations were extended from a benchmark established in the study area by Control Point Surveying. This benchmark is a box cut on the northwest corner of concrete slab around the makai park restroom (Figure 4-2). This elevation was leveled from a third order benchmark near Lahaina Warf about 0.25 miles to the northwest (Appendix 1). The elevation from the box cut was extended to the top of casing of each well. As mentioned earlier the wells are grouted with bentonite-water slurry. As a result they are easily subject to movement due to soil-water pressure, vandalism or accidental damage. Over time, the top of casing elevations may change.

Figure 4-2. Benchmarks for Study Area (MW5, 8/5/08; Imagery NOAA 2002)

Figure 4-3. Monitor Well Map (Imagery NOAA 2002)

4.2 Cross-Sections and Soil Logs Data

The direct push rig extracted three foot lengths (segments) of core. Each core "segment" represented a vertical cross section of the substrate. Segments penetrated three feet, so the corer was driven down three times to reach the desired depths (with the exception of well MW5, which went to 15.8 ft below the surface). Owing to compression of the material, the final core length within each segment was shorter. Thus, the strata indicated on the core log are measured from the top of each segment, and the position of each segment is measured relative to the ground surface. The core logs are presented in Appendix 2. The depth of core is different from the total depth of the well in Table 4-1 because the annular space of the borehole tended to collapse and backfill before the casing could be installed.

Four of the boreholes encountered sand or coral and basalt detritus between about 0 to -2 ft MSL. Above this level the core consisted of soil, silty mud, fill material and clay. The core log indicates that MW 4 did not encounter sand at its total depth of -3 ft (The core logs are deeper than the total depth because of backfilling before the casing could be installed). The monitor well core data show that there is a horizon of beach sand at or slightly below sea level. The exact elevation is not known from the core data because of compression in the core "segments".

4.3 Water Level Data

Schlumberger Mini-Diver water level data loggers were installed in MW 1, 2, 4 and 5 on August 7, 2007. The data loggers were downloaded and instantaneous depths to water measurements were taken at each well on October 12, 2007, January 7, 2008, March 31, 2008, and June 16, 2008. On June 16 the data logger from MW 4 was moved to MW 3. All of the data loggers were removed from the wells and last downloaded on August 5, 2008. A Schlumberger barologger was used to obtain data to compensate for barometric pressure. The data loggers measure absolute pressure which includes the weight of the water column on the instrument and the weight of the air column (barometric pressure) thus the raw data requires barometric compensation.

The measured depths to water and surveyed top of casing elevations were used to relate the water pressure data from the data loggers to mean sea level. The measurements were also used to check the accuracy of the water pressure data obtained from the data loggers as readings from pressure data loggers occasionally lose precision. Also data logger readings can become inaccurate if the well settles or rises, is damaged accidentally or is tampered with. The instantaneous depth to water measurements can serve as a check for well damage or tampering.

The calculated water level data for MW 4 deviated significantly from the measured water level during the period between March 31 and June 16, 2008. In

June it was noted that it was possible to easily shift the casing housing indicating that the housing had been damaged. There were also vehicle tracks in the area. It is likely that someone had broken into the housing and tampered with the logger. Fortunately it was not broken or stolen although the elevation setting was shifted. As a result of this problem the MW 4 data from March 31 to June 16, 2008 was not included in these analyses.

One well could not be continuously monitored because there were only four data loggers available. MW 3 was not initially used for continuous water level monitoring because it did not appear to have sufficient hydraulic connection to the aquifer. The water level in MW 3 appeared to be anomalously high. Also, when water was poured into the borehole in an attempt to develop the well, water levels did not decline significantly. It was also thought that the other wells might also have reduced hydraulic connection with the aquifer because of the "smearing" effect of direct push drilling.

On March 31, 2008 all of the wells were developed with dry ice (solid carbon dioxide) to help increase their hydraulic connection with the aquifer. Dry ice was lowered quickly below the water in the well in a perforated pipe. The fast release of gas as the dry ice sublimates in the well bore mobilized sediment in the well and annulus and transported out of the top of the well. The development process removed significant amounts of sediment from the wells. Based upon the apparent success of well development process it was decided that MW 3 could be used for continuous water level monitoring.

Slug tests were not performed on the monitor wells. This variety of test would not be an effective indicator of aquifer parameters under the existing conditions. The wells were installed with a direct push system (DPS). This system tends to smear the wall of the annulus and create an artificial zone of low permeability around the well. Slug tests are only able to test the volume of aquifer immediately around the well and these annular effects would significantly affect the test. Also slug tests are less reliable than constant rate tests such as passive tidal analysis or test pumping with monitor wells (Hall 1996; Huntsman and McCready 1995).

Other wells in the area were investigated as candidates for water level observation wells but none were suitable (Figure 3-4). Both Department of Parks and Recreation wells (well nos. 5240-07 and 08) have pumps installed. The pumps block access to the water surface in the well and there is no chase tube or airline through which to monitor water levels. Lahaina Pump B (5240-03) and Lahaina Pump A (5240-02) are old Pioneer Mill shafts. They would be ideal for monitoring purposes but these shafts were found to be unsafe to enter because of collapsing ceilings and stairs. A well apparently located in Kamehameha Iki Park (5240-04) just makai of the study area could not be found.

Figure 4-4 shows the water level data collected from August 2007 to August 2008. Figure 4-5 shows the same water level data graphed with rainfall data from

three relatively nearby rain gages. Rainfall data is included in this graph for comparative purposes to illustrate the relationship between heavy rainfall events and water levels. Table 4-2 shows average summer and winter groundwater levels and depths to water measurements and Table 4-3 shows maximum winter and minimum summer groundwater levels. Average summer water levels varied from 2.5 to 4.0 ft and were generally fairly steady. Winter water levels in all the wells were much more variable than summer water levels. Water levels showed distinct peaks during heavy rainfall with typical recession curves after the rainfall-recharge event.

MW	Ground Elevation (ft MSL)	Average Summer WL (ft MSL)	Average Summer depth to water (ft)	Average Winter WL (ft MSL)	Average Winter depth to water (ft)
1	5.5	2.91	2.59	3.16	2.34
2	5.52	2.91	2.61	3.23	2.29
3	6.97	2.95	4.02	nd	nd
4	5.92	2.98	2.94	4.08	1.84
5	5.7	2.98	2.72	3.6	2.1

Table 4-2. Monitor Well Average Winter and Summer Water Levels and Depth to Water Measurements (nd indicates no data)

MW	Ground Elevation (ft MSL)	Minimum Summer WL (ft MSL)	Minimum Summer depth to water	Maximum Winter WL (ft MSL)	Maximum Winter depth to water
1	5.5	2.66	2.84	5.47	0.03
2	5.52	2.67	2.85	5.55	-0.03
3	6.97	2.8	4.17	nd	nd
4	5.92	2.81	3.11	6.07	-0.15
5	5.7	2.36	3.34	5.19	0.51

Table 4-3. Monitor Well Maximum Winter and Minimum Summer Water Levels and Corresponding Depth to Water Measurements (nd indicates no data)

During some periods during the rainy winter groundwater levels are at or above ground level (Table 4-3). This indicates that the soil is fully saturated and there is ponded water in the study area during the rainy season. During the summer groundwater levels are generally 3 to 4 feet below ground surface. Limited research was conducted on local historical groundwater levels. In February 1979 the water levels at Lahaina Pumps A and B were 3.3 ft MSL. In February 1980 water levels were 3.5 ft MSL (Souza 1981). These water levels are not significantly different from the water levels measured in the study area. This is in spite of the fact that the Lahaina Pumps were completed in the Wailuku Volcanics and the monitor wells installed for this project were completed in caprock (recent alluvium).

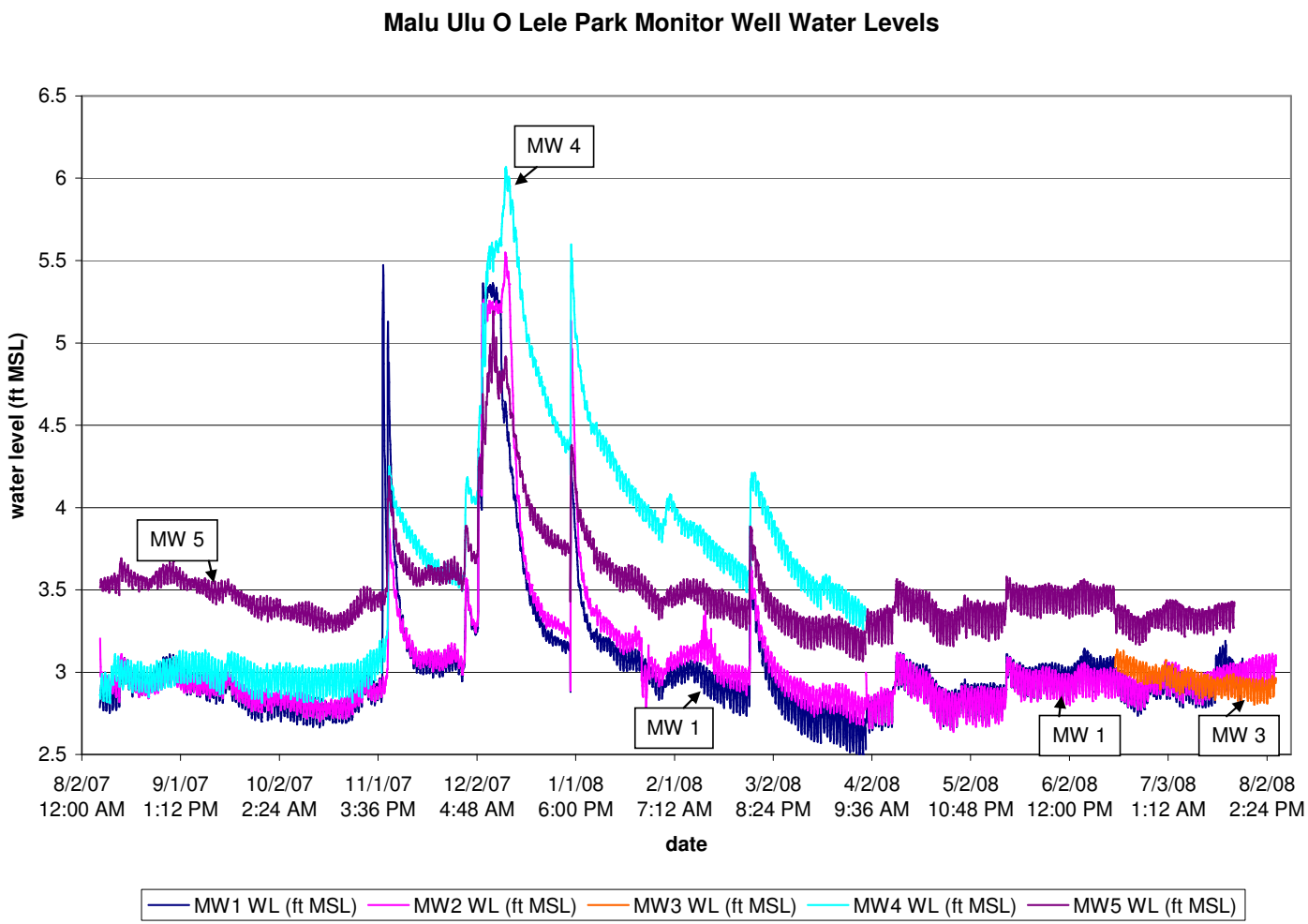

Figure 4-4. Hydrograph of Monitor Well Water Levels from August 2007 to August 2008

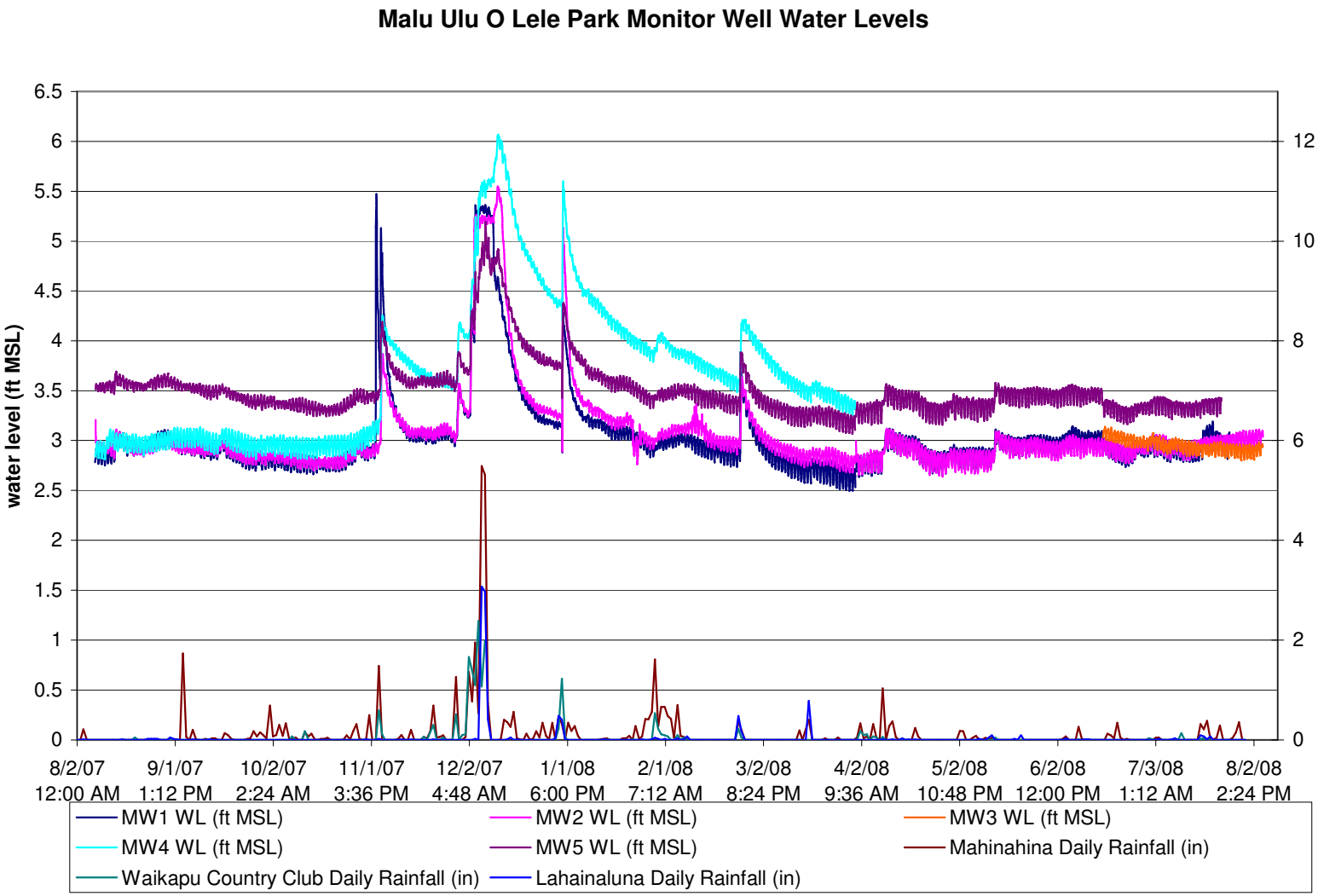

Figure 4-5. Hydrograph of Monitor Well Water Levels from August 2007 to August 2008

4.4 Conductivity Temperature and Depth Data

A Schlumberger CTD-Diver datalogger was used to obtain vertical specific conductivity logs of the wells. Logs were obtained from all five monitor wells by slowly lowering the device to the bottom of the borehole on January 7, 2008 (Figure 4-6) and on August 5, 2008 (Figure 4-7). Appendix 3 shows the January and August logs of each well graphed together to show variations between summer and winter salinity.

January specific conductivity values at elevations between 5 ft MSL and -1 ft MSL varied from about 3 to13 milliSeimens/cm (mS/cm). Two of the wells, MW 1 and MW 5, had nearly identical conductivity profiles at elevations down to an elevation of about -2 ft MSL. The specific conductivity of the water in the northern monitor wells was generally lower than the specific conductivity of the water in the southern monitor wells. The data indicate that the average January specific conductivity of the water column in the five monitor wells above an elevation of -1 ft MSL was about 8 mS/cm. The water in the deep well, MW 5, began to get increasingly brackish after about -4.5 ft MSL. Specific conductivity increased from about 10 mS/cm to 20 mS/cm at about -7 ft MSL.

August specific conductivity values at elevations between 5 ft MSL and -1 ft MSL varied from about 3.75 to 13 mS/cm. Water in monitor wells 2, 3 and 5 had nearly identical specific conductivities. The specific conductivity of water in MW 1 was only slightly higher. As in January, the August specific conductivity of the water in the northern monitor wells was generally lower than the specific conductivity of the water in the southern monitor wells. The data show that the average August specific conductivity of the water column in the five monitor wells above -1 ft MSL was about 6.2 mS/cm. The water in the deep well, MW 5, began to get increasingly brackish after about -2 ft MSL. Specific conductivity increased from about 4 mS/cm to 8 mS/cm at about -5 ft MSL.

The specific conductivity data presented in Appendix 3 clearly shows that the conductivity in the boreholes of MW 1, 2 and 5 were higher in January than in August. The specific conductivity of the borehole water of MW 4 did not significantly change over time and the conductivity of the borehole water of MW 3 was slightly higher in August.

Historical records were researched to ascertain salinity of other wells in the area. This would also give an idea of potential salinity levels of a wetland at Mokuhinia. In February 1979 the chloride levels of Lahaina Pump A (5240-02) and Lahaina Pump B (5240-03) were 310 and 640 mg/L (Souza 1981). This roughly equates to conductivity of 1.7 to 3.0 mS/cm. Although recharge and pumpage conditions have changed since 1979, this still indicates that the groundwater in the area is brackish. In 2002, the chloride concentration in the Lahaina Park Well (5240-07) was 380 mg/L (~1.8 mS/cm) also indicating brackish water.

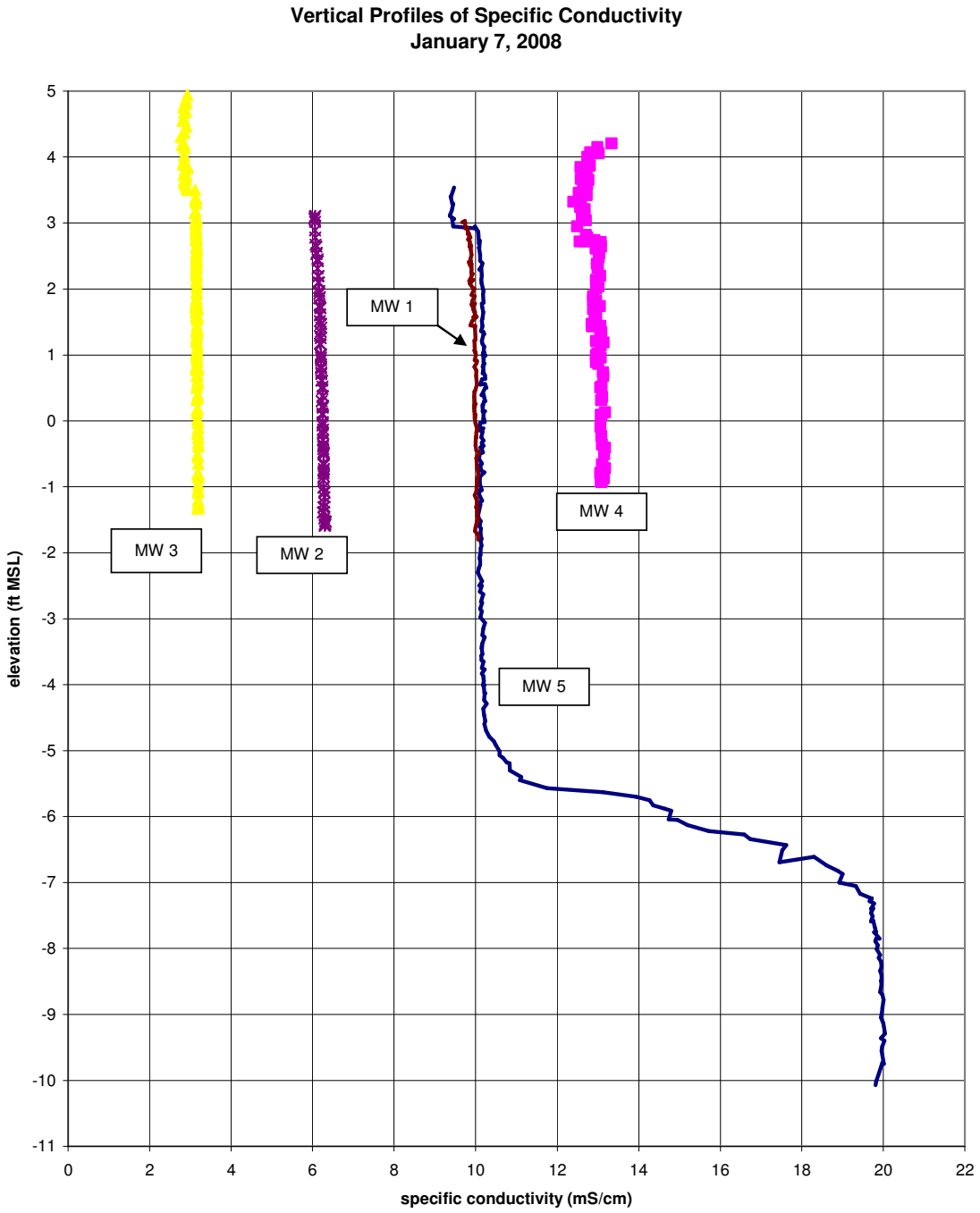

Figure 4-6. Graph of Monitor Well Specific Conductivity Logs January 7, 2008

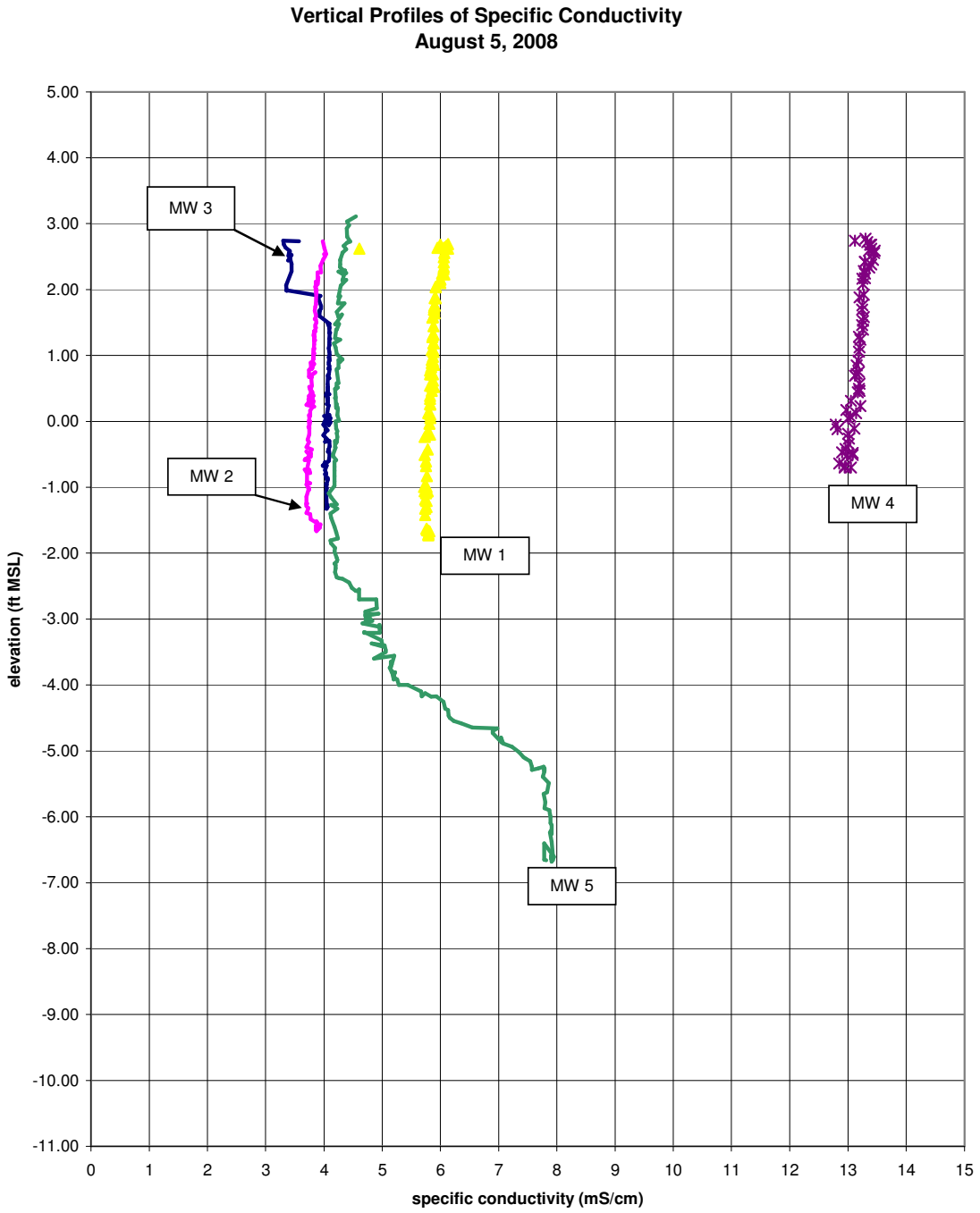

Figure 4-7. Graph of Monitor Well Specific Conductivity Logs August 5, 2008

4.5 Aquifer Calculations

This section details the procedures that were used to calculate the groundwater flow through the study area.

4.5.1 Parameter Calculations

Aquifer transmissivity (T) and hydraulic conductivity (K) were calculated using tidal and groundwater level data from the monitor wells installed on site. Transmissivity and hydraulic conductivity are terms that describe the ease with which water can move through rock or soil. Other options for calculating T and K would have been to conduct a local test pump or slug tests with the monitor wells. The advantage of a passive tidal and groundwater level test is that the results can represent hydraulic conditions over the full study area. Individual wells tests such as slug tests would only represent conditions within a few feet to a few inches of the well (Rotzoll 2007; Huntsman and McCready 1995; Hall 1996, Weight and Sonderegger 2001).

The first step is to calculate aquifer diffusivity (Diffusivity = Transmissivity/Storage Coefficient = T/S). This was calculated with the technique developed by Allen (1951) through a methodology used by Huntsman and McCready (1995).

$$D = \frac{T}{S} = \frac{x^2(t_o)}{4\pi(t_1^2)}$$

Equation 4-1. Aquifer Diffusivity

Where:

D= diffusivity (ft^2/day)
T = transmissivity (ft^2/day)
S = storage coefficient (dimensionless)
x = effective distance from the observation well to the ocean (ft)
t_o = period of full range of tidal fluctuation (day)
t_1 = time lag between maximum tidal stage and maximum groundwater stage (day)

The complete calculations to determine T and K are shown in Appendix 4. Data from monitor wells 1, 2, 4 and 5 are used.

An estimate of the effective porosity or storage coefficient (S) is necessary to calculate aquifer transmissivity. Gingrich and Voss (2005) used a storage coefficient of 0.04 for caprock in the Pearl Harbor area of Oahu. This figure is considered valid for the sedimentary rock in the Lahaina area. Oki (2005) used a storage coefficient of 0.10 for “all other rocks” in another groundwater model of the Pearl Harbor area. This includes the non-limestone component of the

caprock. Fetter (1988) uses a range storage coefficient for sandy clay from 0.03 to 0.12. Therefore, based on this limited literature research, a storage coefficient of 0.05 is used in these calculations.

The resulting calculated transmissivity is 7684 ft^2/day. In order to calculate hydraulic conductivity, a value necessary for unconfined flow conditions, the transmissivity is divided by the saturated thickness.

$$T = Kb$$

and

$$K = \frac{T}{b}$$

Monitor wells 1, 2, 3 and 4 penetrate about 5 ft into the upper aquifer. Groundwater flow to these partially penetrating wells has a vertical component because the aquifer is in a discharge zone. Groundwater is discharging into the soil and into the ocean. Also, there is a probable vertical head gradient as indicated by the differences in water level data from MW 5 and the other wells. John Mink (undated) used a factor of 1.6 to account for vertical groundwater flow. In this study a factor of 1.5 is used. The saturated thickness for MW 5, calculated in a similar fashion is 20.4 feet.

As shown in Appendix 4:

$$K = \frac{T}{b} = 870\, {}^{ft}\!/_{day}.$$

The calculated hydraulic conductivity of 870 ft/day appears to be slightly high for caprock. For example Gingrich and Voss (2005) used a caprock hydraulic conductivity of 0.457 m/d (1.5 ft/d) in a groundwater model of Pearl Harbor on Oahu. The value used in Gingrich and Voss is not comparable to values calculated in this study because it represents an aggregate value encompassing low and high permeability zones. Sand is a major component of the saturated zone sediment in the study area (Appendix 2). Takasaki and Mink (1982) reported that unconsolidated sand has a hydraulic conductivity between 100 and 1000 ft/day and unconsolidated lagoonal sands have a hydraulic conductivity between 100 and 500 ft/day. Also, a table of representative hydraulic conductivities is presented in Domenico and Schwartz (1990). Hydraulic conductivities of sands varied from 2×10^{-7} to 6×10^{-3} meters/second (0.057 to 1700 ft/day). Based upon this research, K = 870 ft/day appears to be reasonable.

4.5.2 Groundwater Flow

Groundwater flow (also known as groundwater flux) was calculated using the previously calculated or estimated parameters. The aquifer appears to be unconfined with some semi-confined portions so the steady-state Dupuit equation and assumptions can be applied. These assumptions are 1) the hydraulic gradient is equal to the slope of the water table; and 2) groundwater flow lines are horizontal and equipotential lines are vertical (horizontal flow). Also groundwater flow is from the northeast towards the ocean. Figure 3-5 is a conceptual diagram of the groundwater flow model used in this study. The complete calculations for groundwater flow using the Dupuit assumptions are shown in Appendix 5. The Dupuit equation for calculating groundwater flow is:

$$q = -\frac{1}{2} K \frac{(h_2^2 - h_1^2)}{L}$$

Equation 4-2. Groundwater Flow (Flux)

Where:

q = the specific discharge (ft^2/day)
K = hydraulic conductivity (ft/day)
h_2 = downstream aquifer saturated thickness (ft)
h_1 = upstream aquifer saturated thickness (ft)
L = flow length (ft)

The specific discharge must be multiplied by the cross-sectional distance (y) to get actual discharge (Q) in units of volume/time. The distance (y) is the length of the park along the coast. This distance is 600 ft (Figure 4-3).

$$Q = qy$$

Equation 4-3. Actual Discharge

Where:

Q = groundwater discharge (ft^3/day)
y = distance along coast (ft)

In order use the Dupuit Equation it is necessary to determine the upstream and downstream saturated thickness. Conductivity profile data from MW 5 indicates that there is an abrupt change in conductivity at about -5 ft MSL (Figure 4-5). Data from MW 5 also indicate that summer water levels in MW 5 are significantly higher than in MW 1, 2 and 4 (Figure 4-6). This indicates that MW 5 penetrates into a part of the aquifer with higher piezometric pressure. The aquitard (leaky confining layer) may be around -5 ft MSL. Based upon this information the bottom of the flow system potentially affecting the wetland system was assumed to be at -5 ft MSL. The saturated thickness is equal to the depth of penetration

below sea level plus the water level above sea level. For the study area this varies from five to 7.98 ft.

Groundwater flow can be calculated for the flow lines between the various monitor wells and the ocean. The flow between MW 4 and the ocean was chosen for this report because it is the longest in terms of distance and extends the furthest inland. It is probably the most representative of the Moku‘ula/Mokuhinia study area. In order to construct a seasonal water balance groundwater flows were calculated based upon winter and summer water levels. The calculated summer groundwater flow though the study area was 9,569 cubic feet/day (71,578 gallons/day) and the calculated winter groundwater flow was 14,212 cubic fee/day (106,305 gallons/day).

The flow computed for the study area compares favorably with the flow computed for the Ewa Caprock on Oahu. The flow per mile through the study area varies from 629,886 gallons/day/mile in summer to 935,484 gallons/day/mile in the winter. In a Ewa caprock study, Bauer (1996) calculated that the flow per mile in the Pu‘uloa area was approximately 1,700,000 gallons/day/mile. Bauer (1996) used a significantly thicker saturated thickness because of the different geology. Also, the Ewa Caprock is recharged by the highly productive Pearl Harbor aquifer. These factors would account for the two or three to one difference between the two flows in sedimentary aquifers.

4.5.3 Water Balance

Summer and winter water balances were constructed for this study. The purpose is to determine if groundwater flow is adequate to sustain the proposed wetlands. These water balances include evapotranspiration, groundwater flow, rainfall, and surface water flow.

These calculations were conducted assuming that the study area is 7.5 acres and that the pond and wetland system would be about 3 acres. The results of the water balance calculations could change significantly based upon the final design of the wetland. The design of the pond and surrounding wetland will partially be a function of public expectations. For example the artistic rendition of the proposed pond and wetland on the Friends of Moku‘ula webpage (Friends of Moku‘ula 2008) shows open water covering the entire study area. The water balance of the proposed pond and wetland system can also be considerably altered by design considerations such as pond depth, tree shading, wind obstruction, and plant species selection (France 2003).

The water budget for the pond wetland system can be described by the following equation (modified from Krohelski and others 2002):

$$\boxed{\Delta S = P + SW_{in} - ET + GW_{in}}$$

Equation 4-4. Water Balance

Where

$\boxed{\Delta S}$	is the change in wetland and pond system storage
P	is precipitation or rainfall falling on the water or land
SW_{in}	is surface-water runoff into the wetland and pond system
ET	is actual evapotranspiration
Gw_{in}	is groundwater flow into the wetland and pond system

The change in storage (delta S) is equal to the groundwater flow out of the system and into the ocean. This represents the potential water flow through the wetland and pond system.

Precipitation (P) is described in Section 3.3. Average monthly rainfall data was obtained from Lahaina Raingage 361.00. The data were then adjusted for Hawai‘i’s seasons. The average total summer rainfall (May through September) was 1.26 inches and the average total winter rainfall (October through April) was 13.31 inches.

The surface-water runoff (SW_{in}) is discussed in Section 3.2.2. Drainage plans for the Lahaina area indicate that all off-site surface water runoff will bypass the study area. Surface-water runoff is assumed to be zero.

Actual evapotranspiration (ET) is described in Section 3.4. In order to estimate the ET from open water, average monthly pan evaporation data was obtained from Lahaina Station 361.00. The pan coefficient was assumed to be 1.00. The data were adjusted by Hawai‘i’s seasons. The average total summer evapotranspiration was 41.52 inches and the average total winter evapotranspiration was 39.64 inches. Actual evapotranspiration off the dry land portion of the study area was assumed to be one half of annual rainfall or 7.29 inches/year. This average was applied to both summer and winter values.

Summer and winter groundwater flows (Gw_{in}) through the study area were calculated in Section 4.5.2. Seventy percent groundwater flow into the study area is assumed to discharge into the pond and wetland system. The summer flow into the system is 6,698 cubic feet/day (50,103 gallons/day) and the winter flow into the system is 9,948 cubic feet/day (74,414 gallons per day).

Tables 4-4 and 4-5 summarize the summer and winter water balances for the study area. There will be an excess water flow of 3,766 cubic ft/day (28,166 gallons/day) in the summer season. There will be an excess water flow of 9,269 cubic ft/day (69,395 gallons/day) in the winter season. The local groundwater gradient and hydraulic conductivity (properties of the groundwater system that drive or allow groundwater flow) will allow this excess water to flow to the ocean as groundwater.

Summer Water Balance

	cu ft/day	gallons/day
Total Rainfall to 7.5 ac parcel (P)	360	2,693
Groundwater inflow (Gw_{in})	6,698	50,103
total inflow:	7,058	52,796
Evapotranspiration from open water (ET)	(2,955)	(22,105)
Actual Evaporation from land (ET)	(338)	(2,525)
total consumptive use:	(3,293)	(24,630)
Groundwater outflow to ocean (delta S):	3,766	28,166

Table 4-4. Summer Study Area Water Balance

Winter Water Balance

	cu ft/day	gallons/day
Total Rainfall to 7.5 ac parcel (P)	1,703	12,736
Groundwater inflow (Gwin)	9,948	74,414
total inflow:	11,651	87,150
Evapotranspiration from open water (ET)	(2,036)	(15,231)
Actual Evaporation from land (ET)	(338)	(2,525)
total consumptive use:	(2,374)	(17,755)
Groundwater outflow to ocean (delta S):	9,277	69,395

Table 4-5. Winter Study Area Water Balance

5 Results and Discussion

5.1 Water Level Results

It is probable that the caprock aquifer is heterogeneous with stratigraphic layers that limit vertical flow. In other words the water pressure in the saturated material making up the various layers probably has slightly different piezometric pressures. This is supported by evidence from the water level and specific conductivity data. As noted earlier, MW 5 had summer average water levels about 0.9 feet higher than the summer water levels of the other monitor wells (Figure 4-6). This indicates that the average piezometric pressure in this well is higher than the pressure in the other wells. MW 5 is also about twice as deep as the other wells and seems to penetrate a zone where the salinity of the water increases rapidly (Figure 4-5) at about -5 ft MSL. The core log description indicates that the material changes from “fine black sand in transition to coarse” to “medium coarse black sand at roughly the same elevation.

Water levels showed distinct peaks during heavy rainfall with typical recession curves after the rainfall-recharge event. This probably indicates that there is local groundwater recharge during heavy rains. The local recharge quickly discharges into the ocean as groundwater flow. Measured groundwater levels were occasionally above the ground surface. There are also white caliche or salt deposits in the soil north of MW 5 and in the soil around MW 4. This also indicates that groundwater levels frequently exceed the elevation of the ground surface.

5.2 Specific Conductivity Results

Wetlands can still function and be productive with salinities varying from fresh to seawater. The specific conductivity data collected indicate that the water quality in the pond and surrounding wetland system will be brackish. Specific conductivity values range from 3 to 14 mS/cm. This equates to roughly six to twenty eight percent sea water or 2.1 to 9.8 ppt. Salinity is lower on the northwest side of the study area. Salinity is consistently highest on the southeast end of the study area. This probably indicates that there is more groundwater flow in the northwest end of the study area and may mean that the former springs may have been located in this area. The springs can be excavated and attempted to be reactivated . The water salinity is probably more brackish then it was before the original pond was filled. Historically, salinity levels have increased in water wells in the Launiupoko Aquifer System Area.

5.3 Interaction with the Regional Groundwater Flow System

A constructed wetland at Moku‘ula/Mokuhinia is unlikely to negatively interfere with regional groundwater flow. If the proposed wetland is excavated below the groundwater level, it can be visualized as a large diameter well. It will form a sink for groundwater flow. Groundwater will tend to flow towards the pond. The water balance calculations indicate that an average of 15,000 gallons in the winter and 22,000 gallons in the summer will be lost due to evapotranspiration per day. In other words, the pond will be “pumped” at 15,000 to 22,000 gallons per day. This is not a significant amount of draft in proportion to the regional groundwater flow.

A possible negative effect of the proposed ponds is that it will increase the groundwater salinity in the area by effectively moving the groundwater discharge area closer to the ocean or by increased levels of salt caused by increased evaporative losses of water. This would cause the transition zone (zone of fresh-saltwater mixing) to thicken further inland. Effectively the wetland system will move the shallow groundwater discharge zone about 1000 ft further inland. This will not result in greater salinity because the ponds will not be sustained at sea level and the wetland surface water will have roughly the same salinity as local groundwater flow system. The evaporative loss of water and retention of salt will not significantly increase regional groundwater salinity.

5.4 Interaction with Other Wells

There are nine wells in the vicinity of Malu ‘Ulu o Lele Park (Figure 3-3, Table 5-1). All of these wells are either irrigation wells or are unused or abandoned. Five wells are in use for irrigation.

The only wells that could be impacted by the proposed wetland restoration project are owned by the Maui County Department of Parks and Recreation and are inland of the study area (5240-07, 08). Well 5240-07 is 0.34 miles east of the study area and well 5240-08 is 0.20 miles east of the study area. It was not possible to obtain pumpage records for these wells. The wells have an installed capacity of 210 gallons/minute but it is unlikely that they are pumped continuously at this rate. The park size is nine acres (County of Maui 2008). If the irrigation demand of turf grass is assumed to be 8000 gallons/acre/day then the average draft from these wells would be 72,000 gallons per day. Drawdown at this pumpage rate would be negligible in the vicinity of the study area. It is unlikely that the proposed pond will affect or be affected by the Maui Parks and Recreation irrigation wells.

Well no.	Well name	Year drilled	Owner	Use	Geology	Bottom well (ft MSL)	Pump capacity (mgd)	Distance (mi) and bearing from study area
5140-01	Puamana Comm 1	1987	Puamana Comm	Landscape Irrigation	alluvium	-31	0.290	0.87 SE
5140-02	Puamana Comm 2	1987	Puamana Comm	Landscape Irrigation	alluvium	-45	0.290	0.87 SE
5240-01	Mill Pump C	1897	Pioneer Mill	abandoned and sealed	Wailuku Basalt	-5		0.58 N
5240-02	Lahaina-Pump A	1897	Pioneer Mill	unused	Wailuku Basalt	-1		0.34 NE
5240-03	Lahaina-Pump B	1897	Pioneer Mill	unused	Wailuku Basalt	-1		0.34 NE
5240-04	Lahaina	1956	Shaw P	unused	alluvium	-45		0.04 W
5240-05	Lahaina Umc	1989	Lahaina Umc	Landscape Irrigation	Wailuku Basalt	-70	0.040	0.55 N
5240-07	Lahaina Park	2002	Maui Pks & Rec	park irrigation	Wailuku Basalt	-8	0.158	0.34 E
5240-08	Lahaina Rec Ctr	1986	Maui Pks & Rec	park irrigation	Wailuku Basalt		0.144	0.20 E

Table 5-1. List of Wells in the Vicinity of the Study Area

There is a potential for increasing groundwater pumpage in the region to impact the proposed pond and wetland system. As pumpage in the basalt aquifer increases, water levels will decrease in the Laniupoko Aquifer System Area. The pond-wetland system receives groundwater flow from the local alluvial (caprock) aquifer. The local alluvial aquifer receives most of its recharge from the Wailuku Basalt aquifer. If water levels decline in the basalt aquifer then discharge into the local alluvial aquifer will also decrease. This will result in lower water levels and lower groundwater flow through and around the proposed wetlands. Summer impacts will be greater then winter impacts. Oki (2007) modeled the regional groundwater flow around a proposed wetland near Kaunakakai, Moloka‘i. He found that discharge into the wetland system would decline if pumpage were increased. If regional pumpage levels were to increase significantly the water levels in the proposed wetlands would decline and salinity would increase. Although the salinity may increase, the pond and surrounding wetland system can still function if it is excavated to approximately mean sea level or lower as these areas will retain open water.

5.5 Adequacy of Groundwater Flow

The calculated groundwater flow through the study area is adequate to maintain the proposed pond and surrounding wetland system. There will generally be enough water flowing through the system to maintain water levels. Theoretically, a wetland only needs enough flow to prevent it from drying up. In the summer the average excess water flowing through the pond and wetland will be about 28,000 gallons per day. In the winter the excess water flow through will be about 69,000 gallons per day. It should be noted that only one year of groundwater data was collected. Extremely low water levels could result in little or no groundwater flow through the system. The wetland could still remain viable as long as it has portions that extend to near mean sea level or below.

Although the calculated groundwater flow is adequate to support the proposed pond and wetland system it is not known if the flow circulation will be adequate to support the uses and aesthetic considerations desired by public. To help increase the circulation small capacity wells should also be installed in the study area to supply the pond and surrounding wetland.

The wells could be installed on the east (mauka) or the west (makai) side of the study area. They also could be completed in the alluvium or the basalt. Wells on the east side would have lower salinity but would have the drawback of intercepting some of the natural groundwater flow into the study area. Wells on west side would not impact flow into the study area but may have higher salinity. The Puamana Community wells (5140-01, 02) which are about a 0.87 miles south of the study area, were completed in the caprock and are about 400 ft from the ocean. They each have 200 gallon per minute pumps installed and were pumped at about 64,000 gallons per day in 2006. The Puamana wells have a relatively high pump capacity. Much smaller wells would be adequate to provide circulation water for the wetland. For example a 10 gallon per minute pump would yield 14,400 gallons per day if it were pumped constantly. This would augment the anticipated summer groundwater flow through by about 50 percent.

6 Recommendations

There are two possible general conceptual designs for restoring the wetlands at Mokuhinia.

(1) One possibility is to excavate the project about three feet below the present ground surface (elevation 2 feet MSL). Groundwater levels in the area are about two or three ft below ground surface. The wetland would be soft and muddy with standing water present only during parts of the winter season or after heavy rainfall. If more standing water were required, then shallow basalt or caprock supply well(s) would have to be installed. The summer water levels would be dependent on these wells and pumps.

(2) Another possibility is to excavate the project area to an elevation below the elevation of groundwater. Standing water would always be present. The maximum depth should be no more than two feet below sea level. Below this depth there appears to be an increase in salinity. The maximum depth of the wetland pond would be about five feet. If more circulation is desired in the pond then shallow basalt or caprock well(s) could be installed to augment the flow.

Option (1) does not appear to restore the pond to near its historical appearance and function. Water levels in the former natural system were not artificially maintained. Option (2) is the recommended conceptual design. Wells will probably be necessary to maintain circulation and prevent localized areas of elevated salinity, nutrients or temperature.

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Appendices

Appendix 1	Elevation Survey Documentation
Appendix 2	Core Logs
Appendix 3	Specific Conductivity Data
Appendix 4	Calculations for Aquifer Parameters from Tidal Data
Appendix 5	Summer and Winter Calculations to Determine Groundwater Flow

Appendix 1 Elevation Survey Documentation

CONTROLPOINT
Surveying, Inc.

August 3, 2007

Oceanit
1001 Bishop Street, ASB Tower 2970
Honolulu, HI 96813

Attention: Mr. Kevin L. Gooding

Subject: Mokuhinia / Moku'ula Ecosystem Restoration Project
Lahaina, Maui, Hawaii

With this letter we inform you that that benchmarks you requested have been set. They have been set at the locations specified by you per your email of August 23, 2007. The elevations were carried from the USGS bronze tablet at the base of the flagpole at Lahaina Wharf. The elevation of this benchmark is 7.74 feet (MSL).

The elevations of the benchmarks set at the site are:

Benchmark 1 (mag nail in parking lot):	6.29 feet
Benchmark 2 (box cut on concrete slab):	6.53 feet

Should you have any questions, please don't hesitate to call me at (808) 242-9641. Thank you.

Very truly yours,

Norman Murakami

Oahu 1150 South King Street, Suite 1200
Honolulu, Hawaii 96814
Ph. (808) 591-2022 • FAX (808) 591-8333

Maui 1129 Lower Main Street, Suite 102
Wailuku, Hawaii 96793
Ph. (808) 242-9641 • FAX (808) 244-9220

Appendix 1 Elevation Survey Documentation

LAHAINA (94) Hawaii R. M. Wilson, 1921

Island of Maui

Third Order

Adjusted Elevations

Book: B 1212

Latitude 20°50' Longitude 156°35'

(1) FROM THE NORTH EDGE OF OLAWALU (89) NORTHWEST ALONG THE COAST TO LAHAINA

P.B.M. Lahaina, 3.9 mi. E. of, at point where rd. passes through a short rock cut, N. side of rd., 88 ~~200~~ ft. E. of milepost No. 18, at E. end of cut, bronze tablet cemented in solid rock, stamped "15" 14.901

T.B.M. Lahaina, 2.8 mi. E. of, beside stone wall, on N. side of rd., copper nail cemented in top of milepost No. 19, painted "13" 12.75

T.B.M. Lahaina, 1.8 mi. E. of, on E. side of rd., about 40 ft. from beach and 20 ft. from RR. track; copper nail in top of milepost No. 20, painted "11" 10.94

T.B.M. Lahaina, 0.8 mi. in SE. part of town; copper nail in milepost No. 21, painted "14" 14.27

P.B.M. Lahaina, 300 ft. SE. of wharf, in front of post office, on NW. side of large concrete base for flag pole; bronze tablet stamped "7" 7.740

B.M. No. 1, established by Asst. F. W. Perkins, 1900, center of shallow square hole cut in the concrete sill of the N. cellar window on W. side of Customs House at Lahaina. Mark is on the N. end of sill, near outer edge. Elevation above Mean Tide Level, 8.08 8.634

Note: There was a mark at the place where the bronze tablet was set which corresponds nearly with the described position of H.T.S. B.M. No. 2, as follows: "H.T.S. B.M. No. 2, 6.912"

B.M. No. 2, established by Asst. F. W. Perkins in 1900, top of concrete block, .62 ft. above center of a cross cut in the foundation of the flag staff in front of the Customs House at Lahaina. The flag staff stands in the center of a concrete block with two steps and the cross is on the W. face of the lower step near the S. end. Elevation above Mean Tide Level, 7.11 7.719

 12/7/60 hd

Appendix 1: Map Showing the location of the USGS Bronze Tablet near the Lahaina Wharf and the box cut on the northeast corner of the makai restrooms.

Appendix 2

Core Logs

The data for these core logs was collected in the field on August 7 and 8, 2007. The sampler is 36-inch long and theoretically the core returned should also be 36 inches. In almost every case some core was not retrieved or the core was compressed by the sampler so the returned length of core is less than 36 inches on the report sheet. There is no exact way of interpreting the entire column but a commonly accepted method is to distribute the log descriptions throughout the length of core. In the following descriptions, the depth represents the core penetration and the last column represents the description of compressed core.

Appendix 2 Core Logs

Well MW1

Core Name:		MW1A
Represents (inches below surface):		0-36
Penetration (in):		36
Final Core Length (in):		18
Water Level (in):		n/a
Depth (in)	(ft)	
1	0.08	Humus
2	0.17	Humus
3	0.25	Humus
4	0.33	Humus
5	0.42	Humus
6	0.50	Humus
7	0.58	Humus
8	0.67	Humus
9	0.75	Humus
10	0.83	Humus
11	0.92	Humus
12	1.00	Humus
13	1.08	Humus
14	1.17	Humus
15	1.25	Humus
16	1.33	Soil w/ Humus
17	1.42	Soil w/ Humus
18	1.50	Soil w/ Humus
19	1.58	
20	1.67	
21	1.75	
22	1.83	
23	1.92	
24	2.00	
25	2.08	
26	2.17	
27	2.25	
28	2.33	
29	2.42	
30	2.50	
31	2.58	
32	2.67	
33	2.75	
34	2.83	
35	2.92	
36	3.00	

Core Name:		MW1B
Represents (inches below surface):		37-72
Penetration (in):		36
Final Core Length (in):		36
Water Level (in):		n/a
Depth (in)	(ft)	
37	3.08	Soft Silty Mud (Brown)
38	3.17	Soft Silty Mud (Brown)
39	3.25	Soft Silty Mud (Brown)
40	3.33	Soft Silty Mud (Brown)
41	3.42	Soft Silty Mud (Brown)
42	3.50	Soft Silty Mud (Brown)
43	3.58	Soft Silty Mud (Brown)
44	3.67	Soft Silty Mud (Brown)
45	3.75	Soft Silty Mud (Brown)
46	3.83	Soft Silty Mud (Brown)
47	3.92	Soft Silty Mud (Brown)
48	4.00	Soft Silty Mud (Brown)
49	4.08	Firm Silty Mud (Darker)
50	4.17	Firm Silty Mud (Darker)
51	4.25	Firm Silty Mud (Darker)
52	4.33	Firm Silty Mud (Darker)
53	4.42	Firm Silty Mud (Darker)
54	4.50	Firm Silty Mud (Darker)
55	4.58	Firm Silty Mud (Darker)
56	4.67	Firm Silty Mud (Darker)
57	4.75	Firm Silty Mud (Darker)
58	4.83	Firm Silty Mud (Darker)
59	4.92	Firm Silty Mud (Darker)
60	5.00	Firm Silty Mud (Darker)
61	5.08	Firm Silty Mud (Darker)
62	5.17	Firm Silty Mud (Darker)
63	5.25	Firm Silty Mud (Darker)
64	5.33	Firm Silty Mud (Darker)
65	5.42	Mixed Coraline & Basalt sand
66	5.50	Mixed Coraline & Basalt sand
67	5.58	Mixed Coraline & Basalt sand
68	5.67	Mixed Coraline & Basalt sand
69	5.75	Mixed Coraline & Basalt sand
70	5.83	Mixed Coraline & Basalt sand
71	5.92	Mixed Coraline & Basalt sand
72	6.00	Mixed Coraline & Basalt sand

Core Name:		MW1C
Represents (inches below surface):		73-108
Penetration (in):		36
Final Core Length (in):		24
Water Level (in):		n/a
Depth (in)	(ft)	
73	6.08	Coraline Sand w/ Basalt
74	6.17	Coraline Sand w/ Basalt
75	6.25	Coraline Sand w/ Basalt
76	6.33	Coraline Sand w/ Basalt
77	6.42	Coraline Sand w/ Basalt
78	6.50	Coraline Sand w/ Basalt
79	6.58	Coraline Sand w/ Basalt
80	6.67	Coraline Sand w/ Basalt
81	6.75	Coraline Sand w/ Basalt
82	6.83	Coraline Sand w/ Basalt
83	6.92	Coraline Sand w/ Basalt
84	7.00	Coraline Sand w/ Basalt
85	7.08	Coarse Coraline Detritus and Basalt Detritus
86	7.17	Coarse Coraline Detritus and Basalt Detritus
87	7.25	Coarse Coraline Detritus and Basalt Detritus
88	7.33	Coarse Coraline Detritus and Basalt Detritus
89	7.42	Coarse Coraline Detritus and Basalt Detritus
90	7.50	Coarse Coraline Detritus and Basalt Detritus
91	7.58	Coarse Coraline Detritus and Basalt Detritus
92	7.67	Coarse Coraline Detritus and Basalt Detritus
93	7.75	Coarse Coraline Detritus and Basalt Detritus
94	7.83	Coarse Coraline Detritus and Basalt Detritus
95	7.92	Coarse Coraline Detritus and Basalt Detritus
96	8.00	Coarse Coraline Detritus and Basalt Detritus
97	8.08	Coarse Coraline Detritus and Basalt Detritus
98	8.17	
99	8.25	
100	8.33	
101	8.42	
102	8.50	
103	8.58	
104	8.67	
105	8.75	
106	8.83	
107	8.92	
108	9.00	

General Notes

August 7, 2007, 16:15, Check Photos for "C", as my notes are not clear on the "transition".

Well MW2

Core Name:		MW2A
Represents (inches below surface):		0-36
Penetration (in):		36
Final Core Length (in):		20
Water Level (in):		n/a
Depth (in)	(ft)	
1	0.08	Top Soil
2	0.17	Top Soil
3	0.25	Top Soil
4	0.33	Coral Hash (Dredge ?)
5	0.42	Coral Hash (Dredge ?)
6	0.50	Coral Hash (Dredge ?)
7	0.58	Coral Hash (Dredge ?)
8	0.67	Top Soil
9	0.75	Top Soil
10	0.83	Silty Clay
11	0.92	Silty Clay
12	1.00	Silty Clay
13	1.08	Silty Clay
14	1.17	Silty Clay
15	1.25	Silty Clay
16	1.33	Silty Clay
17	1.42	Silty Clay
18	1.50	Silty Clay
19	1.58	Silty Clay
20	1.67	Silty Clay
21	1.75	
22	1.83	
23	1.92	
24	2.00	
25	2.08	
26	2.17	
27	2.25	
28	2.33	
29	2.42	
30	2.50	
31	2.58	
32	2.67	
33	2.75	
34	2.83	
35	2.92	
36	3.00	

Core Name:		MW2B
Represents (inches below surface):		37-72
Penetration (in):		36
Final Core Length (in):		14
Water Level (in):		n/a
Depth (in)	(ft)	
37	3.08	Silty Clay
38	3.17	Silty Clay
39	3.25	Silty Clay
40	3.33	Clay with Silt
41	3.42	Clay with Silt
42	3.50	Clay with Silt
43	3.58	Clay with Silt
44	3.67	Clay with Silt
45	3.75	Clay with Silt
46	3.83	Clay with Silt
47	3.92	Clay with Silt
48	4.00	Clay with Silt
49	4.08	Clay with Silt
50	4.17	Clay with Silt
51	4.25	Clay with Silt
52	4.33	Clay with Silt
53	4.42	
54	4.50	
55	4.58	
56	4.67	
57	4.75	
58	4.83	
59	4.92	
60	5.00	
61	5.08	
62	5.17	
63	5.25	
64	5.33	
65	5.42	
66	5.50	
67	5.58	
68	5.67	
69	5.75	
70	5.83	
71	5.92	
72	6.00	

Core Name:		MW2C
Represents (inches below surface):		73-108
Penetration (in):		36
Final Core Length (in):		30
Water Level (in):		n/a
Depth (in)	(ft)	
73	6.08	Clay with Silt
74	6.17	Clay with Silt
75	6.25	Clay with Silt
76	6.33	Clay with Silt
77	6.42	Clay with Silt
78	6.50	Clay with Silt
79	6.58	Clay with Silt
80	6.67	Clay with Silt
81	6.75	Clay with Silt
82	6.83	Clay with Silt
83	6.92	Clay with Silt
84	7.00	Clay with Silt
85	7.08	Clay with Silt
86	7.17	Coraline Sand
87	7.25	Coraline Sand
88	7.33	Coraline Sand
89	7.42	Coraline Sand
90	7.50	Coraline Sand
91	7.58	Coraline Sand
92	7.67	Coraline Sand
93	7.75	Coraline Sand
94	7.83	Coraline Sand
95	7.92	Coraline Sand
96	8.00	Coraline Sand
97	8.08	Coraline Sand
98	8.17	Coraline Sand
99	8.25	Coraline Sand
100	8.33	Coraline Sand
101	8.42	Coraline Sand
102	8.50	
103	8.58	
104	8.67	
105	8.75	
106	8.83	
107	8.92	
108	9.00	

General Notes

August 7, 2007, 17:15.

Well MW3

Core Name:		MW3A
Represents (inches below surface):		0-36
Penetration (in):		36
Final Core Length (in):		25
Water Level (in):		n/a
Depth (in)	(ft)	
1	0.08	Top Soil
2	0.17	Top Soil
3	0.25	Top Soil
4	0.33	Top Soil
5	0.42	Top Soil
6	0.50	Top Soil
7	0.58	Top Soil
8	0.67	Top Soil
9	0.75	Top Soil
10	0.83	Top Soil
11	0.92	Top Soil
12	1.00	Top Soil
13	1.08	Sand & Silt
14	1.17	Sand & Silt
15	1.25	Sand & Silt
16	1.33	Coral Detritus
17	1.42	Coral Detritus
18	1.50	Coral Detritus
19	1.58	Coral Detritus
20	1.67	Coral Detritus
21	1.75	Coral Detritus
22	1.83	Coral Detritus
23	1.92	Coral Detritus
24	2.00	Coral Detritus
25	2.08	Black Sand
26	2.17	
27	2.25	
28	2.33	
29	2.42	
30	2.50	
31	2.58	
32	2.67	
33	2.75	
34	2.83	
35	2.92	
36	3.00	

Core Name:		MW3B
Represents (inches below surface):		37-72
Penetration (in):		36
Final Core Length (in):		24
Water Level (in):		39
Depth (in)	(ft)	
37	3.08	Black Sand
38	3.17	Black Sand
39	3.25	Muddy Silt (wet)
40	3.33	Muddy Silt (wet)
41	3.42	Muddy Silt (wet)
42	3.50	Muddy Silt (wet)
43	3.58	Muddy Silt (wet)
44	3.67	Muddy Silt (wet)
45	3.75	Muddy Silt (wet)
46	3.83	Muddy Silt (wet)
47	3.92	Muddy Silt (wet)
48	4.00	Muddy Silt (wet)
49	4.08	Muddy Silt (wet)
50	4.17	Muddy Silt (wet)
51	4.25	Organic
52	4.33	Organic
53	4.42	Organic
54	4.50	Silty Soil
55	4.58	Silty Soil
56	4.67	Silty Soil
57	4.75	Silty Soil
58	4.83	Silty Soil
59	4.92	Silty Soil
60	5.00	Silty Soil
61	5.08	
62	5.17	
63	5.25	
64	5.33	
65	5.42	
66	5.50	
67	5.58	
68	5.67	
69	5.75	
70	5.83	
71	5.92	
72	6.00	

Core Name:		MW3C
Represents (inches below surface):		73-108
Penetration (in):		36
Final Core Length (in):		31
Water Level (in):		n/a
Depth (in)	(ft)	
73	6.08	Sandy Silt
74	6.17	Sandy Silt
75	6.25	Sandy Silt
76	6.33	Sandy Silt
77	6.42	Sandy Silt
78	6.50	Sandy Silt
79	6.58	Sandy Silt
80	6.67	Sandy Silt
81	6.75	Silty Clay
82	6.83	Silty Clay
83	6.92	Silty Clay
84	7.00	Silty Clay
85	7.08	Silty Clay
86	7.17	Silty Clay
87	7.25	Silty Clay
88	7.33	Silty Clay
89	7.42	Silty Clay
90	7.50	Silty Clay
91	7.58	Silty Clay
92	7.67	Silty Clay
93	7.75	Sand (Gray)
94	7.83	Sand (Gray)
95	7.92	Sand (Gray)
96	8.00	Sand (Gray)
97	8.08	Sand (Gray)
98	8.17	Sand (Gray)
99	8.25	Sand (Gray)
100	8.33	Sand (Gray)
101	8.42	Sand (Gray)
102	8.50	Sand (Gray)
103	8.58	Sand (Gray)
104	8.67	Sand (Gray)
105	8.75	
106	8.83	
107	8.92	
108	9.00	

General Notes

August 7, 2007, 8:45am.

Well MW4

Core Name:		MW4A
Represents (inches below surface):		0-36
Penetration (in):		36
Final Core Length (in):		25
Water Level (in):		34
Depth (in)	(ft)	
1	0.08	Top Soil
2	0.17	Top Soil
3	0.25	Top Soil
4	0.33	Top Soil
5	0.42	Top Soil
6	0.50	Crushed Coral
7	0.58	Crushed Coral
8	0.67	Crushed Coral
9	0.75	Crushed Coral
10	0.83	Sand
11	0.92	Sand
12	1.00	Sand
13	1.08	Sand
14	1.17	Silty Mud
15	1.25	Silty Mud
16	1.33	Silty Mud
17	1.42	Silty Mud
18	1.50	Silty Mud
19	1.58	Silty Mud
20	1.67	Silty Mud
21	1.75	Silty Mud
22	1.83	Silty Mud
23	1.92	Silty Mud
24	2.00	Silty Mud
25	2.08	Silty Mud
26	2.17	
27	2.25	
28	2.33	
29	2.42	
30	2.50	
31	2.58	
32	2.67	
33	2.75	
34	2.83	
35	2.92	
36	3	

Core Name:		MW4B
Represents (inches below surface):		37-72
Penetration (in):		36
Final Core Length (in):		33
Water Level (in):		n/a
Depth (in)		
37	3.08	Silty Mud
38	3.17	Silty Mud
39	3.25	Silty Mud
40	3.33	Sand
41	3.42	Sand
42	3.50	"Mud"
43	3.58	"Mud"
44	3.67	"Mud"
45	3.75	"Mud"
46	3.83	"Mud"
47	3.92	"Mud"
48	4.00	"Mud"
49	4.08	"Mud"
50	4.17	"Mud"
51	4.25	"Mud"
52	4.33	"Mud"
53	4.42	"Mud"
54	4.50	"Mud"
55	4.58	"Mud"
56	4.67	Organic
57	4.75	Organic
58	4.83	Organic
59	4.92	"Black Mud"
60	5.00	"Black Mud"
61	5.08	"Black Mud"
62	5.17	"Black Mud"
63	5.25	"Black Mud"
64	5.33	"Black Mud"
65	5.42	"Black Mud"
66	5.50	"Black Mud"
67	5.58	"Black Mud"
68	5.67	"Black Mud"
69	5.75	"Black Mud"
70	5.83	
71	5.92	
72	6	

Core Name:		MW4C
Represents (inches below surface):		73-108
Penetration (in):		36
Final Core Length (in):		35
Water Level (in):		n/a
Depth (in)	(ft)	
73	6.08	Silty Mud
74	6.17	Silty Mud
75	6.25	Silty Mud
76	6.33	Silty Mud
77	6.42	Silty Mud
78	6.50	Silty Mud
79	6.58	Silty Mud
80	6.67	Silty Mud
81	6.75	Silty Mud
82	6.83	Silty Mud
83	6.92	Silty Mud
84	7.00	Silty Mud
85	7.08	Silty Mud
86	7.17	Silty Mud
87	7.25	Silty Mud
88	7.33	Silty Mud
89	7.42	Silty Mud
90	7.50	Silty Mud
91	7.58	Silty Mud
92	7.67	Silty Mud
93	7.75	Silty Mud
94	7.83	Silty Mud
95	7.92	Silty Mud
96	8.00	Silty Mud
97	8.08	Silty Mud
98	8.17	Silty Mud
99	8.25	Silty Mud
100	8.33	Silty Mud
101	8.42	Silty Mud
102	8.50	Silty Mud
103	8.58	Silty Mud
104	8.67	Silty Mud
105	8.75	Silty Mud
106	8.83	Silty Mud
107	8.92	Silty Mud
108	9.00	

General Notes

Two Five foot sleeves, one 2 foot riser.

Well MW5

Core Name:		MW5A
Represents (inches below surface):		0-36
Penetration (in):		36
Final Core Length (in):		20
Water Level (in):		n/a
Depth (in)	(ft)	
1	0.08	Top Soil
2	0.17	Top Soil
3	0.25	Top Soil
4	0.33	Top Soil
5	0.42	Top Soil
6	0.50	Top Soil
7	0.58	Top Soil
8	0.67	Top Soil
9	0.75	Top Soil
10	0.83	Top Soil
11	0.92	Top Soil w/ Occ. Pumice
12	1.00	Top Soil w/ Occ. Pumice
13	1.08	Top Soil w/ Occ. Pumice
14	1.17	Top Soil w/ Occ. Pumice
15	1.25	Top Soil w/ Occ. Pumice
16	1.33	Top Soil w/ Occ. Pumice
17	1.42	Clay Soil
18	1.50	Clay Soil
19	1.58	Clay Soil
20	1.67	Clay Soil
21	1.75	
22	1.83	
23	1.92	
24	2.00	
25	2.08	
26	2.17	
27	2.25	
28	2.33	
29	2.42	
30	2.50	
31	2.58	
32	2.67	
33	2.75	
34	2.83	
35	2.92	
36	3.00	

Core Name:		MW5B
Represents (inches below surface):		37-84
Penetration (in):		48
Final Core Length (in):		36
Water Level (in):		44
Depth (in)	(ft)	
37	3.08	Clay Soil
38	3.17	Clay Soil
39	3.25	Clay Soil
40	3.33	Clay Soil
41	3.42	Clay Soil
42	3.50	Clay Soil
43	3.58	Clay Soil
44	3.67	Clay Soil
45	3.75	Clay Soil
46	3.83	Clay Soil
47	3.92	Clay Soil
48	4.00	Silty with roots
49	4.08	Silty with roots
50	4.17	Silty with roots
51	4.25	Silty with roots
52	4.33	Silty with roots
53	4.42	Silty with roots
54	4.50	Silty with roots
55	4.58	Silty with roots
56	4.67	Silty with roots
57	4.75	Silty with roots
58	4.83	Silty with roots
59	4.92	Silty with roots
60	5.00	Silty with roots
61	5.08	Silty with roots
62	5.17	Silty with roots
63	5.25	Silty with roots
64	5.33	Silty with roots
65	5.42	Silty with roots
66	5.50	Silty with roots
67	5.58	Silty with roots
68	5.67	Silty with roots
69	5.75	Sandy Silt
70	5.83	Sandy Silt
71	5.92	Sandy Silt
72	6.00	Sandy Silt
73	6.08	
74	6.17	
75	6.25	
76	6.33	
77	6.42	
78	6.50	
79	6.58	
80	6.67	
81	6.75	
82	6.83	
83	6.92	
84	7.00	

Core Name:		MW5C
Represents (inches below surface):		85-120
Penetration (in):		36
Final Core Length (in):		24
Water Level (in):		n/a
Depth (in)	(ft)	
85	7.08	Silty Soil
86	7.17	Silty Soil
87	7.25	Silty Soil
88	7.33	Silty Soil
89	7.42	Silty Soil
90	7.50	Silty Soil
91	7.58	Fine Black Sand transition to coarse
92	7.67	Fine Black Sand transition to coarse
93	7.75	Fine Black Sand transition to coarse
94	7.83	Fine Black Sand transition to coarse
95	7.92	Fine Black Sand transition to coarse
96	8.00	Fine Black Sand transition to coarse
97	8.08	Fine Black Sand transition to coarse
98	8.17	Fine Black Sand transition to coarse
99	8.25	Fine Black Sand transition to coarse
100	8.33	Fine Black Sand transition to coarse
101	8.42	Fine Black Sand transition to coarse
102	8.50	Fine Black Sand transition to coarse
103	8.58	Fine Black Sand transition to coarse
104	8.67	Fine Black Sand transition to coarse
105	8.75	Fine Black Sand transition to coarse
106	8.83	Fine Black Sand transition to coarse
107	8.92	Fine Black Sand transition to coarse
108	9.00	Fine Black Sand transition to coarse
109	9.08	Fine Black Sand transition to coarse
110	9.17	Fine Black Sand transition to coarse
111	9.25	Fine Black Sand transition to coarse
112	9.33	Fine Black Sand transition to coarse
113	9.42	
114	9.50	
115	9.58	
116	9.67	
117	9.75	
118	9.83	
119	9.92	
120	10.00	

General Notes

August 7, 2007, 14:40. 15.7 feet to the bottom.

(Continued)

Well MW5 (Cont'd)

Core Name:		MW5D
Represents (inches below surface):		121-162
Penetration (in):		42
Final Core Length (in):		36
Water Level (in):		n/a
Depth (in)	(ft)	
121	10.08	Medium Coarse Black Sand
122	10.17	Medium Coarse Black Sand
123	10.25	Medium Coarse Black Sand
124	10.33	Medium Coarse Black Sand
125	10.42	Medium Coarse Black Sand
126	10.50	Medium Coarse Black Sand
127	10.58	Medium Coarse Black Sand
128	10.67	Medium Coarse Black Sand
129	10.75	Medium Coarse Black Sand
130	10.83	Medium Coarse Black Sand
131	10.92	Medium Coarse Black Sand
132	11.00	Medium Coarse Black Sand
133	11.08	Medium Coarse Black Sand
134	11.17	Medium Coarse Black Sand
135	11.25	Medium Coarse Black Sand
136	11.33	Medium Coarse Black Sand
137	11.42	Medium Coarse Black Sand
138	11.50	Medium Coarse Black Sand
139	11.58	Medium Coarse Black Sand
140	11.67	Medium Coarse Black Sand
141	11.75	Medium Coarse Black Sand
142	11.83	Medium Coarse Black Sand
143	11.92	Medium Coarse Black Sand
144	12.00	Medium Coarse Black Sand
145	12.08	Medium Coarse Black Sand
146	12.17	Medium Coarse Black Sand
147	12.25	Medium Coarse Black Sand
148	12.33	Coarse Sand with coral detritus, sand & shell bits
149	12.42	Coarse Sand with coral detritus, sand & shell bits
150	12.50	Coarse Sand with coral detritus, sand & shell bits
151	12.58	Coarse Sand with coral detritus, sand & shell bits
152	12.67	Coarse Sand with coral detritus, sand & shell bits
153	12.75	Coarse Sand with coral detritus, sand & shell bits
154	12.83	Coarse Sand with coral detritus, sand & shell bits
155	12.92	Coarse Sand with coral detritus, sand & shell bits
156	13.00	Coarse Sand with coral detritus, sand & shell bits

Core Name:		MW5E
Represents (inches below surface):		163-198
Penetration (in):		36
Final Core Length (in):		13
Water Level (in):		n/a
Depth (in)	(ft)	
163	13.08	Coarse Coraline Sand
164	13.17	Coarse Coraline Sand
165	13.25	Coarse Coraline Sand
166	13.33	Coarse Coraline Sand
167	13.42	Coarse Coraline Sand
168	13.50	Coarse Coraline Sand
169	13.58	Coarse Coraline Sand
170	13.67	Coarse Coraline Sand
171	13.75	Coarse Coraline Sand
172	13.83	Coarse Coraline Sand
173	13.92	Coarse Coraline Sand
174	14.00	Coarse Coraline Sand
175	14.08	Coarse Coraline Sand
176	14.17	Coarse Coraline Sand
177	14.25	
178	14.33	
179	14.42	
180	14.50	
181	14.58	
182	14.67	
183	14.75	
184	14.83	
185	14.92	
186	15.00	
187	15.08	
188	15.17	
189	15.25	
190	15.33	
191	15.42	
192	15.50	
193	15.58	
194	15.67	
195	15.75	
196	15.83	
197	15.92	
198	16.00	

Appendix 3

Specific Conductivity data from Monitor Wells 1, 2, 3, 4 and 5 for January 7, 2008 and August 5, 2008.

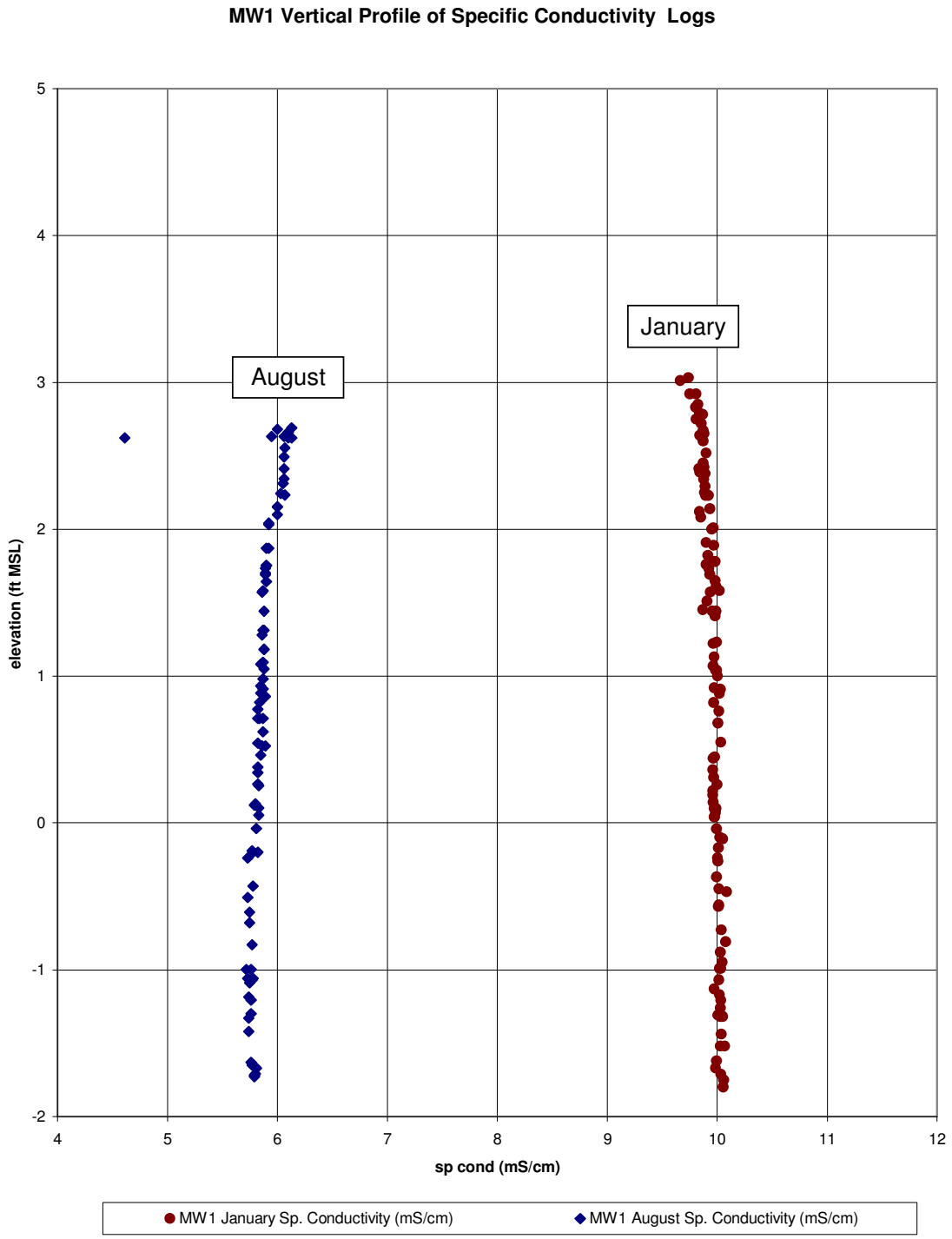
MW 1 vertical profiles of specific conductivity

MW 2 vertical profiles of specific conductivity

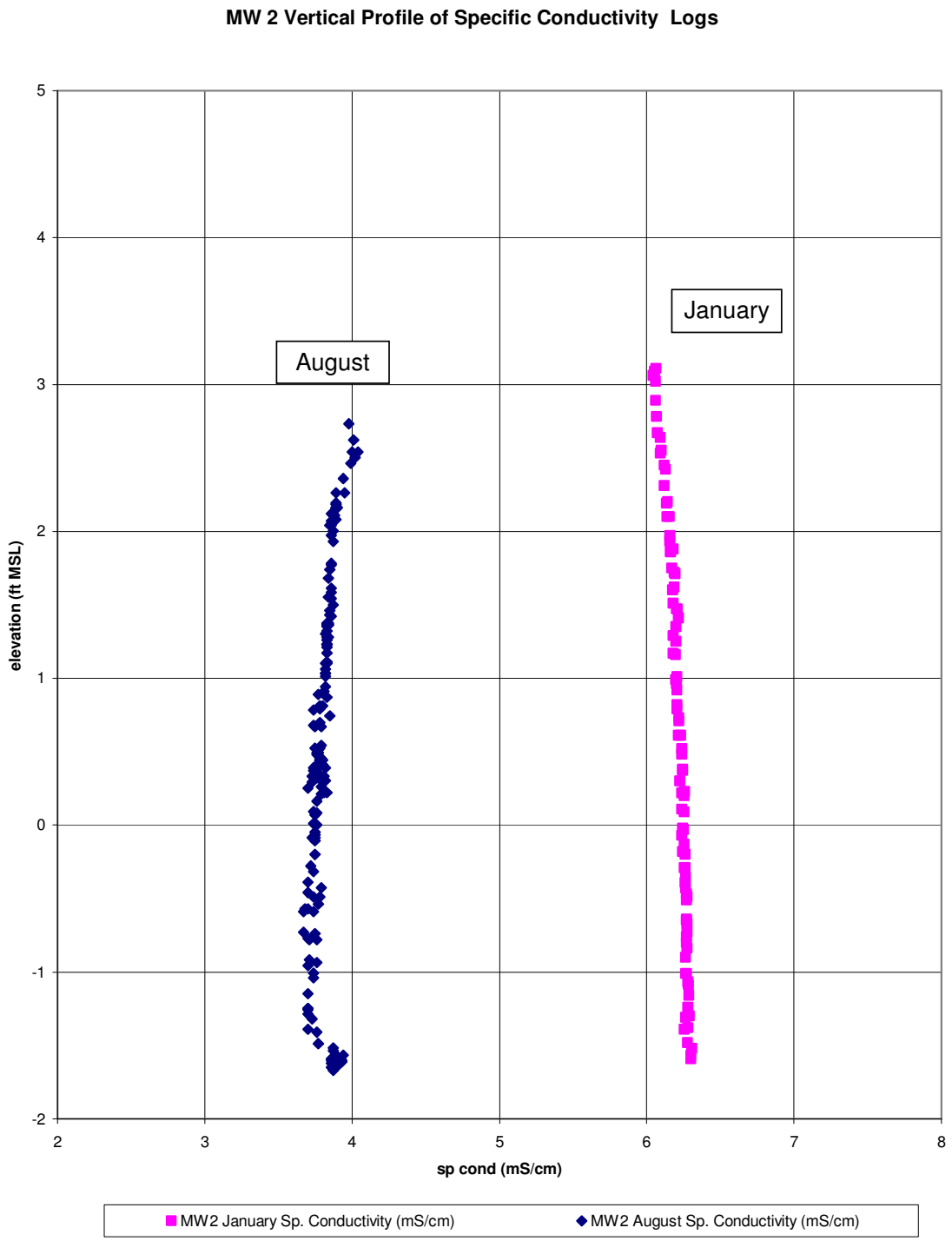
MW 3 vertical profiles of specific conductivity

MW 4 vertical profiles of specific conductivity

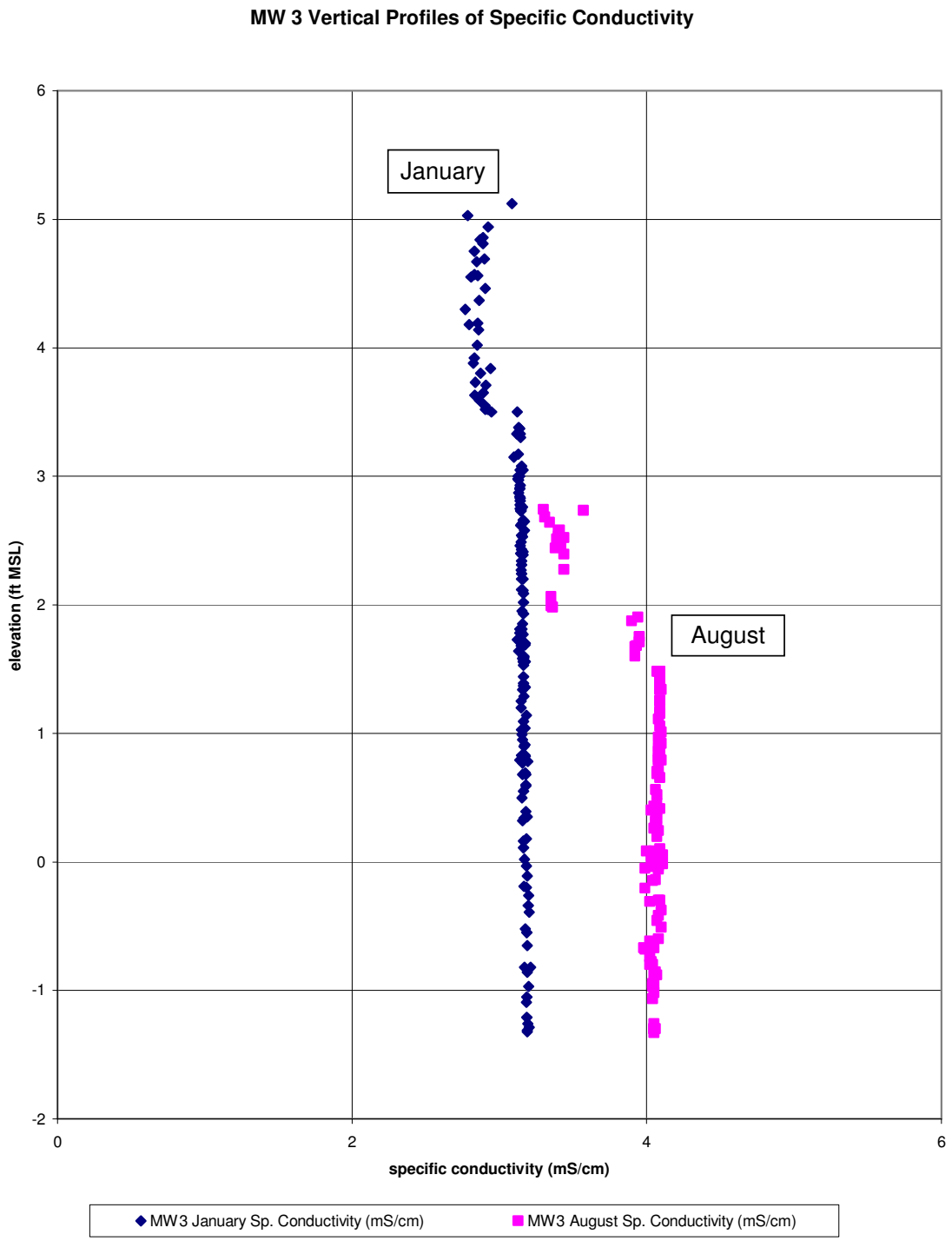
MW 5 vertical profiles of specific conductivity



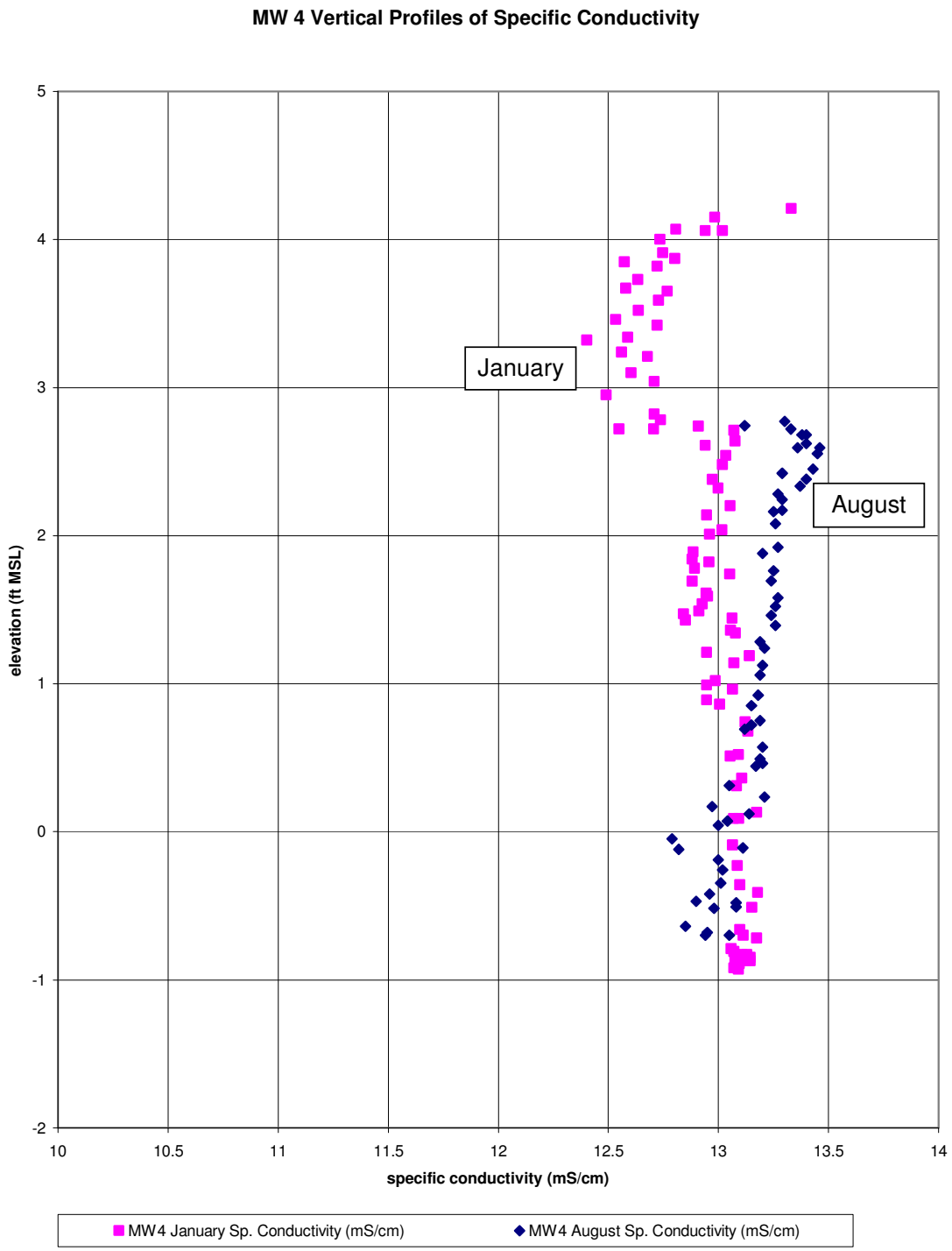
MW 1 vertical profiles of specific conductivity



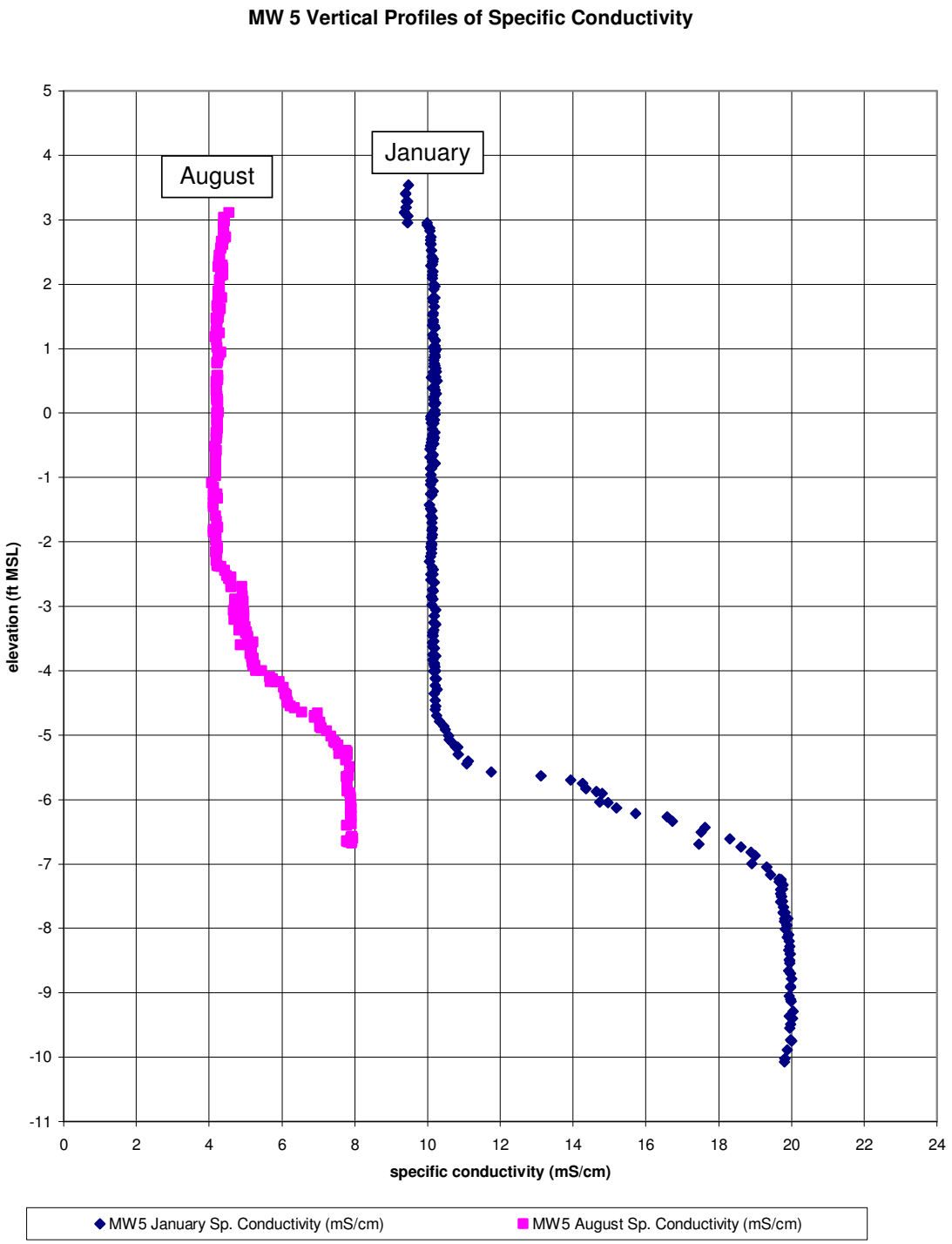
MW 2 vertical profiles of specific conductivity



MW 3 vertical profiles of specific conductivity



MW 4 vertical profiles of specific conductivity



MW 5 vertical profiles of specific conductivity

Appendix 4 Calculating aquifer parameters from tidal data

Ferris (1951)
Huntsman and McCready (2004)

Well	Distance From Ocean (ft)	Lag Time (hours)
Shore	0	0
MW1	594	13.3
MW2	694	15.6
MW4	1055	16.5
MW5	852	12

Regression analysis to calculate distances

y = 0.0153x + 1.6901
R2 = 0.8352

tidal period (to) is 24.3 hours

T/S=(x^2*to)/(4*pi*t1^2)

Well	Distance From Ocean (ft)	Lag Time (hours) (t1)	Calculated distance using y = 0.0153x + 1.6901 (x) (feet)	T/S (ft^2/hr) (using regression calculated distances)	T/S (ft^2/hr) (using actual distances)
MW1	594	13.3	759	6295	3857
MW2	694	15.6	909	6568	3827
MW4	1055	16.5	968	6655	7906
MW5	852	12	674	6098	9748

Diffusivity (D) = T/S

D*S=T

	T/S (ft^2/hr) (using regression calculated distances)	S=.05 T (ft2/hr)	S=.05 T (ft^2/day)	S=0.1 T (ft2/hr)	S=0.1 T (ft^2/day)	S=0.15 T (ft2/hr)	S=0.15 T (ft^2/day)
MW1	6295	315	7554	629	15107	944	22661
MW2	6568	328	7881	657	15762	985	23644
MW4	6655	333	7986	666	15972	998	23958
MW5	6098	305	7317	610	14634	915	21951

Assume horizontal flow into the well and that well effect is 1.5 saturated penetration

T=Kb b=1.5*well penetration well penetration for MW1,2,4 is about 5 ft s 5*1.5= 7.5

	Calculate K (ft/day) S=0.05	b= (ft)	Calculate K (ft/day) S=0.1	Calculate K (ft/day) S=0.15
MW1	1007	7.5	2014	3021
MW2	1051	7.5	2102	3152
MW4	1065	7.5	2130	3194

MW 5b= 13.6*1.5= 20.4

MW5	359	20.4	717	1076

Average T =	7684	ft^2/day
Average K =	870	ft/day

Appendix 5
Summer calculations to determine groundwater flow

May to September

Dupuit Flow
Steady-state flow
assumptions
Hydraulic gradient = slope of water table
For small water table gradients the stream lines are horizontal and the equipotential lines are vertical
Flow from the northeast towards to ocean

$$q' = -\frac{1}{2} K \frac{(h_2^2 - h_1^2)}{L}$$ Dupuit Equation

y=	600
(length along Front Street parallel to the coast)	

K= 870 ft/day

ft	ft	ft	ft/ft	ft^2/day	ft^3/day	gal/day	
h_2	h_1	L		q'	q' * y		
downstream saturated thickness	upstream saturated thickness	length	gradient	specific discharge	discharge	discharge	flow line
5	7.98	1055	0.00282	15.949	9,569	71,578	Well 4 to Ocean
5	7.87	594	0.00483	27.050	16,230	121,399	Well 1 to Ocean
5	7.88	694	0.00415	23.251	13,950	104,350	Well 2 to Ocean
5	7.95	1042	0.00283	15.948	9,569	71,576	Well 3 to Ocean
13.6	17.12	852	0.0041	55.209	33,126	247,780	Well 5 to Ocean

Appendix 5
Winter calculations to determine groundwater flow

October to April

Dupuit Flow
Steady-state flow
assumptions
Hydraulic gradient = slope of water table
For small water table gradients the stream lines are horizontal and the equipotential lines are vertical
Flow from the northeast towards to ocean

$$q' = -\frac{1}{2} K \frac{(h_2^2 - h_1^2)}{L}$$ Dupuit Equation

y=	600
(length along Front Street parallel to the coast)	

K= 870 ft/day

ft	ft	ft	ft/ft	ft^2/day	ft^3/day	gal/day	
h_2	h_1	L		q'	q' * y		
downstream saturated thickness	upstream saturated thickness	length	gradient	specific discharge	discharge	discharge	flow line
5	9.08	1055	0.00387	23.68643	14,212	106,305	Well 4 to Ocean
5	8.16	594	0.00532	30.4541	18,272	136,678	Well 1 to Ocean
5	8.23	694	0.00465	26.78503	16,071	120,211	Well 2 to Ocean
13.6	17.2	852	0.0042	56.61127	33,967	254,071	Well 5 to Ocean

Page 20: Additional data on the ET assumptions: The evapotransportation (ET) rate assumptions were further assessed based on additional input from a recent POH study with UH researchers. This data was confirmed by the leading expert in Hawaii Dr. Thomas Giambelluca at UH. The data pixels around the Lahaina area and the lowest annual ET values are around 4-6 inches, presumably for non-irrigated land covers. So, for un-irrigated, dry land areas (no supplemental water from any source), an ET estimate of 50% of rainfall is an accurate estimate.
In the case of a wetland in the Lahaina area, assuming it has year-round standing water or, at a minimum, saturated soil (derived from artificial or natural sources), ET would be essentially independent of rainfall, and would be very high, perhaps reaching potential ET rates of 80 to 100 inches per year.

APPENDIX B
ESA Section 7 Correspondence

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

4/20/10

In Reply Refer To:
2010-SL-0212

APR 1 9 2010

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PP-C

Mr. Anthony J. Paresa, P.E.
Deputy District Engineer for Programs and Project Managment
U.S. Army Corps of Engineers, Honolulu District
Civil and Public Works Branch
Programs and Project Management Division
Fort Shafter, Hawaii 96858-5440

Subject: Species List Request for the Mokuhinia Ecosystem Restoration, Lahaina, Maui

Dear Mr. Paresa:

Thank you for your letter dated March 17, 2010, requesting a list of threatened and endangered species and designated critical habitat that may occur in the vicinity of the proposed Mokuhinia Ecosystem Restoration Project in downtown Lahaina, Maui. We received your letter on March 18, 2010.

We have reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program and the Hawaii GAP Program. The federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) has been observed in the vicinity of the proposed project. No designated critical habitat occurs at the project site. The information paper included with your March 17, 2010, letter indicated that the purpose of the project is to restore habitat for the Hawaiian coot (*Fulica alai*), Hawaiian duck (*Anas wyvilliana*), Hawaiian moorhen (*Gallinula chloropus sandvicensis*) and Hawaiian stilt (*Himantopus mexicanus knudseni*) (collectively referred to as waterbirds).

We appreciate your efforts to restore approximately seven acres of wetland habitat, but have some concerns regarding waterbird use of this wetland in the future. Waterbirds and the Hawaiian goose (*Branta sandvicensis*) are attracted to standing water and the created wetland is likely to attract some or all of these species, and could provide foraging and nesting habitat to them. However, since the proposed project site is in a populated, urban area, there is the risk that predation from non-native predators such as rats, mongoose, and feral and domestic cats and dogs, and increased human interaction may negatively impact these listed species. We encourage you to develop endangered and native species interpretive signs, and an interpretive program. In order to evaluate the success of habitat creation for these species, we recommend you also develop a waterbird and Hawaiian goose monitoring plan. Furthermore, future use and

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maintenance of the wetland may adversely impact these species particularly if some of the birds nest in the vicinity of the wetland, creating a "sink", or an area of non-productivity due to failed nests. We recommend you develop a predator management plan to evaluate and address these impacts. Avian botulism outbreaks are common in Hawaii and can be a significant localized cause of waterbird mortality. Botulism can occur in any area with standing fresh or brackish water frequented by waterbirds. There is a possibility that the proposed project may increase the risk for an outbreak of avian botulism. We recommend further coordination with our office for the protection of federally listed species that maybe impacted by the proposed project.

We appreciate your efforts to conserve endangered species. If you have questions, please contact Megan Laut, Fish and Wildlife Biologist, Consultation and Technical Assistance Program (phone: 808-792-9400; fax: 808-792-9581).

Sincerely,

for Loyal Mehrhoff
Field Supervisor

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

April 11, 2013

REPLY TO ATTENTION OF:

Civil and Public Works Branch
Programs and Project Management Division

Dr. Loyal Mehrhoff
U.S. Fish and Wildlife Service
Pacific Islands Ecoregion
300 Ala Moana Blvd., Room 3-122
Box 50088
Honolulu, Hawaii 96850

Dear Dr. Mehrhoff:

At the request of the County of Maui (hereafter "County"), the U.S. Army Corps of Engineers, Honolulu District (USACE) is conducting a feasibility planning study for the proposed Mokuhinia Ecosystem Restoration Project in the town of Lahaina, on the island of Maui, Hawaii (Enclosure 1). The study is authorized under Section 206 of the 1996 Water Resources Development Act (WRDA), as amended.

Historically, Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the western shoreline of Maui. The site served as habitat for a variety of waterbird and migratory shorebirds, as well as other wetland species. Within this pond, was the island of Mokuula, which was the preferred residence of high ranking *alii* (chiefs) of Maui through the mid-1800s. However, in 1913, Lahaina businessmen filled the pond for hygienic and development purposes, and a 1918 Executive Order turned the area over to the County for the establishment of Maluulu o Lele Park. Mokuhinia and Mokuula currently lie approximately 2 to 3 feet under the ground surface of the park. The proposed project specifically addresses restoration of the aquatic ecosystem functions and processes associated with Mokuhinia.

Other activities are being concurrently planned within Maluulu o Lele Park as part of the restoration of the overall site as shown in Enclosure 1. Specifically, restoration of Mokuula is being pursued by the County in coordination with the native Hawaiian community. In addition, a support facilities project is being pursued within the southeast corner of the park by the Friends of Mokuula, a local non-profit organization. It is important to note that the USACE is coordinating the restoration of Mokuhinia with these other activities, but does not have the authority to be involved with their planning or implementation.

The purpose of this letter is to continue informal consultation with the U.S. Fish and Wildlife Service (USFWS) in accordance with Section 7 of the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1531 et. seq.) in support of the Mokuhinia Ecosystem Restoration Project. Specifically, input is requested relative to the potential for the project to impact species that are listed as endangered or threatened and/or designated critical habitat for those species.

Project Description

As defined, the goal of the project is to restore a portion of the pond and associated wetlands of Mokuhinia to provide aquatic ecosystem functions and values, with consideration given to the subsequent cultural revitalization of Mokuula by the native Hawaiian community. The specific objectives of the project are to: (1) re-establish wetland functions and values associated with Mokuhinia, (2) maximize foraging habitat throughout the year for the endangered Hawaiian stilt (*aeo*, *Himantopus mexicanus knudseni*) and Hawaiian coot (*alae ke okeo*, *Fulica alai*), and (3) provide habitat for migratory waterfowl and shorebird species.

Based on the project goal and objectives, a conceptual restoration design has been developed for the proposed project as shown in Enclosures 2 and 3. The conceptual design reflects ongoing coordination with USFWS staff, particularly as related to addressing specific habitat requirements for the Hawaiian stilt and coot. Specific components of the conceptual restoration design are as follows:

- Excavation to intercept the existing groundwater, as needed to achieve a maximum water depth of approximately 2 feet, based on average groundwater levels in the winter.

- Grading to provide shallow wetland slopes (with target slopes of 18:1 and maximum slopes of 3:1) and microtopographic variation throughout the wetland.

- Installation of a groundwater well and pump to supplement groundwater levels, as needed to maintain desired water levels (particularly during drier months of the year).

- Installation of an outlet into an adjacent ditch (which runs along the northern edge of the project site) to promote internal water circulation and accommodate surface water overflow.

- Planting of wetland vegetation species including *kaluha* (*Bolboschoenus maritimus*), *makaloa* (*Cyperus laevigatus*), *ahuawa* (*Cyperus javanicus*), *akulikuli* (*Sesuvium portulacastrum*), *aeae* (*Bacopa monnieri*), *akiaki* (*Sporobolus virginicus*) and *ohelo kai* (*Lycium sandwicense*).

- Installation of a perimeter fence to provide predator control.

If approved, it is currently anticipated that construction of the project would be completed in 2016. The USACE would be responsible for post-construction performance monitoring at the site for up to 10 years, and long-term operations and maintenance (O&M) activities would be performed by the County. Specific O&M activities would be specified in an O&M plan prepared by the USACE, and are expected to include basic site maintenance (e.g., trash removal, inspection, and repair of the perimeter fence), water level monitoring, pump operations, maintenance, vegetation management, and predator control efforts (e.g., trapping).

Action Area

The action area for the proposed project would include areas that would be directly impacted by construction, as well as those that may be indirectly impacted. The area that would be directly impacted during construction is shown as the project area in Enclosure 1; representative photographs are provided in Enclosure 4. This area is comprised of the majority of Maluule o Lele Park (excluding the areas that are set aside for restoration of Mokuula and the Friends of Mokuula's support facilities). Currently, the park is planted with Bermuda grass (*Cynodon dactylon*), with peripheral vegetation consisting of *koa haole* (*Leucaena leucocephala*), coconut (*niu*, *Cocus nucifera*), Chinese fan palm (*Livistona chinensis*), monkeypod (*Pithecellobium saman*), *hau* (*Hibiscus tiliaceus*), breadfruit (*Artocarpus altilis*), mango (*Mangifera indica*), and *kiawe* (*Prosopis pallida*). Avifauna that have been observed within the project site include introduced species, such as Japanese white-eye (*Zosterope japonicus japonicus*), zebra dove (*Geopelia striata*), cardinal (*Cardinalis virginianus*), spotted dove (*Streptopelia chinensis*), common mynah (*Acridotheres tristis*), and indigenous species, such as the Pacific golden plover (*kolea*, *Pluvialis fulva*), black-crowned night heron (*aukuu*, *Nycticorax nycticorax*), and Hawaiian owl (*pueo*, *Asio flammeus sandwichensis*).

Areas that may be indirectly impacted by the proposed project include the adjacent ditch and the nearshore waters to which it drains. The adjacent ditch collects runoff from areas *mauka* of the project site; it runs parallel to the northern edge of the project site, then near Front Street, jogs to the north and drains to the ocean via a box culvert. In general, the areas immediately surrounding the project site are heavily urbanized, and include a variety of residential, recreational, religious, and commercial uses. None of these areas are known or are expected to provide suitable habitat for threatened or endangered species.

Species and Habitat Information

In response to a request for information regarding threatened and endangered species and designated critical habitat in the vicinity of the proposed project site, the USFWS provided a list in a letter dated April 19, 2010. The letter states that a review of USFWS files, including data compiled by the Hawaii Biodiversity and Mapping Program and the Hawaii Gap Analysis Program, indicates that the federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) has been observed in the vicinity of the project site. No other threatened or endangered species or designated critical habitat is referenced in the USFWS letter.

The letter also expresses concerns regarding waterbird use of a restored wetland in an urbanized environment, explaining that predation from non-native predators (such as rats, mongoose, and feral and domestic cats and dogs) and increased human interaction could potentially create a "sink" (i.e., an area of non-productivity due to failed nests) and/or increase the risk of avian botulism outbreaks.

Potential Impacts and Determination

Consistent with the information provided in the USFWS letter regarding the Hawaiian hoary bat, a graphic summary of species records from the Hawaii Natural Heritage Program as published in *Hawaii's Comprehensive Wildlife Conservation Strategy* shows a single record of the Hawaiian hoary bat near Lahaina, as well as a single record near Olowalu, approximately

6 miles south of Lahaina; documentation of the species distribution state there is no evidence of a breeding population on Maui (Mitchell et al., 2005). Although it is possible that Hawaiian hoary bats could forage within the project site, it is highly unlikely given the low probability of species occurrence in the project vicinity, the nature of the available habitat, and the degree disturbance within and surrounding the project site. Furthermore, all construction activities would be conducted during daytime hours, thus avoiding potential bat foraging activities, which typically occur in the evening hours. As such, potential impacts to the Hawaiian hoary bat are expected to be discountable.

No other threatened or endangered species are known to potentially exist within or adjacent to the project site. As the site does not currently support any aquatic habitat, construction activities would not affect any of the listed Hawaiian waterbird species. However, the potential impacts associated with the wetland restoration, as referenced in the USFWS letter dated April 19, 2010, are understood. Specifically, the concern is that predation from non-native predators and increased human interaction could lead to non-productivity, due to failed nests and/or botulism outbreaks could contribute to waterbird mortality. In an effort to address these potential impacts, the project planning and conceptual design development have been closely coordinated with USFWS technical staff resulting in incorporation of the following measures:

- Focus of the conceptual restoration on suitable foraging habitat for Hawaiian stilt and coot, avoiding conditions that encourage nesting.

- Concentration of suitable foraging habitat in those portions of the project site that do not interface with areas that are regularly accessed by the public (e.g., away from existing roads and sidewalks).

- Construction of an outlet to increase groundwater exchange and improve circulation, thereby reducing the potential for botulism outbreaks.

- Installation of a fence around the entire perimeter of the site to provide predator control.

- Inclusion of specific predator management activities, including monitoring and trapping, as part of the proposed O&M plan.

With implementation of these measures, potential impacts to endangered waterbirds are expected to be avoided and/or minimized, such that implementation of the project would provide a long-term net benefit to the species by increasing the availability of a suitable habitat. In particular, the project is expected to contribute to the network of available habitat within the species' range by providing a suitable habitat for foraging and resting in an area that was historically used, and is still transited by the species as they move between other areas of suitable habitat on Maui and Molokai.

Based on the information presented above, the USACE has determined that the proposed action may affect, but is not likely to adversely affect the listed species or designated critical habitat that occur in the action area. Your concurrence with this determination is requested within 30 days in accordance with the consultation requirements of Section 7 of the ESA.

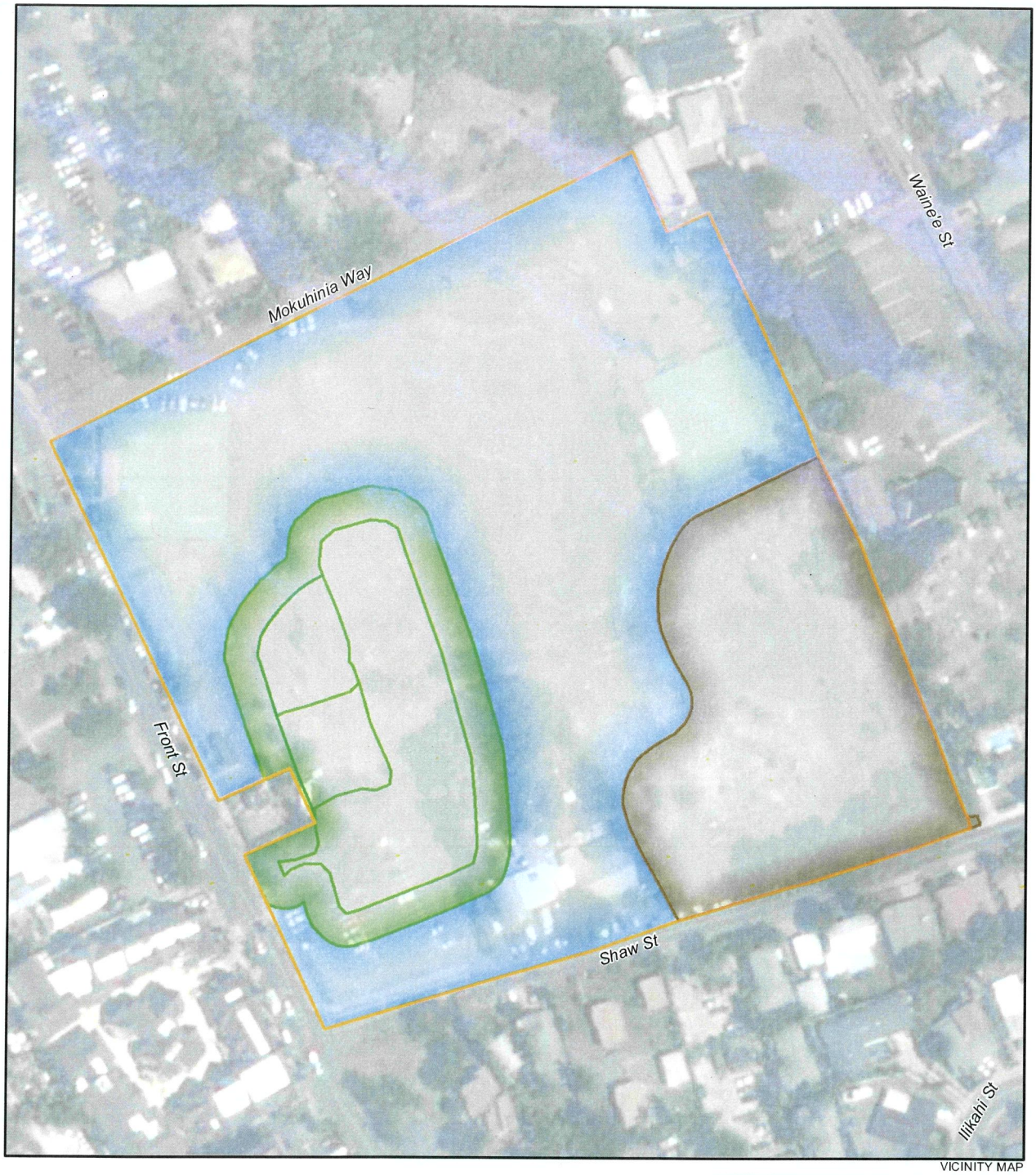
Should you have any questions regarding this submittal or require additional information, please contact Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032 or e-mail athline.m.clark@usace.army.mil.

Sincerely,

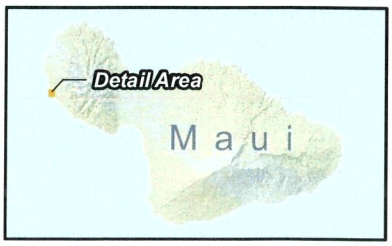
for Anthony J. Palesa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

Enclosure 1



VICINITY MAP



LEGEND

- Moku'ula/Mokuhinia Site
- Mokuhinia Ecosystem Restoration Project Site
- Moku'ula
- Friends of Moku'ula Support Facilities

Notes:
The boundaries of Moku`ula and the adjacent southern pond are based on the boundaries shown in the Hawaiian Government Survey of the Town of Lāhainā (S.E. Bishop, 1884); the northern pond was added at the request of Friends of Moku`ula based on historical documents. A 10-meter buffer has been included around the perimeter of the island and adjacent ponds.

0 75 150 Feet

1 inch = 150 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

Overview of Project Site

Mokuhinia Ecosystem Restoration Project

Lāhainā, Maui, Hawai'i

CH2MHILL

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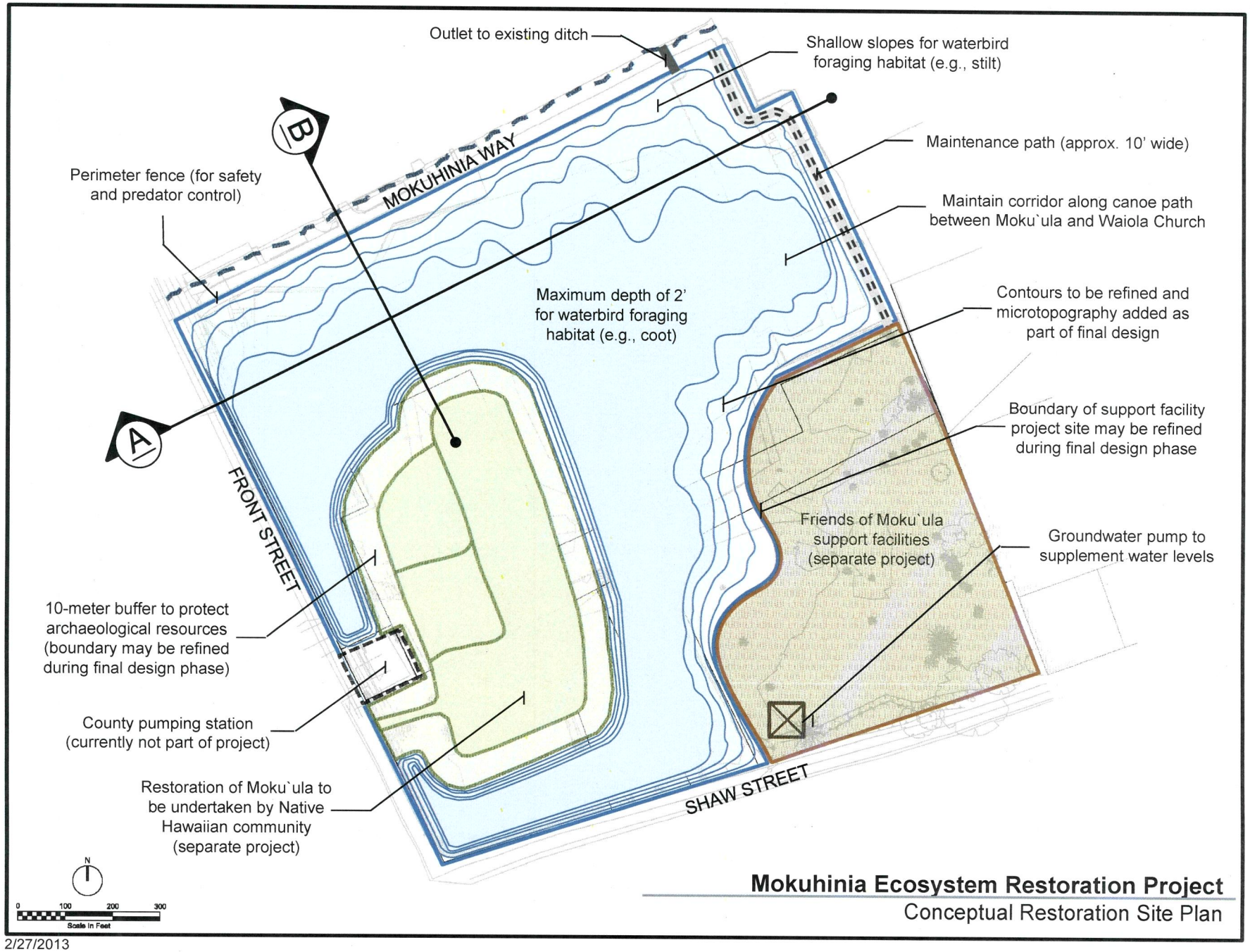
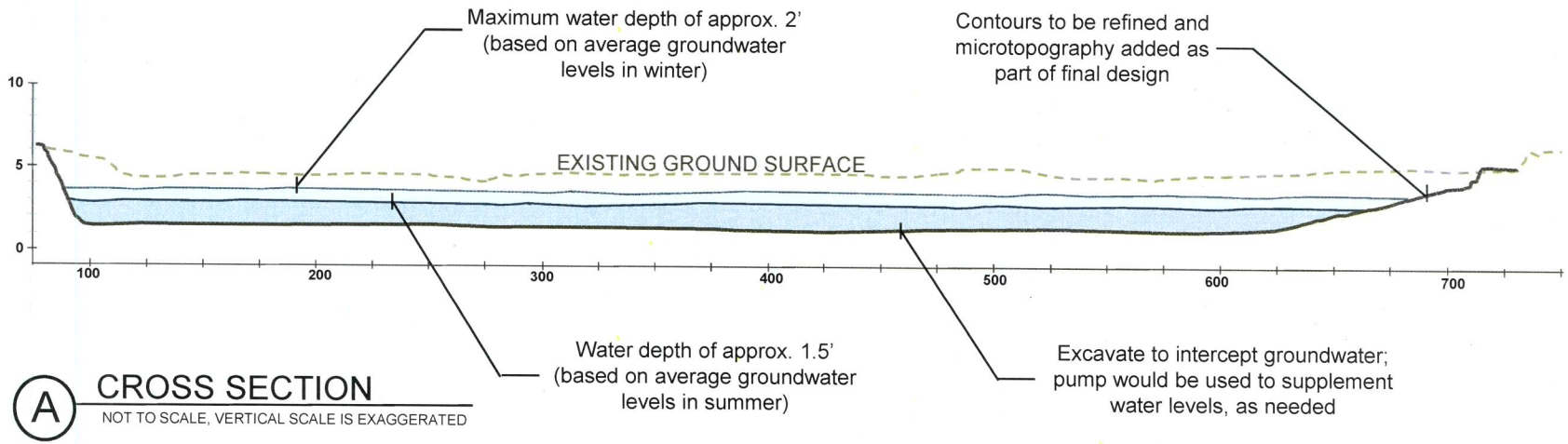
Enclosure 2

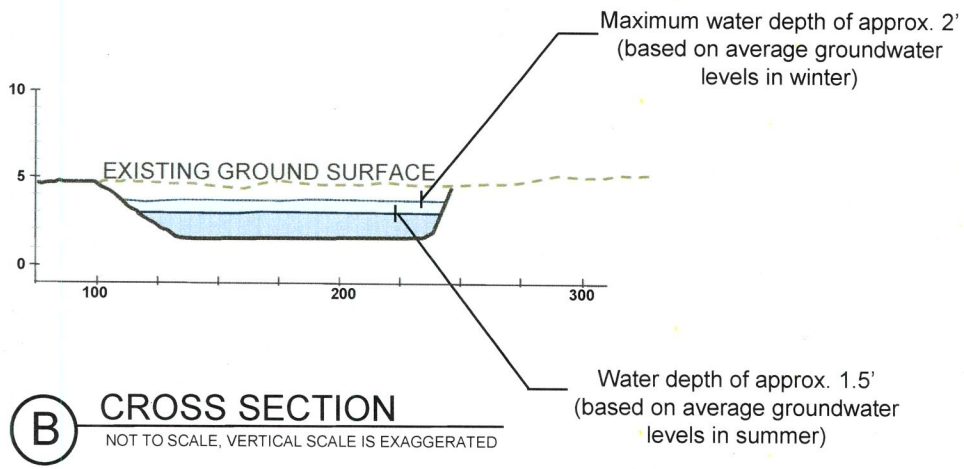


2/27/2013

Enclosure 3



A CROSS SECTION
NOT TO SCALE, VERTICAL SCALE IS EXAGGERATED



B CROSS SECTION
NOT TO SCALE, VERTICAL SCALE IS EXAGGERATED

Mokuhinia Ecosystem Restoration Project

Conceptual Restoration Cross Sections

2/27/2013

Enclosure 4

Figure 4A. Looking northeast across proposed project site for Mokuhinia Ecosystem Restoration Project

Figure 4B. Looking west across proposed project site for Mokuhinia Ecosystem Restoration Project

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
2013-CPA-0072

APR 2 5 2013

Mr. Anthony J. Paresa, P.E.
Deputy District Engineer
Programs and Project Management
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

Subject: Planning Aid Letter for the Mokuhinia Ecosystem Restoration Project, Town of Lahaina, Island of Maui, Hawaii.

Dear Mr. Paresa:

The U.S. Fish and Wildlife Service (Service) received your letter of April 11, 2013, requesting technical assistance with the above referenced project, and concurrence with the Corps' determination that the proposed project may affect but is not likely to affect endangered species. The proposed project is sponsored by the U.S. Army Corps of Engineers (Corps), working with the County of Maui and Friends of Moku`ula (local sponsors). This letter has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (FWCA) of 1934 [16 U.S.C. 661 *et seq.*; 48 Stat. 401], Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et. seq.*), as amended (ESA); the Migratory Bird Treaty Act (16 U.S.C. 703-712), and other authorities mandating the Service to provide biological expertise to guide conservation of trust resources.

The proposed project involves planning and conducting a feasibility study to restore approximately seven (7) acres of wetland at a culturally significant site known as Mokuhinia in Lahaina, Maui. The proposed habitat restoration will include re-establishment of wetland functions and values historically associated with the site that is currently a County of Maui park constructed on historically filled wetland. Project goals include restoration of cultural and wildlife values, including habitat for native endangered waterbirds. There is currently no federally designated critical habitat or aquatic habitat in the project footprint.

Background

March 17, 2010: The Service was originally requested by letter to provide technical assistance in the planning phase (Phase 1) of this project, and to provide a species list and identification of critical habitat in the project area. The Corps requested the Service, based on our experience specific to Hawaiian wetlands, to provide technical input on defining the ecosystem restoration

objectives. Because of the constraints and needs of the project area the ecosystem restoration objectives were intended to be based on restoring wetland functions and values rather than (recovery of) specific target species. The Corps also requested the Service to: 1) review proposed alternatives (screening) criteria; 2) assist with development and evaluation of an ecosystem valuation model specific to this project; and 3) participate in coordination meetings on the formulation of alternatives.

April 19, 2010: The Service expressed concerns about the potential impacts of creating bird habitat in an urbanized environment. A species list was provided to the Corps, along with recommendations for monitoring and management of the restored site into the future to ensure effective endangered species conservation. Concerns were raised about impacts on federally endangered waterbirds from predation, and human disturbance, and the potential for avian botulism outbreaks. The Service recommended development of endangered and native species interpretive signs, and an interpretive program, as well as predator management plans. We also recommended development of a waterbird monitoring plan to evaluate the success of habitat creation for the species of concern.

May 20, 2010: A Scope of Work was prepared and submitted to the Corps. Initial meetings addressed the potential for project implementation to provide habitat for native and endangered fish and wildlife resources that may require long term conservation management, assistance was also provided to ensure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA.

After approximately 3 years of the Corps' collaboration with stakeholders including the Service, local sponsors and others, on April 11, 2013, the Corps requested continuation of informal consultation with the Service in support of the latest conceptual project design. Due in part to stakeholder input, the project objectives have changed slightly to address stated concerns. The Service continued to express concerns that predation from non-native predators (such as, but not limited to rats, mongoose and feral and domestic cats and dogs) and increased human interaction could potentially create a "sink" (*i.e.*, an area of non-productivity due to failed nests or adult mortality). The Service also noted concerns about the risk of avian botulism outbreaks from any design alternative that does not provide an outlet and/or adequate water circulation.

Again, based partly on the Service's and other stakeholder input, the current goal of the project is to restore a portion of the pond and associated wetlands of Mokuhinia to provide aquatic ecosystem functions and values, with consideration given to the subsequent cultural revitalization of the site by certain native Hawaiian communities. Specific objectives of the project are to: 1) reestablish wetland functions and values associated with Mokuhinia; 2) maximize foraging habitat throughout the year for the endangered Hawaiian stilt (aeo, *Himantopus mexicanus knudseni)* and Hawaiian coot *(alae ke okeo, Fulica alai),* and 3) provide habitat for migratory waterfowl and shorebird species.

As of April 22, 2013-to date, the Service has: 1) provided a species list and confirmation that no critical habitat for federally listed threatened or endangered species exist in the project area; 2) reviewed and commented on various conceptual design plans and ecosystem model variables; 3) assessed significant fish and wildlife resources that could be attracted to the restoration site and provided recommendations for long term conservation measures; 4) evaluated potential impacts associated with a suite of proposed project design alternatives; 5) provided ongoing, informal

consultation under Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et. seq.*), as amended (ESA); 6) assisted with aquatic habitat design parameters including water depths, salinity, vegetative cover, substrate and slope qualities. At a later planning phase, technical assistance may include participation in the development of predator control, conservation effectiveness monitoring protocols, and botulism prevention and management plans. Specifically, the Service's unresolved concerns pertain to potential for human disturbance and non-native species predation on the waterbirds that may inhabit the site upon its restoration of wetland features, and potential botulism outbreaks from poorly circulated water.

Project Description

The project goals and objectives and a conceptual restoration design were developed for the proposed project that reflect ongoing coordination with Service staff, particularly as related to addressing specific habitat requirements for the Hawaiian stilt and the Hawaiian coot. Specific components of the conceptual restoration design for which the Corps is seeking concurrence with their determination of effects includes, subject to modification (further refinements are implicit with the conceptual nature of the design at this planning stage):

- Excavate existing site to intercept the existing groundwater as needed to achieve a maximum water depth of approximately 2 feet, based on average ground water levels in the winter (rainy season).

- Grade to provide shallow wetland slopes (with target slopes of 1.8:1 (Note the Corps description in the request erroneously described these slopes as 18: 1) and a maximum slope of 3:1, and micro-topographic variation throughout the wetland.

- Install a groundwater well and pump to supplement groundwater levels, as needed to maintain desired water levels (particularly during the drier months of the year).

- Install an outlet into an existing adjacent ditch (which runs along the northern edge of the project site) to promote internal water circulation and accommodate surface water overflow.

- Plant wetland vegetation species including *kaluha (Bolboschoenus maritimus), makaloa (Cyrperus laevigatus), ahuawa (Cyperus javanicus), akulikuli (Sesuvium portulacastrum), aeae (Bacopa monnieri)akiaki (Sporobulus virginicus)* and *ohelo kai (Lycium sandwicense).*

- Install a perimeter fence to provide predator control.

With the exception of HAHB that occur in the vicinity of the project, no other threatened or endangered species are known to exist within or adjacent to the project site. As the site does not currently support any aquatic habitat, construction would not impact any of the listed Hawaiian waterbird species. However, the Corps has expressed an understanding of the potential impacts associated with the wetland restoration, as referenced in the Services letter dated April 19, 2010 and discussed at several technical team meetings.

Based on this understanding, the Corps has largely addressed the Service's unresolved concerns with the current plan, with the exception of certain project implementation and management aspects that are not completely designed or established to date. Therefore, informal consultation is ongoing because the final project alternative has not been selected, completely designed or associated with the needed, completed resource conservation and management plans to date. The Corps is moving forward with efforts to address these concerns through coordinated project planning, including the Service's recommendations in the conceptual design development, and by incorporating the following conservation measures into the project:

- Although the Corps has determined that the potential impacts to HAHB are expected to be discountable, to minimize impacts to the HAHB, woody plants greater than 15 feet tall should not be disturbed, trimmed or removed during bat pup rearing season, June 1-September 15.

- Focus of the conceptual restoration on suitable foraging habitat for Hawaiian Stilt and Hawaiian coot.

- Concentrate suitable foraging habitat in portions of the project site that do not interface with areas that are regularly accessed by the public (e.g., away from existing roads and sidewalks).

- Construct an outlet to improve circulation and increase groundwater exchange to reduce the potential for botulism outbreaks.

- Install a fence around the entire perimeter of the site to prevent mammalian predator ingress.

- Include specific predator management activities, including effectiveness monitoring and trapping, as part of the proposed long term Operations and Management Plan.

The Corps plans to implement these measures (above) to avoid and minimize potential impacts to endangered waterbirds, such that implementation of the project is intended to provide a long-term net benefit to the species by increasing the availability of suitable habitat. In particular, the Corps expects the restoration of wetland functions and values to contribute to the network of available habitat within the species range by providing a suitable habitat for foraging and resting in an area that was historically used, and is still transited by the species as they move between areas of suitable habitats on or within Maui Nui.

As noted in the Corps April 11, 2013, request for concurrence, the Service's April 19, 2010, letter stated that the federally endangered HAHB (*Lasiurus cinereus semotus*) has been observed in the vicinity of the project site. Although no other threatened or endangered species or designated critical habitat is referenced in the Service's letter, the Corps provided a rationale to suggest that the project's potential impacts on Hawaiian hoary bat are expected to be discountable. The Service does not agree with this determination of effect or the source that was cited to justify it; (Mitchell *et. al.*, 2005). Terrestrial habitat of limited value to native wildlife species surrounds the site but it could conceivably support the federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*). Hawaiian hoary bats roost in both exotic and native

woody vegetation and leave their young unattended in "nursery" trees and shrubs when they forage. If trees or shrubs suitable for bat roosting are cleared during the bat pupping season (June 1-September 15), there is a risk that young bats could inadvertently be harmed or killed. As such, we recommend the following avoidance measure be included in the final project description and implementation plan.

- To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet tall should not be removed or trimmed during the bat-birthing and pup-rearing season (June 1 through August 15).

Conclusion

The Service appreciates the opportunity to participate in the planning process and the development of project elements that are proposed to be implemented. However, at this conceptual stage of planning and design, without certain project specifications and management plans completed, it is unclear if long term conservation can be achieved. We anticipate as planning proceeds, that we can agree with the Corps' determination that the proposed project may affect but is not likely to adversely affect the listed species that are expected to occur in the area, once the aquatic habitat has been restored.

Therefore we recommend the Corps to: 1) revise the project description to include implementation of the previously discussed measures to avoid impacts to the Hawaiian hoary bat; 2) design the perimeter fence and provide specifications as to predators of waterbirds that it will exclude; 3) develop an acceptable predator control plan to effectively preclude access to non-native predators of endangered waterbirds; and 4) develop a botulism prevention and management plan. We look forward to further coordination with the Corps on the proposed project. If you have any questions regarding this Planning Aid letter, please contact Paula Levin by telephone at (808) 792-9400.

Sincerely,

for Loyal Mehrhoff
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

Rc'd 6/19/13 @ 09
PP 6/19
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In Reply Refer To:
12200-2010-CPA-0095

JUN 1 8 2013

Mr. Anthony J. Paresa, P.E.
Deputy District Engineer
Programs and Project Management
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

Re: Addendum to April 25, 2013, Fish and Wildlife Coordination Act Planning Aid Letter for the Mokuhinia Ecosystem Restoration Project, and clarification of recommendations.

Dear Mr. Paresa:

This letter is a response to the U.S. Army Corps of Engineers (Corps)' request of April 6, 2013, for the U.S. Fish and Wildlife Service (Service) to clarify language and recommendations included in the subject Planning Aid Letter (PAL). On April 6, 2013, the Corps met with the Service to discuss the status of the Fish and Wildlife Coordination Act (FWCA) process in relation to the Mokuhinia Ecosystem Restoration Project, particularly the Service's determination to provide a PAL, rather than completing a FWCA 2(b) report. The Corps was concerned that their planning process had been complicated by the Service combining our unresolved Endangered Species Act (ESA) consultation concerns with our FWCA technical assistance conclusions under the cover of a single PAL.

Because the project involves restoration of habitat where there are no currently existing aquatic resources, the Service's technical assistance was, in this case, requested to provide expertise related to restoring aquatic habitat functions and subsequent long-term management of this restored habitat, as outlined in the May 21, 2010 Scope of Work (SOW). Given that the goals of the Corps and their partners included restoration of wildlife habitat function to the site with features that would support endangered waterbirds, the Corps promoted early coordination with the Service under the FWCA to ensure that our involvement would guide the process toward achieving the specified habitat goals while simultaneously ensuring compliance with the ESA. It was clear based on the current site conditions and the nature of our technical assistance in the Feasibility Study phase of planning that a PAL would be sufficient to document our technical assistance in relation to the FWCA requirements. The Service adopted the position that because no aquatic biological surveys could be performed, the project did not warrant preparation of a FWCA 2(b) report.

Although the Corps has adequately addressed impacts to the aquatic environment throughout the feasibility phase, there are unresolved ESA concerns for endangered species that are intended to be attracted to the site. Therefore, the Corps has requested a de-coupling of FWCA and ESA

issues during the Feasibility Study Phase of planning, so that the Service's unresolved concerns for endangered species impacts do not delay the overall planning process.

Moving forward, to ensure that the Corps' planning process runs on a parallel track with ESA compliance, such as planning to avoid, minimize and mitigate impacts to listed species, the Service will continue to provide technical assistance as requested throughout the Design Phase. Consultation can then be reinitiated upon completion of the Design Phase, including the planning team's adoption of recommended project implementation plans such as predator management and control, and botulism prevention and response plans.

We appreciate the opportunity to coordinate with the Corps on the proposed project. If you have any questions regarding this addendum, please contact Paula Levin by telephone at (808) 792-9400.

Sincerely,

Lorena Wada
for

Loyal Mehrhoff
Field Supervisor

APPENDIX C

Background History and Review of Historic Preservation Efforts at Moku`ula and Recommendations for the Mokuhinia/Moku`ula Ecosystem Restoration Project

Background History and Review of Historic Preservation Efforts at Moku‘ula and Recommendations for the Mokuhinia/Moku‘ula Ecosystem Restoration Project

TMK: (2) 4-6-007:001;035-038

Prepared for

Group 70 International, Inc.

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Management Summary

Reference	Background History and Review of Historic Preservation Efforts at Moku‘ula and Recommendations for the Mokuhinia/Moku‘ula Ecosystem Restoration Project
Date	January 2009 (Final)
Project Number (s)	CSH Job Code: MOKUH-1 U.S Army Corps of Engineers (USACE) Contract No. W9128A-06-D-001
Project Location	Lower Waine‘e Ahupua‘a, Lāhainā District, Maui Island. TMK: (2) 4-6-007:001;035-038. The former inland pond of Mokuhinia and island of Moku‘ula currently lies beneath fill within Malu‘ulu o Lele Park, a Maui County park site. The project area is bounded by Shaw Street to the south, Front Street to the west, an open drainage ditch to the north and private property occupied by the Lahaina Hongwanji Mission and the Waine‘e Protestant Church (Waiola Church) to the east.
Land Jurisdiction	Municipal: The County of Maui Private: The Friends of Moku‘ula
Agencies	U.S. Army Corps of Engineers (USACE) – Federal Agency Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD) – State Reviewing Agency Department of Health, Clean Water Branch – State Reviewing Agency Department of Planning – County of Maui (Local Sponsor)
Project Description	The proposed project is for the restoration of the Loko o Mokuhinia and Moku‘ula Ecosystem in the historic town of Lāhainā. Execution of the project would include complete excavation of the fill sediments of Malu‘ulu o Lele Park in the area of the former location of Loko o Mokuhinia to re-establish the approximate 17-acre pond, restoration of the inland island of Moku‘ula, resuscitation of the natural springs that once fed the pond; and re-establishment of the previous wet sedge land community and *lo‘i kalo* (wetland taro). Also under consideration for this project is the restoration of surface flow via drainage ditches and *auwai* back to Loko o Mokuhinia, in addition to a reconnection of the pond flow back to the ocean.
Project Acreage	Approximately 18 acres
Area of Potential Effect (APE) and Survey Acreage	As the surrounding area has been built out as a result of the development of Lāhainā Town, the APE for this project extends no further than area limited to the boundary of Malu‘ulu o Lele Park.

Historic Preservation Regulatory Context	As the proposed project is being carried by a federal agency on County of Maui lands, this undertaking is subject to both Federal and State of Hawai‘i Historic Preservation Regulations. With regard to Federal regulations, this undertaking is subject to historic preservation review under Section 106 of the National Historic Preservation Act. In the event that human burials of Native Hawaiian descent are encountered, all consultation and subsequent work would be conducted under the State of Hawai‘i Administrative Rules (HAR) Title 13 §13-300.
State Inventory of Historic Places	50-50-03-2967 Moku‘ula

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Section 1 Introduction

1.1 Project Background

At the request of Group 70 International, Inc., Cultural Surveys Hawai‘i, Inc. (CSH) researched both the background history of the former royal residence of Moku‘ula (SIHP 50-50-03-2967) and previous archaeological work conducted at Moku‘ula in order to produce a comprehensive reference document and compilation of companion GIS data that may aid in the restoration of the royal residence and surrounding ecosystem. The proposed project is for the restoration of the Loko o Mokuhinia and Moku‘ula Ecosystem located within the historic district of Lāhainā Town, Waine‘e Ahupua‘a (lower or *makai* portion), Lahaina District, Maui Island (TMK: (2) 4-6-007:001;035-038) (Figure 1 and Figure 2). The preliminary restoration plan includes:

- excavation of the fill sediments at Malu‘ulu o Lele Park in the area of the former location of Loko O Mokuhinia to re-establish the portion of the approximate 17-acre pond that falls within the project area;
- restoration of the inland island and former royal residence of Moku‘ula;
- resuscitation of the natural springs that once fed the pond; and
- re-establishment of the previous wet sedge land community and *lo‘i kalo* (wetland taro).

Also under consideration for this project is the restoration of surface flow via drainage ditches and *auwai* (irrigation ditches) back to Loko o Mokuhinia, as well as, a reconnection of the pond flow back to the ocean. In addition to restoring the physical remnants of Moku‘ula and thus re-establishing the historic and cultural importance of the area, this project will aim to restore the previous ecosystem functions and processes, and create an aquatic habitat for native and endangered water fowl species.

The lands comprising the current project area are located within Malu‘ulu o Lele Park, a County of Maui recreational park, and bound by Front Street to the south-southwest, an open drainage ditch lined with cut and dressed basalt stone to the north, and former traditional *konohiki* lands to the east that are now built-out as church lands (Figure 2 and Figure 3). The specific project area lies on lands between Shaw Street to the south-southeast (once in sugar cane cultivation by the Pioneer Mill Company) and the drainage ditch to the north-northwest. As the proposed project is being carried by the U.S. Army Corps of Engineers, a federal agency, on County of Maui lands, this undertaking is subject to both Federal and State of Hawai‘i Historic Preservation Regulations. With regard to Federal regulations, this undertaking is subject to historic preservation review under Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulation 36 CFR Part 800. In the event that human burials of Native Hawaiian descent are encountered, all consultation and subsequent work would be conducted under the Native American Graves Protection and Repatriation Act of 1990, as well as State of Hawai‘i Administrative Rules (HAR) Title 13 §13-300.

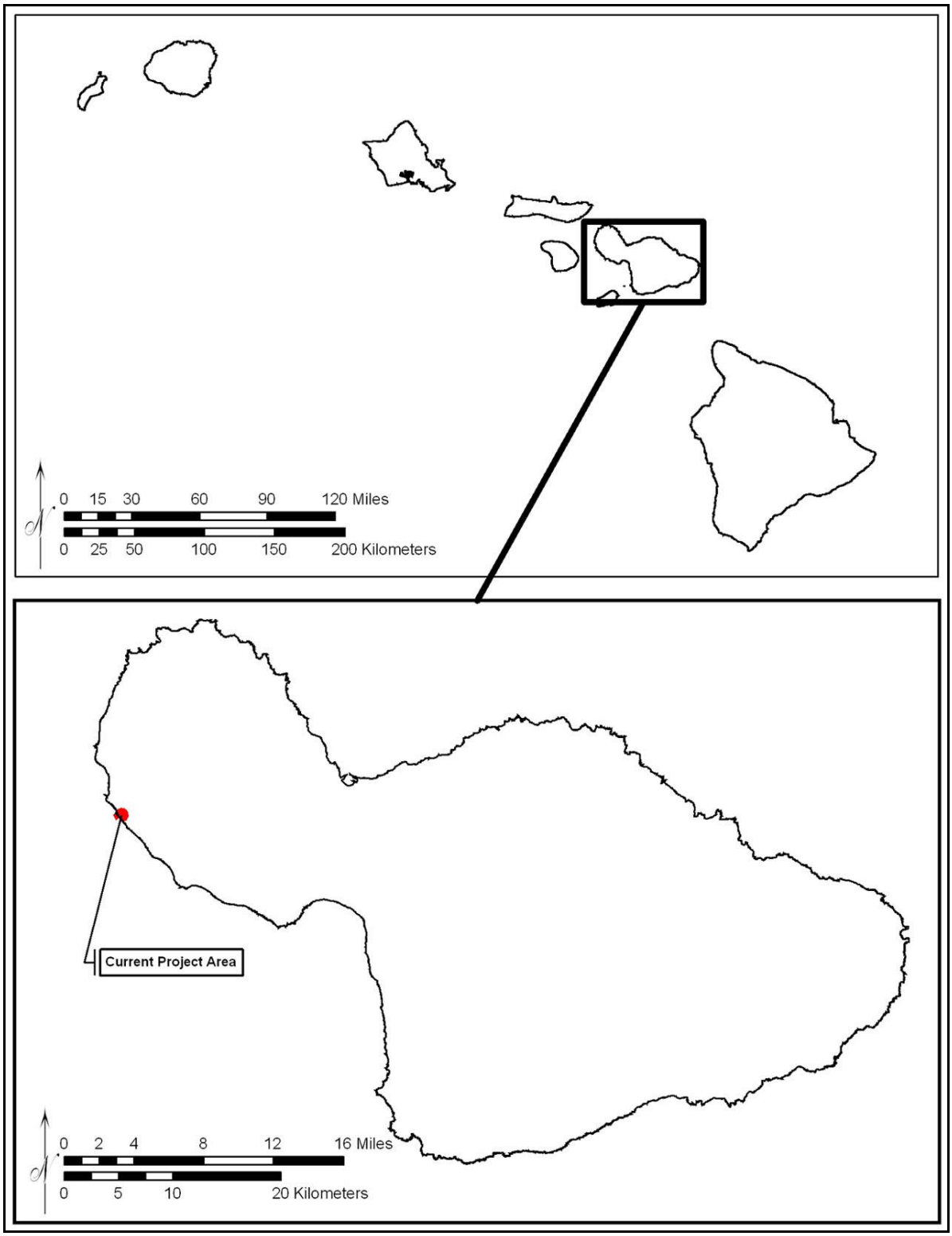

Figure 1. Current project area location in relation to Maui Island and eight major islands of the State of Hawai‘i.

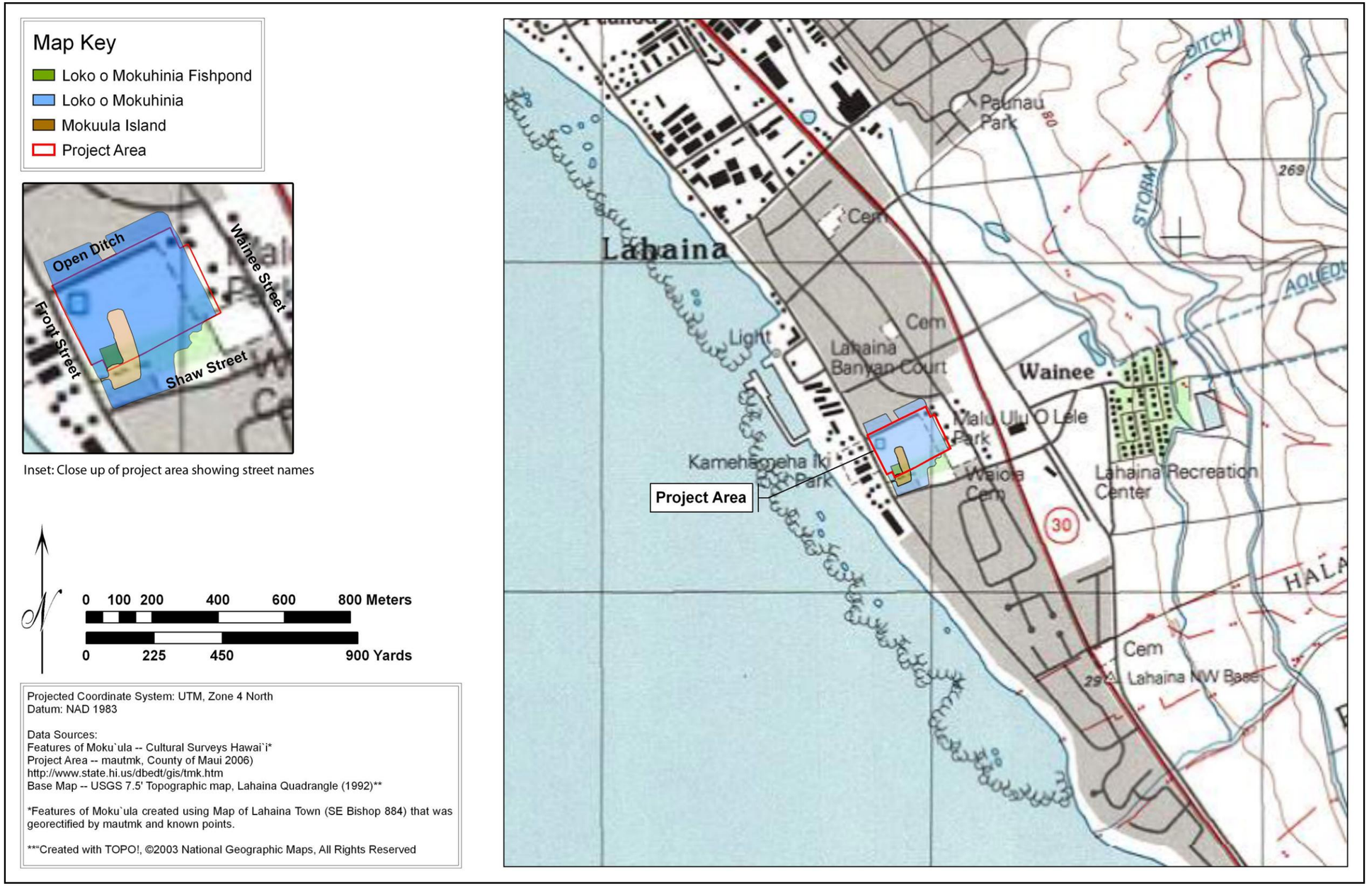

Figure 2. A portion of the USGS 7.5 minute series topographic map, Lāhainā Quadrangle (1992), showing project area

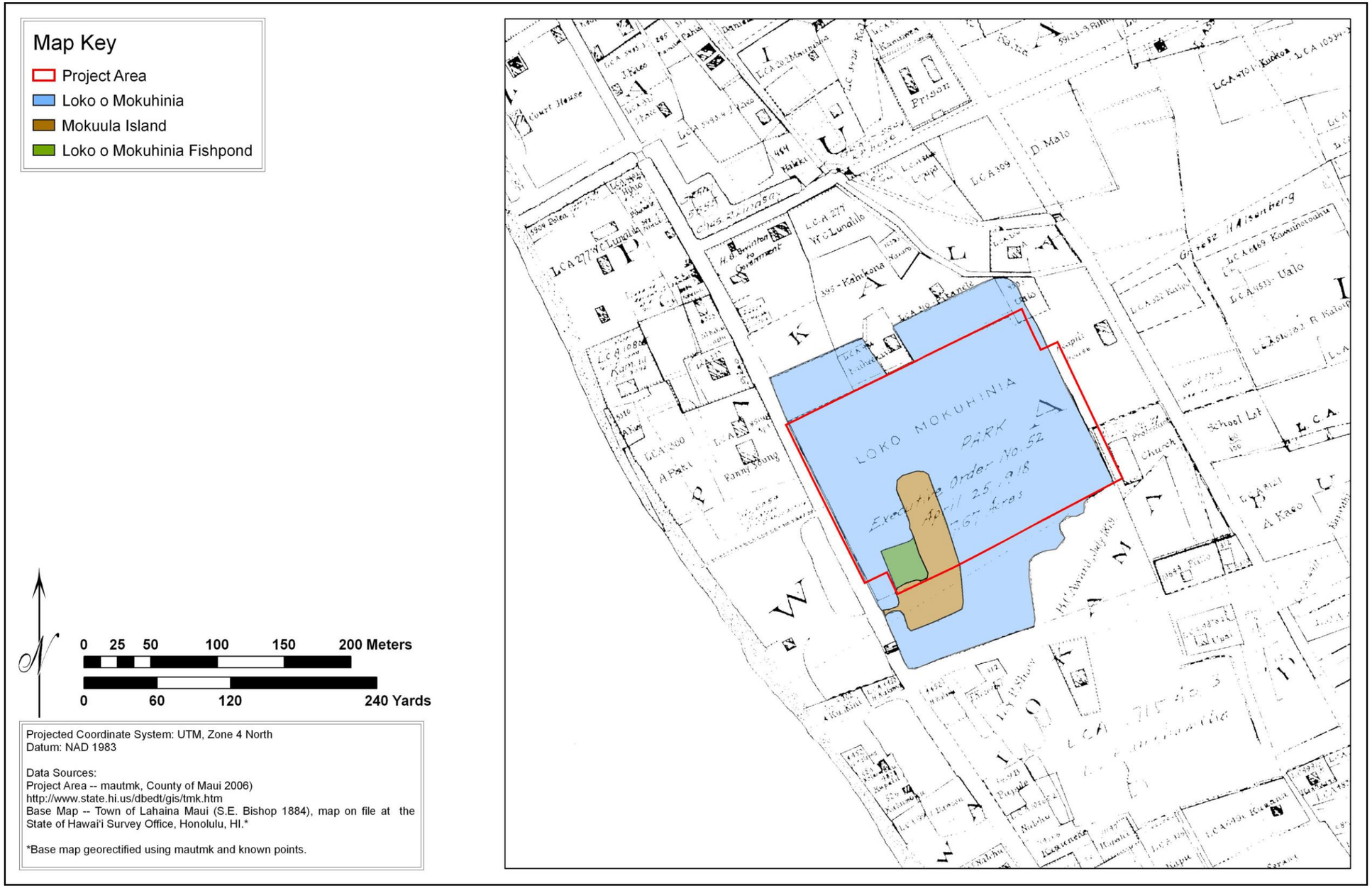

Figure 3. A portion of the S.E. Bishop 1884 map highlighting Loko o Mokuhinia, Moku‘ula, and the associated fishpond.

1.2 Environmental Setting

1.2.1 Natural Environment

The project area is located along the Lāhainā shoreline at an elevation that rises slightly above sea level to approximately 3 to 6 feet above mean sea level (AMSL). The primary landform of the area is dominated by an alluvial plain developed from eroded sediments deposited by Kanaha, Kahoma, Waine‘e and Waiokama Streams. These streams, prior to diversion for plantation use, once traveled through the valleys of each *ahupua‘a*, fed by rains at points high in the West Maui Mountains.

In general, the soils of the intermediate elevations surrounding Lāhainā are of the Waiakoa-Keahua-Molokai association. The soils within the project area are classified as soils of the Ewa Series (Figure 4) and defined as well-drained soils with a moderately fine textured subsoil that, occur on the “low uplands”. More specifically, the soil units specific to the project area are classified as Ewa Silty Clay Loam (EaA), with a substratum of dark reddish-brown silty clay loam, a soil type that is noted for its suitability for sugar cane (Foote et al.1972: 30, 136, 144). These soils at the time of the USDA soil survey were commonly used for sugar cane, pineapple, and pasture.

Rainfall along the leeward coastline of Lāhainā averages 13 inches annually, a fraction of the 389 inches per year that occurs at the Pu‘u Kukui, the highest point of the West Maui Mountains located only 6 miles away (Stearns 1942:32). The current project area receives an average of 13 inches of rainfall per year, due to the “rain shadow” effect caused by the West Maui Mountains (Giambelluca *et al.* 1986:47). Temperatures range from approximate highs of 90ºF to approximate lows of 60ºF, with the greatest variations occurring between day and night rather than winter and summer.

Pollen analysis from soil cores collected during previous archaeological investigations within Malu‘ulu o Lele Park indicates that prior to Polynesian arrival, the paleo-environment of the area surrounding Loko o Mokuhinia was dominated by *loulu* palms (*Pritchardia hillebrandii*) (Klieger 1998:103). Following Polynesian arrival, there is an apparent decrease in the occurrence of *loulu* pollen and an introduction of native Hawaiian heritage crops, or plants that were brought during Polynesian migration to the Hawaiian Archipelago as a part of the traditional diet, such as *niu* (*Cocos nucifera*) and *kalo* (*Colocasia esculenta*) (Klieger 1998:103). The current vegetation of the project area, however, consists of a number of recent introductions of ground cover species. The baseball infield and outfield had been planted in Bermuda grass (*Cynodon dactylon*), with peripheral vegetation consisting of *koa haole* (*Leucaena leucocephala*), and *hau* (*Hibiscus tiliaceus*) interspersed with large breadfruit trees (*Artocarpus altilis*) and mango trees (*Mangifera indica*) to the north, and *kiawe* trees (*Prosopis pallida*) toward Shaw Street. Small stands of Hawaiian shore grass (‘*aki* ‘*aki* grass) (*Sporobolus virginicus*) occur throughout.

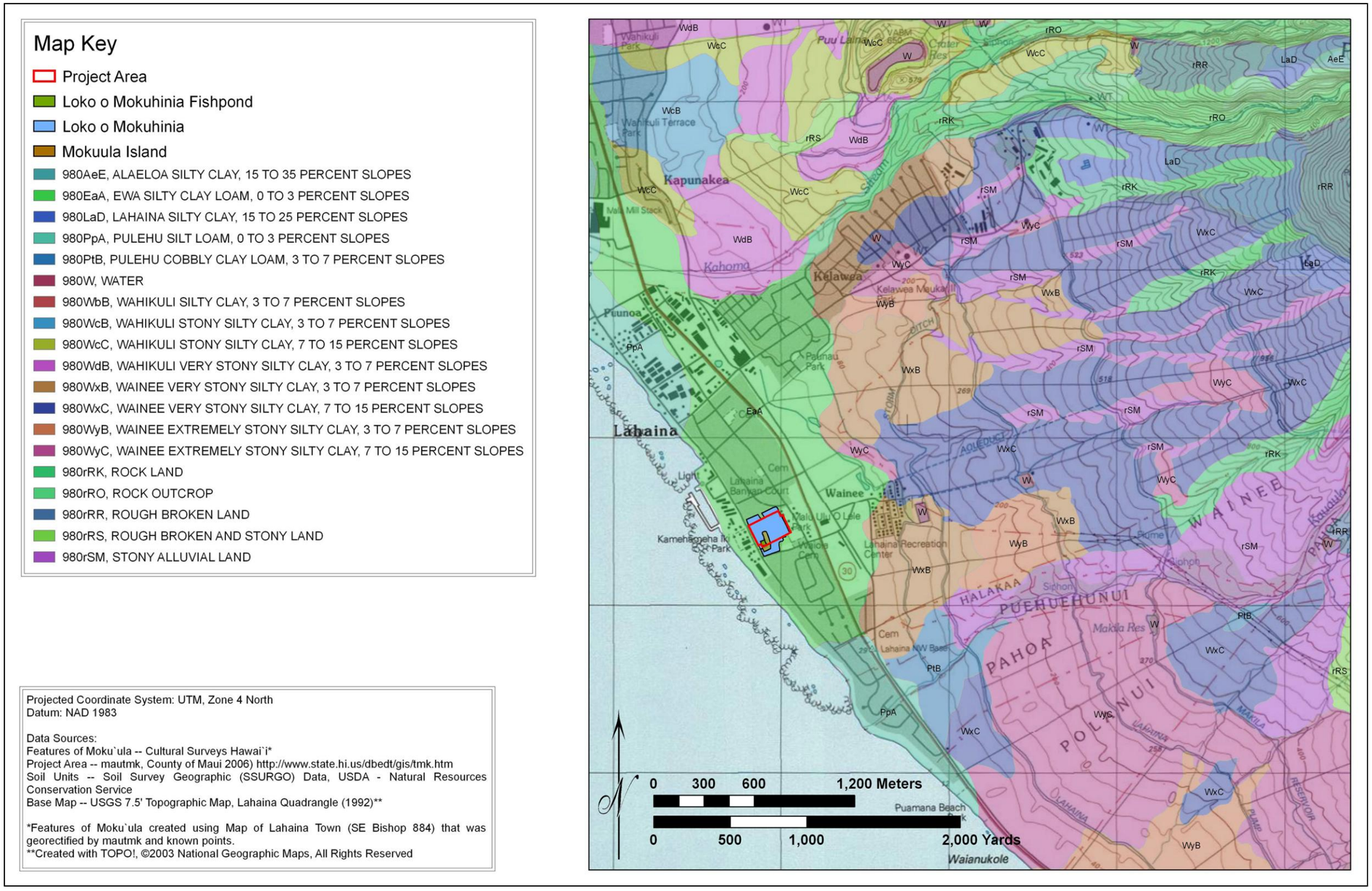

Figure 4. A portion of the USGS 7.5 minute series topographic map, Lāhainā Quadrangle (1992), showing project area lands relative to the surrounding local soil series (U.S. Department of Agriculture, Natural Resources Conservation Service 2001)

1.2.2 Built Environment

The built environment of the project area consists of an 18-acre county park that was developed to include a baseball field, four tennis courts, two rest rooms, a sewer system pumping station and two parking lots (Figure 5). Two main roadways in Lāhainā town, Front Street and Shaw Street, intersect at a point just east of the present-day municipal park. A regional Salvation Army Thrift Store, a small residential house lot, and a commercial parking lot are located between the project area and Shaw Street to the southwest.

Former *konohiki* lands, now built out as church properties, form the northern boundary of the project area. The two churches that are located along the northern boundary of the project area, include the Lahaina Hongwanji Mission, which also operates as a children’s daycare facility, and the historic Waiola Congregational Church, with its associated cemetery that serves as the final resting place for prominent figures, both *ali‘i* and missionary alike, of the Hawaiian Kingdom. Additional residential house lots are located at the intersection of Waine‘e and Shaw Streets, southeast of the present project area.

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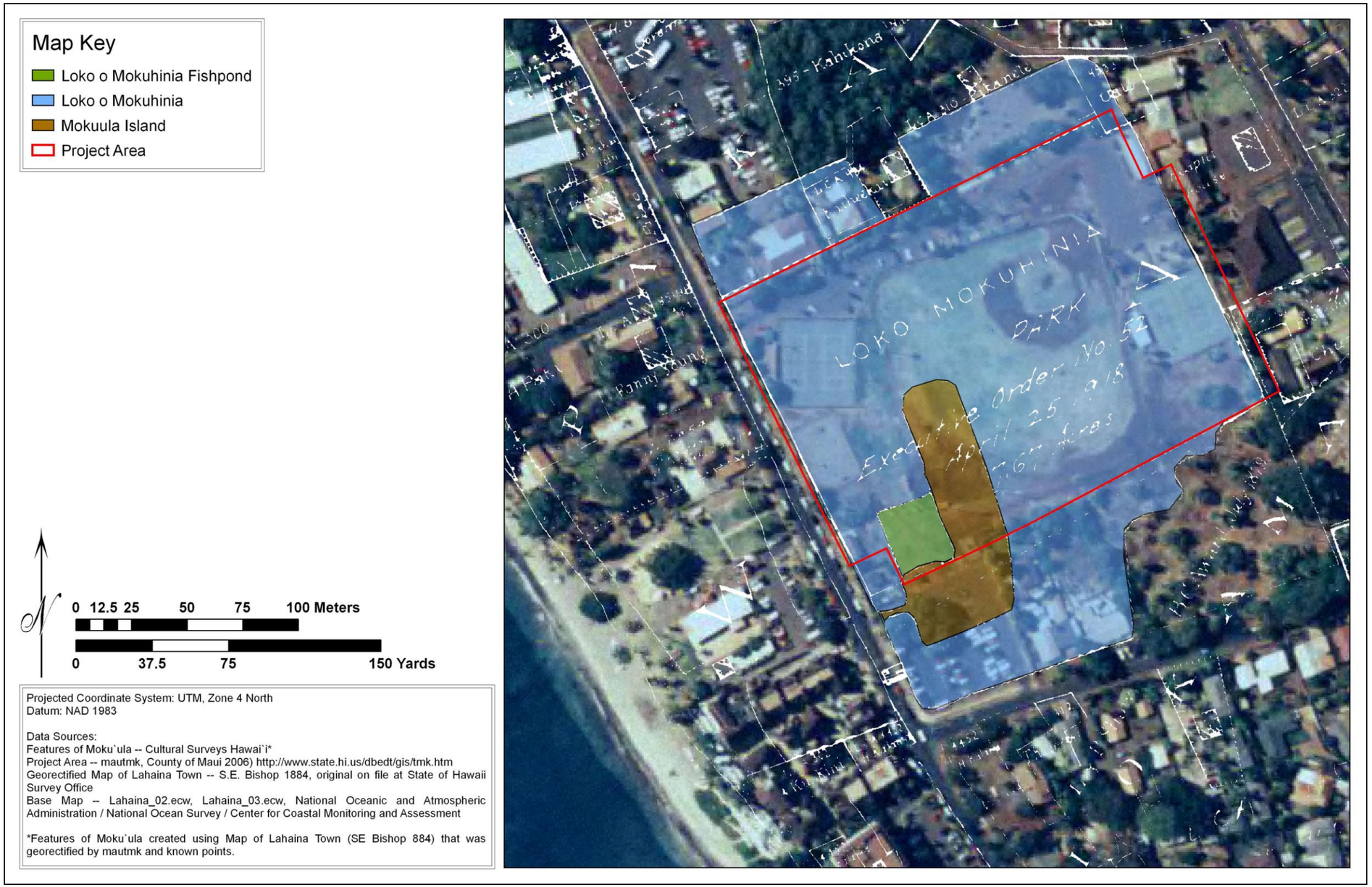


Figure 5. Orthorectified shoreline photo showing the current built environment surrounding the project area (National Oceanic and Atmospheric Administration/ National Ocean Survey [NOAA/NOS] 2000a and 2000b) with the S.E. Bishop 1884 map as an overlay to show the built environment during the historic era.

Section 2 Methods

The following methods and resources were used during the compilation of this document.

2.1 Document Review

Research venues included the State Historic Preservation Division of the Department of Land and Natural Resources, the Survey Office of the Department of Accounting and General Services, as well reference materials from private collections and compliance documents provided by Group 70 International, Inc.

2.2 GIS Data

GIS datasets compiled for this study were exported into a geodatabase created in ARCView 9.1 and ARCCatalog. All shapefiles, orthorectified images, and rectified raster images are spatially referenced using the Universal Trans Mercator (UTM) Coordinate System, Zone 4 North and North American Datum 83 (NAD83). The following GIS clearing houses were searched to find data relevant to the project area:

- The Hawaii Statewide GIS Program: http://www.hawaii.gov/dbedt/gis/
- USGS Hawaii Data Clearinghouse: http://hawaii.wr.usgs.gov/maui/data.html

Archaeological data and raster images were adapted from site maps provided in Klieger (1995) and Bishop (1884). Margin of error for georeferenced data ±8 m.

Section 3 Background Research

The traditional background of Moku‘ula and the immediate surrounding area have been covered extensively in the *Moku‘ula: Maui’s Sacred Island* by Paul Christiaan Klieger (1998), as well as, previous archaeological investigations (E. Fredericksen and D. Fredericksen 2001; W. Fredericksen and D Fredericksen 1965 and 1970; W. Fredericksen et al. 1989; Klieger 1995; and Klieger and Lebo 1999). The following section will summarize the traditional background in order to put the proposed project into proper context. For more detailed descriptions of the traditional and historic background of Moku‘ula the reader should refer to the above works.

The division of Maui’s lands into political districts occurred during the rule of Kaka‘alaneo, under the direction of his *kahuna*, Kalaiha‘ōhi‘a (Beckwith 1970:383). This division resulted in twelve districts or *moku* during traditional times: Kula, Honua‘ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko‘olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Ka‘anapali, and Lāhainā. Moku‘ula is located on shores of Mauna o E‘eka, in the *moku* of Lāhainā, *kalana* of Lāhainā, Waine‘e Ahupua‘a. The workings of traditional Hawaiian land tenure are often reflective of the socio-political intricacies of particular places that were favored among the *ali‘i* (ruling class), and the area surrounding the *kalana* Lāhainā is illustrative of that fact.

An understanding of the land tenure distinction between the Hawaiian *moku* and *kalana* is implicitly necessary in order to grasp the cultural and political context of the project area within Lāhainā. The *moku o loko*, or *moku* as it is most commonly called, literally means “to cut across, divide, separate” (Lucas 1995:77). When used in terms of traditional land tenure, a *moku* is most readily akin to a political district, an overall land division that can contain smaller divisions of land such as *‘okana, kalana, ahupua‘a, ‘ili,* and *mo‘o*. Lāhainā Moku, located on the south facing flanks of Mauna o E‘eka, or the West Maui Mountains as it is commonly called today, consists of multiple *ahupua‘a* that extend from Launiupoko to Makaiwa in earlier maps (Figure 6) and Ukumehame to Hanakao‘o in later maps (Figure 7).

The term *kalana* literally translates to mean a thing loosened or released – “to loosen” (*kala*) with the nominal suffix of “*na*” added at the end (Handy et al. 1991:47). In reference to land tenure, *kalana* is a term that is sometimes interchanged or synonymous with the term *‘okana*, which is a sub-division of land that is smaller than a *moku* (Alexander 1890 and Lucas 1995:47). On Maui Island, W.D. Alexander (1890) observes that there are five *‘okana* or sub-districts within Hāna Moku, while Lāhainā is termed a *kalana*. Handy and others (1991:47) speculate that the land divisions that were designated as *kalana* were politically released from the *‘okana* or even *moku* that they had been a part of during the original division of the islands. These land divisions were then given as separate domains to *ali‘i* of first rank, remaining as autonomous heritages. Curtis J. Lyons, a surveyor during the Mahele, specifically states that the *kalana* of Lāhainā belonged to no *moku* (in Handy et al. 1991:47).

The *kalana* of Lāhainā, as a distinct land division from the *moku* of Lāhainā, has been known by three other names in times past. The oldest name was said to have been Na-hono-a-Pi‘ilani, the lands of Pi‘ilani as it was surrounded by other islands (G.H. Hanakauluna in Sterling 1998: 37). Lāhainā then becomes known as Lele, a name that has been acknowledged as the ancient name of Lāhainā (Sterling 1998: 34 and 37) in the story of Kamalalawalu and Halemano in their

flight from the O‘ahu Chief Aikanaka in the legend of Halemano (Fornander 1918: 238) and in the Legend of Pupukea as home to Maui Chief Kamalalawalu (referred to frequently as Kama), a contemporary of Kakuhihewa on O‘ahu (Fornander 1918:436). A third name for Lāhainā is mentioned in the story *Relating to Kekaa* (S. Kaha in Fornander 1918: 540-544) where Keka‘a is noted as the capital of Maui when Kaalaneo was reigning over West Maui. Fornander speculates that the name of Keka‘a predates that of Lele as the story predates the introduction of breadfruit, the primary food source that is referred to when speaking of the area as Lele (Fornander 1918: 540, Footnote 2; H.L. Sheldon in Sterling 1998: 35.)

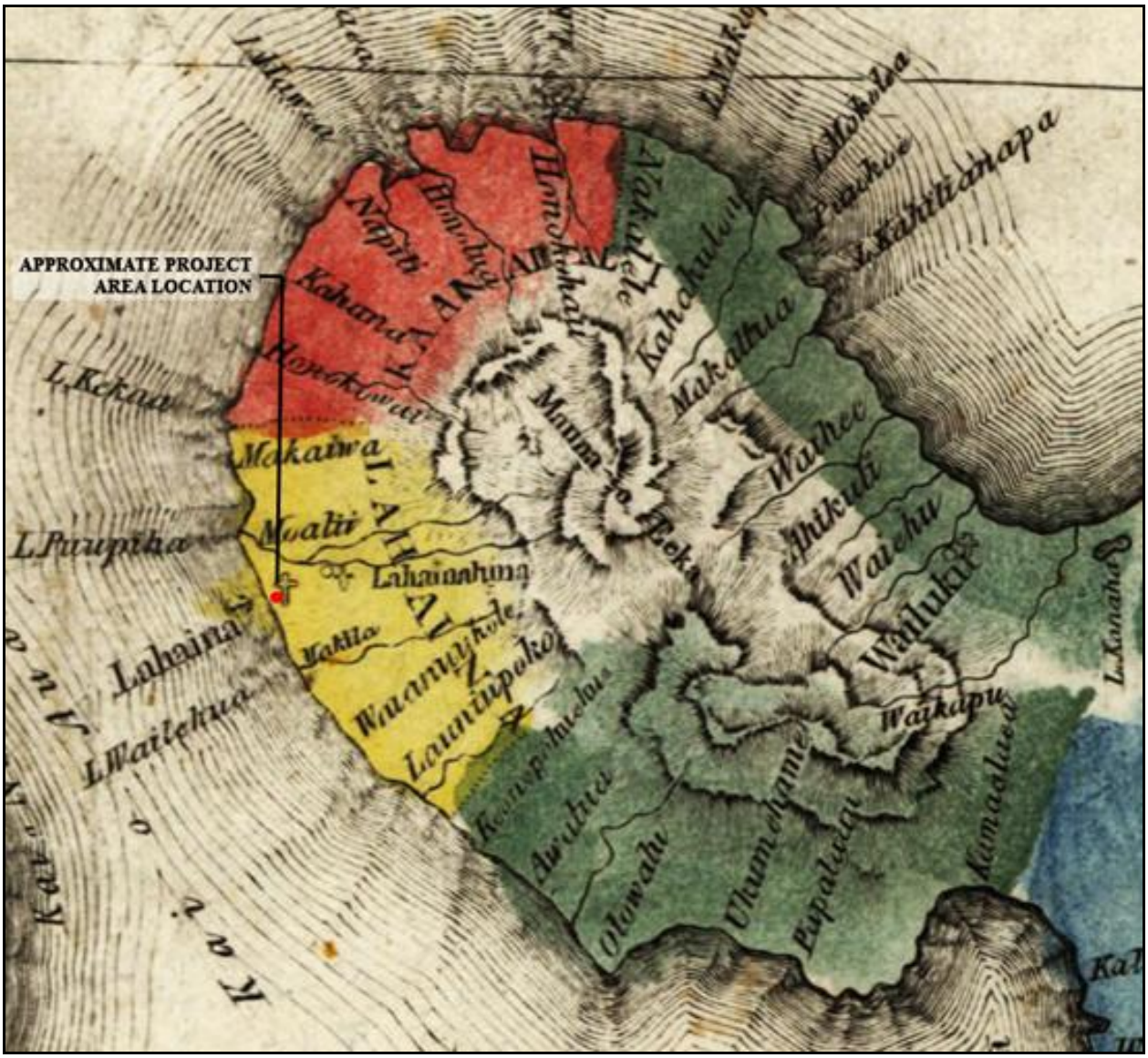


Figure 6. A portion of the 1838 S.P. Kalama map illustrating the *moku* of West Maui as it was known to surveyors at that time (Ka‘anapali Moku [red], Wailuku Moku [green], Lāhainā Moku [yellow])

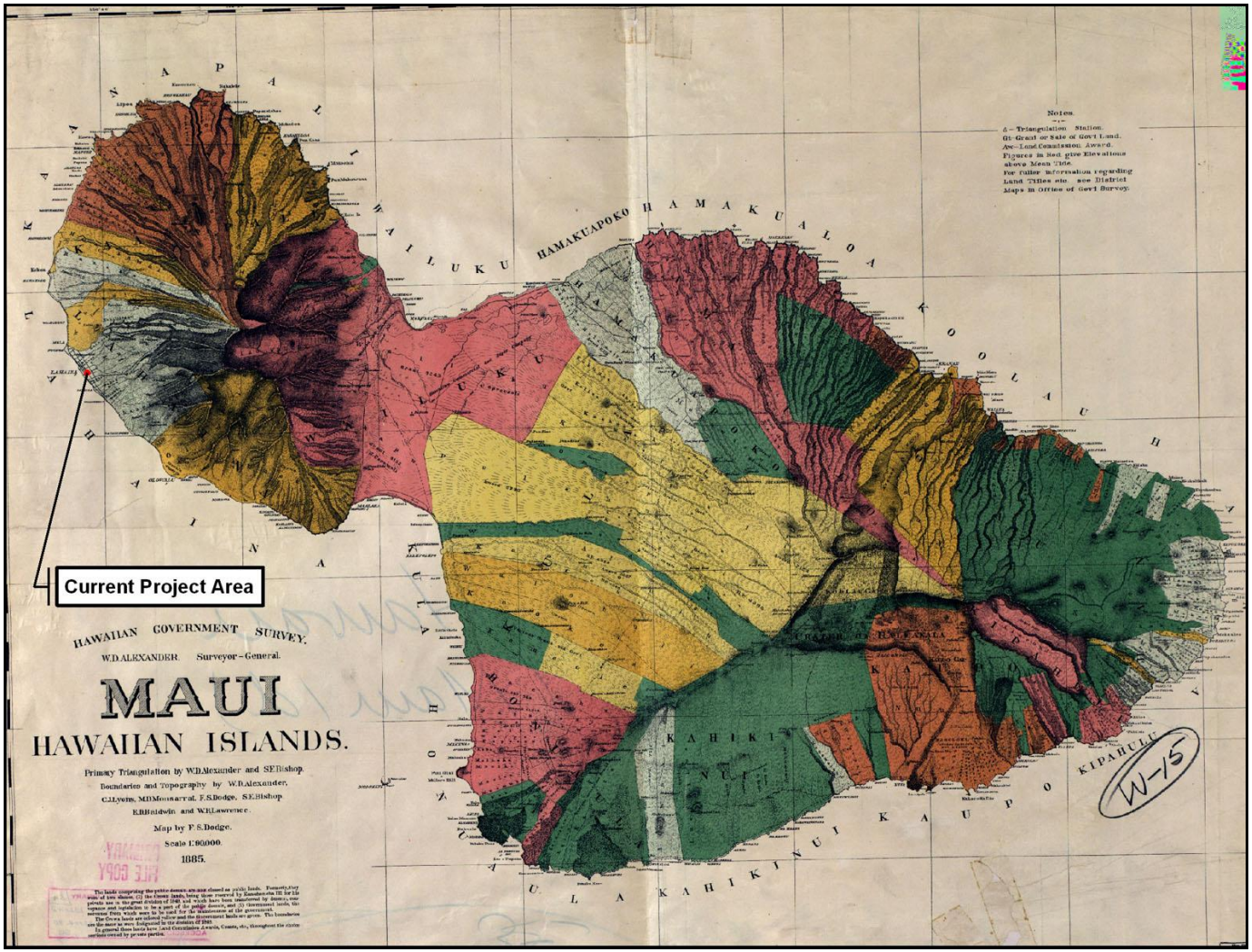


Figure 7. A portion of the F.S. Dodge map (1885) showing the *kalana* of Lāhainā and the approximate location of the current project area (in red) in relation to the traditional *moku* of Lāhainā (crown lands in yellow).

Flanked by excellent fishing grounds the *kalana* of Lāhainā served as the primary seat of the *ali‘i* when residing in West Maui (Handy et al. 1991) and later as the center of government for the Kingdom of Hawai‘i. The *ahupua‘a* that comprise the *kalana* of Lāhainā contained a dense collection of *kuleana* (smaller, fee-simple land divisions awarded to families during the Great Māhele; see also Figure 8), and the lands that immediately surrounded Loko o Mokuhinia were traditionally reserved for the *ali‘i* and those in service to the *ali‘i* (Klieger 1998:64-65). The coastal portion of the largest *ahupua‘a* within the *kalana* Lāhainā, commonly referred to as Lower Waine‘e, is home to Loko o Mokuhinia and Moku‘ula the preferred West Maui residence of the high chiefs of Maui.

3.1 Mythological and Traditional Accounts

Kalā‘aiheana was the sister to the chiefly brothers of Kihaapi‘ilani and Lonoapi‘ilani (Fornander 1918:176) and sister Pi‘ikea, all who were born of Pi‘ilani and Lā‘ieloheikawai. Thus, Kalā‘aiheana was a product of a *pi‘o* or high ranking marriage (McKinzie 1986:113, 114) and double *mo‘o* lineage (Klieger 1998: 9), a fact that would play significantly upon her death. Kihawahine Mokuhinia Kalama‘ula Kalā‘aiheana was her full given name and upon her death was transformed into a mo‘o and referred to as only Kihawahine Mokuhinia Kalama‘ula (Klieger 1955: 9). In this way, Beckwith (1970:126) identifies Moku‘ula, more specifically, Loko o Mokuhinia, as the place where Kihawahine Mokuhinia, the mo‘o goddess, resided. This *loko,* or pond, was a part of a larger complex of ponds called Kalua o Kiha, literally “The Pit of Kiha” or dwelling place of Kiha the *mo‘o* goddess.

The worship of the *mo‘o* occurred at a *heiau*, that was specifically constructed for that purpose, at the summit of Pa‘upa‘u. According to Fornander (1919: 520), this mountain rises immediately behind the village of Lāhainā, and is named for a child whose parents wearied of carrying him down and up the mountain in order to bathe him. At the summit of Pa‘upa‘u is Kamohomoho Heiau, named for a noted Lāhainā chief. Kamohomoho was the first “to build a heiau for the worship of the god called Moo. This lizard [god] excelled in strength; it had a stumped tail; that is the way the tails of the lizards of the present time appear, because of Moo, the great and strong.” Her supernatural powers were great, as she was one of Kamehameha the Great’s ancestral gods (‘*aumakua*) (Fornander 1920: 407). The *mo‘o* goddess, according to Beckwith (1970: 125-26), was set as a dominant image in a heiau by Kamehameha I that was dressed “in deep saffron, yellow or light yellow on a patterned *tapa* cloth.” “In her name [Kamehameha] carried his conquest over the islands” and “Ulumaheihei Hoapili, who later became an active friend of the missionaries [in Lāhainā] and a leader in establishing the Christian church, was her keeper (*kahu*)” Beckwith (1970: 126).

From these stories, we know that Lāhainā, and specifically the area of Loko o Mokuhinia, was a favorite residence of the Maui *ali‘i* and sacred to the worship of Kihawahine, the *mo‘o* goddess up until the time of Kiha-a-Pi‘ilani and through the time of Kamehameha I. Observations by Archibald Menzies, the surgeon and naturalist aboard the ship Discovery that was under the command of Captain Vancouver (1792-1794), also places Chief Kahekili in the vicinity of Loko o Mokuhinia and possibly Moku‘ula:

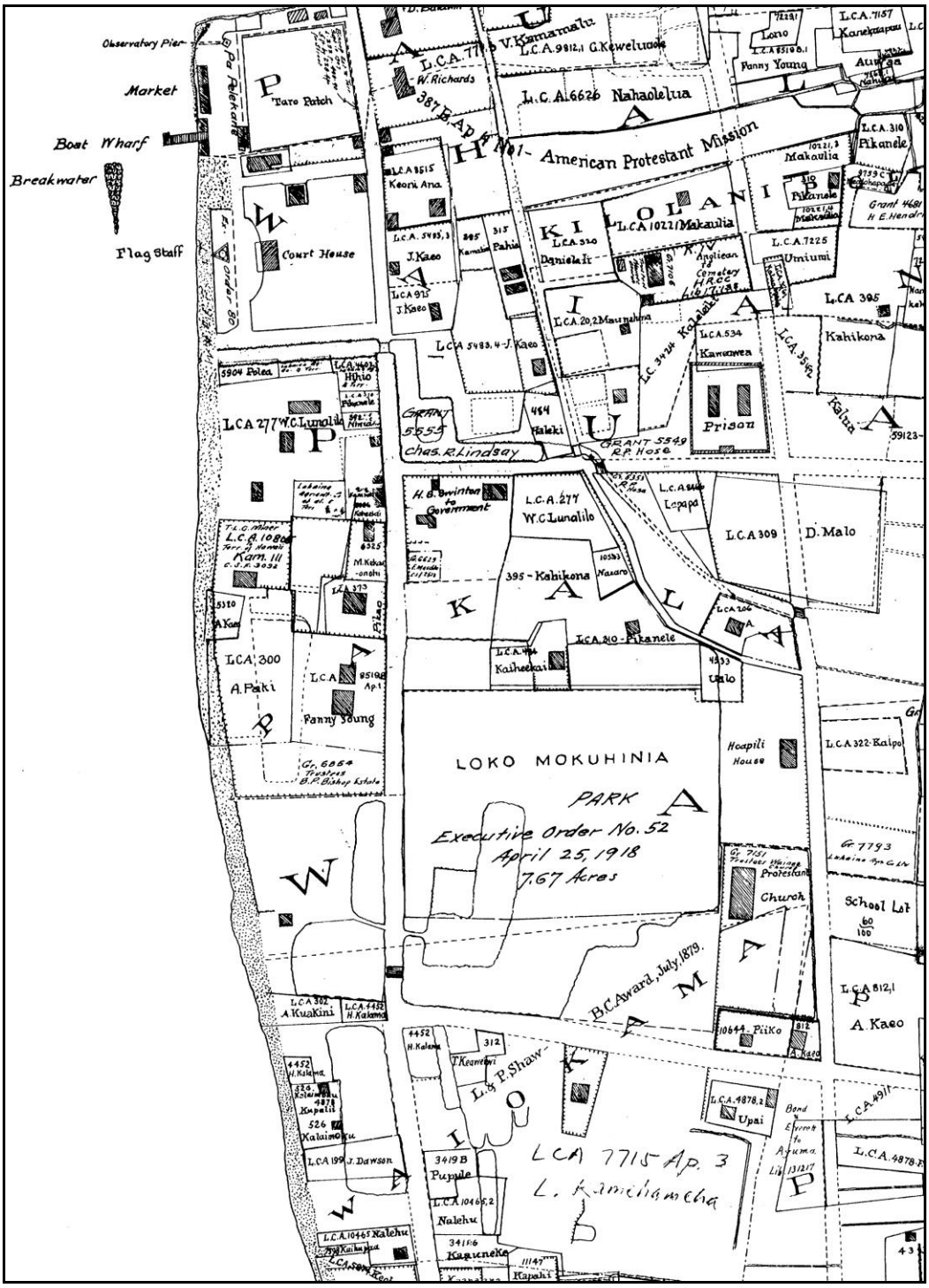


Figure 8. A portion of the SE Bishop 1884 map illustrating LCA density along the coast of Lāhainā , focus on Moku‘ula.

The royal residence was sheltered with spreading trees and cocoa-nut [sic] palms situated near some beautiful fish ponds with which it was more than half

> surrounded, though they were not all at this time in repair or filled with water. They were so contrived as to be filled or emptied at pleasure or in succession. Here we found Kahekili with some of his chiefs seemingly in deep consultation, seated under the shady trees in front of his house (Menzies 1920: 112-113).

3.2 Early Historic Period

Following his conquests of Maui and O‘ahu, Kamehameha I established his government at Lāhainā, but made his residence mostly either on O‘ahu or Hawai‘i island. Between 1796 and 1802, Kamehameha I prepared for his conquest of Kaua‘i by building a fleet of war canoes at Hawai‘i. A two-story brick house was constructed at the Lāhainā landing (*makai* of the present-day public library) for the use of the king, when his travels brought him to Lāhainā. Kamehameha I sailed his fleet of war canoes to Lāhainā in 1802, consecrated several *heiaus*, and collected taxes. His “brick palace” was noted by many contemporary European and American explorers, as were the buildings within Loko Mokuhinia. The first horses seen on Maui were landed at Lāhainā in 1803; a mare and a stallion were presented to Kamehameha, and although the king was 67 years old, he soon became an accomplished rider. Kamehameha moved his invasion forces to O‘ahu, and over the next seven years planned his invasion of Kaua‘i. His residence was then moved to Hawai‘i island until his death in 1819.

According to Fornander (1918:300) the custom following the death of a high chief was to re-divide and distribute the land of the region between the chiefs and favorites of the new monarch. This custom was responsible for many civil wars. The rule of Kamehameha I brought about a new degree of permanence and security, and with the accession of his son Liholiho (Kamehameha II) to the throne in 1819, no general redistribution of lands took place

The pioneer company of Protestant missionaries to reach the Hawaiian Islands arrived off of the coast of Hawai‘i island in April, 1820, and obtained permission from the government of Kamehameha II to establish a church station at Kailua, Kona. In October, 1820, missionaries from Kailua “passed by Mowee and there spent a month in comfortable circumstances [with the entourage of Kamehameha II] (Thurston 1822:63). The Lāhainā station was established by William Richards and his wife in 1823. In August, 1826, the Reverend William Richards writes from Lāhainā, from a spot not far from Moku‘ula (Note the reference to the “royal palace”):

> At the close of my last letter, we were living on the sea beach, a spot rendered unpleasant, not only by the roaring of the surf, which dashed within a few feet of our doors, but also, by the numerous houses recently erected on every side… Our houses, too, had become so bad, that they were a very indifferent shelter from the storm, and we were daily expecting that the wind would take them entirely away.
>
> Ka‘ahumanu soon wrote to me, that she had ordered the governor of Lahaina to make over to me, a small piece of taro and potato ground, and also a garden and building spot. Two large well built native houses were standing in the yard, to which we immediately removed, and in which we now live. Directly in front of us, are several taro gardens and fish ponds, surrounded with cocoa nuts [sic], hala, and kou trees, in the midst of which stands the brick house erected by Tamehameha, and called by Vancouver, “the royal palace”.

> Back of our houses, and inclosed [sic] in the same yard, is about an acre of excellent land, designed for a garden. It contains three breadfruit trees, and on its borders, are a few cocoa nuts. It is now covered with bananas, plantains and sugar cane, interspersed with melons, cucumbers, beans, cabbage and yams.
>
> On the 26th of October [1826], the schools of Lahaina were all publickly [sic] examined. There were present, nineteen schools containing *nine hundred and twenty two* [italics theirs] scholars. The school of Nahienaena, in a particular manner, distinguished itself for its improvement (Richards in the American Board of Commissioners for Foreign Missions 1827:40).

Census figures collected by Protestant missionaries throughout the Hawaiian Islands beginning in 1831 provide the earliest documentation of the size of the native population after the first decades of western contact. During the first census of Maui Island in 1831-1832, a total population of 2,982 was recorded in the Lāhainā District, which comprised 8.5% of the entire island population of 35,062 (Schmitt 1968). Between 1837 and 1845, the island of Moku‘ula was the preferred residence of Kauikeaouli, Kamehameha III and the stage on which the political changes of the Hawaiian Kingdom was to play out (Klieger 1998).

3.3 Mid- to late-1800s and the Great Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Great Māhele - the division of Hawaiian lands - which introduced private property into Hawaiian society. In 1848 the crown and the *ali‘i* (royalty) received their land titles. *Kuleana* awards for individual parcels within the *ahupua‘a* were subsequently granted in 1850. These awards were presented to tenants - native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners - who could prove occupancy on the parcels before 1845.

Land Commission Awards (LCAs) were granted by ministers representing the Kingdom of Hawaii’s Department of the Interior. Testimony to establish title to real property was recorded by Native Register - wherein claimants would provide traditional proof of ownership - and by Foreign Register - wherein boundary survey evidence would support traditional claims.

A large number of houselot LCAs were conveyed in the immediate area surrounding Loko o Mokuhinia and Moku‘ula (Table 1 and Figure 8). The initial work of compiling the following table was performed by P. Christiaan Klieger (1998), as a portion of his archaeological research project “Moku‘ula, Maui’s Sacred Island”. Subsequent additions were made by cross-referencing SE Bishop’s 1884 map with the Waihona Aina online database (2000).

Table 1. LCAs located in or near the present project area at Moku‘ula adapted from Klieger 1998 and updated using Waihona ‘Aina (2000)*.

LCA# Date	Claimant	‘Ili/Kuleana	Ahupua‘a	Notes
00199 4 September 1846	Dawson, John	Kamakalaukalo	Lāhainā	One house lot, obtained by Dawson from the King ca. 1840 through the efforts of the chief Kapu and Hoapili Wahine
00206	Catalina	Pākalā	--	0.24
00277	W.C. Lunalilo	Pākalā	--	0.81
00300	A. Paki	Pākalā	--	1.18
00302 25 December 1846	Kuakini	Waiokama	Waine‘e	House lot at Mokuhinia†
00309	D. Malo	Pākalā	--	--
00310	Pikanele	Pākalā	--	1.168
00312:5	T. Keaweiwi	Waiokama	--	0.16
00339	Kalapaihala	Pākalā	--	0.33
00373	La‘ahili	Pākalā	--	0.28
00395	Kahikona	Pākalā	--	0.84
00476	Pikao	Pākalā	--	0.07
00484:1	Kaihe‘ekai	Pākalā	--	0.2
00526 7 September 1846	Kalaimoku	--	Waiokama	T
00812M 25 October 1847	Kaeo, A.	--	Pua‘a, Lāhainālalo	

* It should be noted that the *ahupua‘a* and *‘ili* of this area of Lahaina are unique in that many do not extend from *mauka* to *makai* in the traditional manner, but rather “jump” and/or are repeated across the landscape (see also Maly and Maly 2007). This area of Lahaina is densely populated resulting in land divisions surrounding the royal residence of Moku‘ula that were intricately complex. This fact, coupled with the difficulty of westerners surveying and understanding Native Hawaiian land tenure often resulted in the land division terms and place names being misrepresented both in the transcripts of Native Testimony and on the government survey maps. The *‘ili* and *ahupua‘a* place names are listed as presented in Klieger (1998) and Waihona Aina (2000).

† There is a discrepancy between the location depicted on the 1884 SE Bishop Map (see Figure 8) and the following boundary description as given in sworn testimony from Kiko (Waihona Aina 2000): Boundaries of house lot at Mokuhinia: Mauka by road; Olowalu by pond; Makai by Kalaimoku’s lot; Kaanapali by road. If the boundary description is correct, it would appear that either Kalama’s LCA and Kuakini’s LCA was transposed on the map or the lot description encompasses both LCAs.

LCA# Date	Claimant	‘Ili/Kuleana	Ahupua‘a	Notes
03419B 12 November 1852	Pupule	--	Waiokama	36 rods
04452	Kalama	Waiokama	--	0.1
04533:1	Ualo	Kuloloia	--	0.528
04878I	Kupalii	--	Waiokama	11 rods
04878:2	Upai	Waiokama	--	0.11
06325	Ha‘alelea	--	--	--
06325M 3 June 1854	Kekauonohi	--	Puako	36 rods
07715:3	Kamehameha V and Shaw (1879)	Waiokama Ahupua‘a	--	25.86
08466 9 February 1854	Kapapa	--	Puako	25
08519B	Fanny Young	Pākalā	--	1.14
10427:2	Na‘ea	Pākalā	--	0.38
10465.1	Nalehu	Waiokama	--	0.25
10465:2	Nalehu	Waiokama	--	0.35
010533	Lazaro	Pākalā	--	--
010644:1	Pi‘iko	Waiokama	--	0.32
10806:77	Kamehameha III	Pākalā	--	0.69
GR 5555	C. Lindsay	Pākalā	--	--
GR 6854	V. Kamamalu	Pākalā	--	--

According to Klieger (1998:69), the neighborhood extending out from the royal residence of Moku‘ula and surrounding *loko* resembled concentric layers or bands and where a person lived within these circles depended on ones rank and/or position in government. From Moku‘ula and the King’s residence as the center or *piko*, the subsequent rings were as follows: Kalua o Kiha for the government and court; Kalua‘ehu for the *ali‘i* and extended family; and Lāhainā for the traders and Lāhainā *maka‘ainana* (Klieger 1998: Figure 19 p.70).

Government censuses during the second half of the 19th century document the diminishing population of the Lāhainā District, which then included lands of Kā‘anapali. In 1853, 4,833

persons were recorded as living in the Lāhainā District. Twenty-five years later, in 1878, the total district population had dropped to 2,448; and by 1896, the number had reached 2,398 (Schmitt 1977:12-13).

3.4 1900s and Modern Land Use – Urbanization and the Effects on the Cultural Landscape of Lāhainā

By the turn of the century, following the annexation of the Hawaiian Islands to the United States of America, the lands of Loko Mokuhinia came under scrutiny of the Commissioner of Public Lands, Edward S. Boyd (Hawaii State Archives 1901). In a letter written in 1901 by W.D. Aiken to Mr. Boyd, the lands of Moku‘ula are discussed:

> The most part of last week I spent in a trip to Lahaina to look into the matter of that land there called "Loko Mokuhinia", about which Mr. Heyselden wrote us. The claims upon this land appear to be several. There is no question about the part that lies *makai* of the Government road, where the old palace use [sic] to stand. Everybody is agreed that this belongs to the Government. But the larger part above the road is claimed by the Bishop Estate, with the Pioneer Mill Co., claiming to own all of it above water, a small neck where the old royal tomb still stands. It is a small piece, and is indicated on the map. The part mauka of the road, the Bishop Estate has advertised for sale for some time since, but the proposed sale was given up for some reason or another.
>
> The plantation claims to have a deed to the premises where the old tomb stands, but could not find it when I was there. I am going to write them to let me know the Liber and page in which it is recorded when they do find it so we can look it up. In the meantime, I think it would be well if you could see the Bishop Estate about the other part of it as to where they get a claim to it.
>
> Most of the piece above the road is a swamp, and I should say a menace to the health of the people, as it is full of filth. It would cost a good deal to fill it in but that is what should be done. If it should be Government property I would recommend that it be sold, as no one would fill it in under leasehold. The piece *makai* of the road is in fair shape, though a little filling would improve it, and it ought to be quite valuable (Hawaii State Archives, DLNR 2 Box 16 as reported in Maly and Maly 2007).

According to oral testimony collected by Klieger (1998:96), soil from Honokōwai was transported by railroad to Loko o Mokuhinia in 1914 and a steam shovel was used to spread the soil over the stagnant waters, and fill in the wetlands. A Department of Public Works Map (Figure 9), however, shows that while a portion of Loko o Mokuhinia pond was filled in by 1916, the pond waters immediately surrounding the inland island of Moku‘ula were still intact. Nevertheless, it is possible that the earlier date of 1914 is a reference to the filling in of the peripheral edges of the pond. The final "reclamation of government swamp lands" in Lāhainā consisted of filling and grading approximately 11.5 acres of wetlands, including that of Loko o Mokuhinia and Moku‘ula, as well as construction of drainage canals and storm sewers.

According to the records of the U.S. Department of Interior, this task was completed in December of 1917 (U.S. Department of the Interior 1918: 665-666).

Urban change came quickly to Lāhainā, and during the period between 1914 and 1950 the area was in a near steady state of modification. Beginning in the late 1880’s, Lāhainā’s main export was sugar. The Kā‘anapali Landing was improved in the 1890’s with the construction of a railroad to handle the shipment of bulk sugar from the Pioneer Mill Company (Conde 1973). By the early 1900’s, an extensive plantation village system, made up of 40 individual camps, was developed by the Pioneer Mill Company (Gilmore 1936). By 1920, plans were finalized for a 650-foot wharf at Mala, funded by a $225,000 appropriation approved by the Hawai‘i Territorial Board of Harbor Commissioners (Bigelow 1920). The Mala improvements included a 700 foot long roadway connecting the existing Government Road to the wharf.

The sheltered waters offshore of Lāhainā became the second home of the U.S. Navy’s Pacific Fleet. During the period between 1926 and 1931, expenditures by the Fourteenth Naval District at the Navy Yard, Pearl Harbor, had reached over 41 million dollars (Navy 1935). The rapid buildup of the military in the Hawaiian Islands was seen Lāhainā, a favorite rest and recreation port throughout the remainder of pre-war and wartime Hawai‘i. Merchants catering to both the military and civilian population expanded, and tourism in and around Lāhainā town grew.

A rubble-mound breakwater was developed for the Lāhainā Small Boat Harbor by the U.S. Army Corps of Engineers in the mid-1950’s. With statehood in 1959, momentum to develop Lāhainā as a resort destination allowed American Factors (Amfac, Inc.) to remove the infrastructure of sugar cultivation from land in the Kā‘anapali region in favor of golf courses and hotels (Simpich 1974). Groups established in the 1960’s, such as the Maui Historical Society and in the 1970’s, such as the Lāhainā Restoration Foundation, have sought to maintain design standards consistent with Lāhainā’s missionary and whaling days. Since then, a renewed interest in the preservation and interpretation of Lāhainā’s historic buildings and landmarks has been key to the success of tourism in the area (Houghtailing 1961).

Figure 9. Public Works, September 1916, Sheet 1 of 3, showing Loko o Mokuhinia, Moku‘ula, and the surrounding environment (original on file at the Hale Pa‘i, Lahainaluna High School).

Section 4 Previous Archaeological Research

The following section will provide an overview of previous archaeological work in the surrounding area with specific emphasis on the excavations conducted within Malu‘ulu o Lele Park. Beginning in the late 1920's and continuing in recent decades, archaeological studies have been conducted within the *kalana* of Lāhainā, in the region of the Lower Waine‘e Ahupua‘a (Figure 10). Studies conducted here show patterns of Hawaiian activity during the pre-contact and early post-contact periods. The renowned fishing grounds and fertile agricultural regions of Lāhainā were best described by missionaries stationed there beginning in 1820, and had been noted earlier by explorers such as Captain George Vancouver and his naturalist Archibald Menzies (Menzies 1920:112) as well as letters from Captain de Freycinet (Arago 1822:119).

Between 1928 and 1929, Winslow Walker of the Bishop Museum attempted the first island-wide systematic archaeological survey of Maui. Walker recorded one major site in Waine‘e: Halekumukalani Heiau (Walker Site 7) near the present project area. Halekumukalani Heiau was described as “a small sacrificial heiau, now totally destroyed” which was located, “(i)n cane lands of Puehuehunui in the ahupuaa [sic] of Halekaa, mauka to railroad of Pioneer Mill Co.” (Walker 1931:64). Three other *heiau* were described by Walker in the general region of the present project area. In the Polanui Region, Makila Ahupua‘a, Walker (1930:64) noted Wailehua, a shoreline *heiau*, that measured 130 by 80 feet. In Kuia Ahupua‘a, in the cane fields above Waine‘e, Walker (1930:65) noted Apahu‘a Heiau which Thrum (1909 in Walker 1930:65) attributed to Hua-nui. In Paunau Ahupua‘a, Walker (1930:65) described Waiie Heiau, located in the Kapualu district south of Lahainaluna Road, in the cane fields. He noted that it was totally destroyed.

Archaeological excavations were conducted at the former location of the “Brick Palace” of Kamehameha I in Paunau Ahupua‘a by Xamanek Researches (W. Fredericksen and D. Fredericksen 1965). Original estimations of the palace footprint placed the dimensions at 20 ft. by 40 ft. (Ellis 1823 in W. Fredericksen and D. Fredericksen 1965: Appendix A). Through thorough archaeological investigation, the measured dimensions of the footprint were not too far off from the original observations of Reverend William Ellis at 15 ft. by 41 ft. The location of the palace was also verified on the Government Survey maps of S.E. Bishop (1884) and discovered to be approximately 25 ft. from location documented by Freycinet in 1819. While most of the historical documentation of the palace did not completely correspond to the excavation results, the majority of the original sources were consistent with the orientation of the palace as discovered through excavation. In addition to confirming the dimensions and location of the palace, the following conclusions were reached:

1. The palace was built of locally made bricks of a sand and coral matrix that varied in size and thickness;
2. The foundation of the brick structure was built atop a mound or platform that was retained by a dry-stacked stone wall.
3. The brick wall construction consisted of the first four courses being laid in alternating axial directions;

Figure 10. Portion of the 7.5 minute USGS topographic map, Lāhainā Quadrangle (1992), showing locations of previous archaeological work

4. Three types of mortar were used in the brick structure construction: (a) the classic early historic mortar of reduced coral with sand and some soil; (b) a clay and sand mortar that contained some coral pieces that did not prove to be as hard as the first; and (c), a sand and lime mortar mixed in roughly equal quantities that was used to plaster the exterior of the palace structure;
5. The palace walls were located on and leveled by a sand lens, which was then superimposed of the traditional dry-masonry foundation that rested on the mound or platform mentioned previously;
6. The 90 degree turn made by the traditional retaining wall may be connected to the orientation of the canoe landing that was observed by early visitors but was not extant at the time of the archaeological investigation conducted by Xamanek Researches;
7. While the location of the palace proper was verified during the course of the excavations, indications of traditional wall structures of an indeterminate function were encountered on the southeast end of the site area; and
8. The high frequency of water-rounded *‘ili* indicated the entire mound area was paved

A follow-up report for the “King’s Palace” site by Walter and Demaris Fredericksen in 1970 detailed the actions by the archaeological team to preserve and display a portion of the “palace” building foundation under a plexi-glass viewing dome.

Xamanek Researches conducted an archaeological investigation of the outbuildings adjacent to the Baldwin House (W. Fredericksen and D. Fredericksen 1977) in anticipation of possible lease agreements between the Lāhainā Restoration Foundation and private commercial interests. Of primary concern was the possible impact of commercial activities on remnants of the “Spare Room” of the Baldwin House. Results of the excavations in the area under consideration for lease however did not yield evidence that the “Spare Room” was once located in the vicinity. Fredericksen and Fredericksen (1977) then concluded that the “Spare Room” was likely located under the concrete slab for the former Arbor Shops Complex.

Robert J. Hommon (1982) conducted a reconnaissance survey of an area near the former plantation village at Waine‘e. This survey determined that the area had previously been cultivated in sugar cane, and no significant archaeological sites or materials were found.

Xamanek Researches performed archaeological excavations at the Hale Pa‘i Site (SIHP 50-50-03-1596) or “House of Printing” on the campus of Lahainaluna High School (W. Fredericksen and D. Fredericksen 1982) in conjunction the historic restoration work. W. Fredericksen and D. Fredericksen (1982:14-17) concluded that the original ground level of the Hale Pa‘i in the area adjacent to the southern wall was approximately 1.5 meters below the then current ground surface. Traditional dry-stacked masonry was likely the original form for the foundation, with the European/American style of architecture built upon it.

Xamanek Researches conducted an archaeological inventory survey with subsurface excavation at a parcel of land located on the Lāhainā shoreline (W. Fredericksen et al. 1988a). The parcel was once the site of a military armory building built in 1912. The parcel was also reported to have been the site of Hale Piula, a metal-roofed “palace” built during the administration of Kamehameha III in the mid-1840’s. The parcel became a public park in 1988,

and the subsurface excavations undertaken in the seaward portion of the 1.797-acre parcel did not reveal any structural features that could be definitively associated with Hale Piula. Archaeological monitoring was recommended for future plans to remove pavement and asphalt from the project parcel.

In 1988, Xamanek Researches conducted an archaeological inventory survey at the Aus Site, a parcel of commercial zoned property located on the seaward side of the Seaman’s Cemetery in Lāhainā (W. Fredericksen et al. 1988b). A total of six trenches and 14 auger tests were excavated where possible in order to assess the underlying stratigraphy and cultural context of possible subsurface deposits. While subsurface testing did uncover individual artifacts of historical and archaeological interest, no pre-contact or historic structures were present. Due to the extent of built features, however, W. Fredericksen and others (1988b) were unable to assess the significance of the area in its entirety and recommended further testing following the demolition of existing buildings.

Archaeological Consultants of Hawaii conducted a limited archaeological subsurface testing program on an approximately one-acre lot within Paunau Ahupua‘a (Kennedy 1989). Three backhoe trenches were excavated in the southern portion of the lot. While portable remains were present within the trenches, it was apparent that they were from a mixed context as the diagnostic age for the artifacts ranged from the modern era to early post-contact. It was also notable that the portable remains were only encountered below the water line. This pattern of distribution, along with the soil stratigraphy and high water table appeared to point to a previously marshy environment that had been back filled sometime during the late historic period.

Xamanek Researches conducted an archaeological inventory survey of approximately two acres located directly adjacent and to the east of Malu‘ulu-o-lele Park, the former location of Kamehameha III’s residence at Moku‘ula (W. Fredericksen et al. 1989). A total of 19 test trenches and 6 auger tests were excavated during the sub-surface investigation of the parcel. Testing results led to the conclusion that the survey parcel was likely used as open space and/or lake shore when Lāhainā served as the Capitol of the Hawaiian Kingdom and open space thereafter. Pond sediments over a portion of the parcel also indicated the soils had been submerged for some time and was likely that this portion was a part of Loko Mokuhinia prior to the land filling activities during the turn of the century.

Theresa Donham (1993) completed the disinterment of a flexed burial which had been found during trenching performed by utility workmen at the former Lāhainā Armory parcel. A flake of highly polished basalt was found at 40 cm below surface.

An archaeological inventory survey of a portion of a parcel that was slated for new construction was conducted by Xamanek Researches (D. Fredericksen and E. Fredericksen 2000a). Subsurface testing consisting of two test units and six auger cores was undertaken within the 240-square foot project area. Result from the auger tests revealed previously disturbed subsurface conditions that appeared to consist primarily of fill layers and re-deposited silty sand. Results of the manually excavated test units revealed the presence of one previously disturbed pre-contact burial. Examination of the test unit side walls indicated that the burial pit and remains were likely disturbed during the construction of the neighboring Wharf Cinema and re-deposited to the location of discovery.

Xamanek Researches (D. Fredericksen and E. Fredericksen 2000b) conducted an archaeological inventory survey for the proposed West Side Resource Center to be located within a portion of Waine‘e Village, an old sugar plantation camp. A pedestrian surface survey followed by subsurface test using a backhoe identified SIHP 50-50-03-5042, comprised of two structural remnants of the former Waine‘e Village on the surface and cultural materials consistent with the plantation time period in a subsurface context. No recognizable pre-contact materials or features were observed during testing, thus leading to the conclusion that while the Land Commission Award data had indicated that portions of the study parcel had been used for *lo‘i* agriculture, post-contact ground alteration associated with sugar cane cultivation followed by the construction of Waine‘e Village had effectively eliminated any pre-contact remnant in this area.

Cultural Surveys Hawai‘i, Inc. conducted a subsurface archaeological investigation on the grounds of the historic Lahaina Courthouse (Borthwick and Hammatt 2000). Three backhoe trenches and two manually excavated test units were dug on the Canal Street and Hotel Street sides of the courthouse. One trench was also placed on the corner of Hotel and Wharf Street. The excavations resulted in the identification of six distinct soil layers. Stratum IA and IB consisted primarily of imported top soil and mixed construction layer associated with construction or infrastructure improvements around the Lahaina Courthouse. Stratum II, present in only two of the four backhoe trenches, consisted of a beach sand deposit likely representing a high surf event. Strata II/III consisted of a construction layer and mixed A-Horizon that likely reflected the early Courthouse construction. Stratum IIIB, an intact and discontinuous pre-contact habitation deposit (SIHP 50-50-03-4754) was identified in only two of the four trenches. Stratum IV, identified within all four backhoe trenches, consists of a cultural sterile beach sand deposit with some organic material dispersed throughout.

An archaeological inventory survey was conducted by Haun & Associates (Haun and Henry 2001) of a 0.845-acre parcel located west of Front Street, south of Prison Street, and east of Luakini Street. The completion of the inventory survey resulted in the relocation and further documentation of SIHP-4682, a portion of Loko o Puako Fishpond and SIHP-4690, a stone wall (Feature A) and subsurface cultural deposit (Feature B) that was previously interpreted as associated with LCAs 395 (to Kahikona) and 339 (to Kalaipaihala) (D. Fredericksen and E. Fredericksen 1999a and b; Haun and Henry 2001: Table 1). Further documentation and test excavations conducted during the course of the Haun and Henry (2001) inventory survey however, indicated that the wall was not directly associated with the original parceling out of the two LCAs in the 1840s but was rather a more recent construction based on the materials used to either initially construct or rebuild the wall, as well as the mixed nature (both recent and older items) of cultural material deposits directly underlying the wall. Haun and Henry (2001) further asserted that because the wall was constructed directly on the modern surface, it was not likely that cultural deposit and wall are associated. Data and artifact analysis of the pre-contact materials from Feature B of SIHP -4690 resulted in the determination that the cultural deposit reflected a habitation time period correlating to the late 1400s to late 1600s and further inferring that the deposit or pre-contact habitation activity was not confined to the LCA house lots and presumably not directly associated with the 1840s habitation of the area (Haun and Henry 2001:46).

Xamanek Researches monitored the electrical system upgrade for King Kamehameha III Elementary School located just *makai* (seaward) of historic Front Street in Lāhainā (E. Fredericksen and D. Fredericksen 2001). During the course of monitoring, four previously unidentified historic properties were located. SIHPs -4982, 4983, 4984, and 5174 had all been previously impacted by ground alteration associated with the development and construction of school in the early part of the 20th century and subsequent years. SIHP -4982 was interpreted as a probable post-contact burial area consisting of four burial and probable burial features. One of the four probable burials contained a secondary bundle burial. The remaining features consisted of a waterworn cobble burial platform encountered 45-55 cm below surface and two pit outlines that were discovered during trenching and preserved *in situ* without further investigation. SIHP -4983 consisted of a distinct subsurface cultural layer with subsurface posthole features indicative of habitation and approximately five associated human interments. Wood charcoal dates indicate a late pre-contact to early contact time frame for the occupation and use of this site. SIHP -4984 was a probable pre-contact to early post-contact Native Hawaiian human burial site consisting of approximately 12 *in situ* interments that had been heavily impacted by the reconstruction of the school in the early 1950s. In addition to the 12 *in situ* interments, a minimum of 11 previously disturbed individuals were discovered within the fill soil associated with the classroom construction (E. Fredericksen and D. Fredericksen 2001:28). While an associated cultural layer could not be discerned during the course of mitigation work, it seemed likely that one was present based on the quantity of indigenous artifacts distributed throughout the disturbed sediments. SIHP -5174 consisted of a remnant *‘ili‘ili* pavement and associated refuse or cooking pit feature. Post-contact cultural material remains were noted in both the pavement matrix and pit fill.

Xamanek Researches (E. Fredericksen and D. Fredericksen 2002) conducted an archaeological inventory survey of two adjacent parcels comprising a total of 1314 square meters. Subsurface excavation was carried out only on Parcel 48 as Parcel 53 was used as a commercial parking lot at the time of the survey. Six backhoe trenches were excavated across Parcel 48. Result of the testing indicated that much of the parcel consisted of early 20th-century fill, based on the formal material type. Four post-contact refuse pits and an informal “backyard” water worn pavement were identified during the course of testing and designated as SIHP 50-50-03-5203.

An archaeological inventory survey of a 10,500 foot (3,200 meter) long project corridor was conducted by Xamanek Researches in anticipation of the Lāhainā Watershed Flood Control project (E. Fredericksen and D. Fredericksen 2003). A pedestrian sweep of the corridor and subsequent subsurface testing, both manual and mechanical, identified one previously unrecorded pre-contact burial (SIHP 50-50-03-5239). Based on the burial discovery and the ubiquitous LCAs within and adjacent to the project corridor, it was postulated that intact cultural deposits, as well as additional interments were possible in un-tested areas

4.1 Archaeological Work Specific to Moku‘ula and Loko o Mokuhinia

An archaeological investigation of the inland island of Moku‘ula and private residences of King Kamehameha III, as well as his family’s mausoleum, was conducted by the Anthropology Department of the Bernice Pauahi Bishop Museum (Klieger 1995a). The excavations confirmed

the existence of the island beneath the coral and soil fill of the park, as well as several architectural features in a good state of preservation. Klieger (1995a: 329) posited that much of the island is still preserved under the overlying fill deposits. According to testimony gathered during the course of the excavation work, the coffins that occupied the mausoleum were removed by Bernice Pauahi Bishop and re-interred at the nearby Waine‘e (Waiola) Church yard following the death of Kamehameha III, further indicating that the caretakers of the island had remained at Moku‘ula until it was filled in 1913.

Information resulting from excavations and further research also found that the Loko o Mokuhinia that surrounded the island of Moku‘ula was most likely a natural pond and that the island itself was likely a mud bar resulting from alluvial deposition that was modified significantly for habitation. During the course of this work, the stratigraphic sequence for the filling of Moku‘ula and Loko o Mokuhinia was established.

A total of eight modern or recent fill components overlying sediments associated with the occupancy of Moku‘ula were identified across the project area. The fill sequence included the ball park top soil that ranged from 1 to 3 cm thick and underlain by “Ball Park Fill” that was apparently laid down in four to nine separate events represented by several layers that ranged in thickness from 8 to 35cm thick (Klieger 1995:142). Fill A consisted of a very dark brown to very dark grayish brown silty matrix with modern era cultural materials identified during the course of excavation (Klieger 1995: 142, 145). This layer was identified as a base course under asphalt pavement in the parking lot area and directly under the park topsoil (Unit N2E4 [Figure 11] and N1W4 [Figure 13]). In other areas, Fill A was identified directly over Fill C in areas were Fill B was absent (Klieger 1995:145). Fill B consisted of dark brown silty clay with discontinuous lenses of sandy, silty clay (Fill B1) identified in discrete instances within the Klieger 1995 project area (see Figure 13). Cultural materials identified within the Fill B soils also consisted of later historic to modern era artifact. Fill C materials, consisting primarily of subangular coral cobbles, pebbles and gravels, are thought to originate from dredging material recovered from Lahaina harbor. This layer was identified almost continuously across the project area, with the exception of units that appear to fall adjacent to the area where the tomb was located (Figure 13) and along the northern extent of eastern periphery line (Figure 14). It is important to note that in units where Fill C soils are absent, both Fill A and Fill B soils are absent as well. The apparent lack of these particular fill layers, where it is apparent that Ball Park Soils clearly overly soils related to the occupation of Moku‘ula may be explained by apparent high spots along the island. According to the 1916 Department of Public Works swamp and fill profiles Lines 6 through 8 (Figure 15), the approximate correlate to the test units that lack Fills A through C, show that Moku‘ula, at the end of the 1917 swamp reclamation project, was still exposed. It is likely that the fill events associated with Fills A through C are more associated with Malu‘ulu o Lele Park and the leveling out of the lands within the park to support the recreational development of the park rather than government reclamation of swamp lands. In total, the modern or recent fill deposits range from approximately 35 to 120 cm thick (Klieger 1995:142-147).

The Moku‘ula Sequence (Klieger 1995:149-166), underlying the Fill Sequence, consists of two discreet cultural layers consisting of multiple sub-strata, lenses, and sub-surface features. Layer Ia of the Moku‘ula Sequence is associated with Moku‘ula and consists of a disturbed soil layer ranging from 1 to 6 cm thick cemented deposits to 15 to 22 cm thick un-cemented deposits

believed to be located near the edge of Moku‘ula Island. While Layer Ia contained a sparse amount of faunal material, Layer Ib, although pedontologicaly similar to Layer Ia, differed in respect to the presence of intact cultural features. Archaeological features were identified in both the upper and lower portions of this layer and include discreet concentrations of midden and charcoal remains, as well as, an *in situ* basalt boulder alignment. A possible intact human burial was found in Layer Ib and discussed in Klieger and Clark (1995). Layer Ic was identified along the eastern periphery of the area believed to be Moku‘ula and extends to the water table in places where it overlies gleyed deposits. Both traditional and historic era artifacts were found in this layer, as well as the remains of a wall segment and what appears to have been a wooden pier. Layer Id, where encountered was culturally sterile.

Layer II, was also interpreted as being associated with the occupation sequence of Moku‘ula. Unlike Layer I, Layer II was not continuous across excavation units. Cultural materials recovered from this layer and sub-strata IIa-IIc appear sparse. While the island is known to have been the residence of royalty dating back to Pi‘ilani, as well as, the deity or *mo‘o ‘aumakua* Kihawahine, nothing in the cultural material remains recovered from the excavations indicated exclusive high status use.

The Loko o Mokuhinia Sequence (Klieger 1995:166-169), consists of two sediment layers (noted as L1 and L2 in the archaeological inventory survey report) with multiple sub-layers and are clearly related to the government reclamation of swamp land in Lāhainā. L1 consisted of a mixed deposit of late historic era artifacts and faunal remains. L2 sediments also included late historic era artifacts intermixed with post-contact faunal remains. Excavations within the area of Loko o Mokuhinia encountered the water table at approximately 110cm below surface.

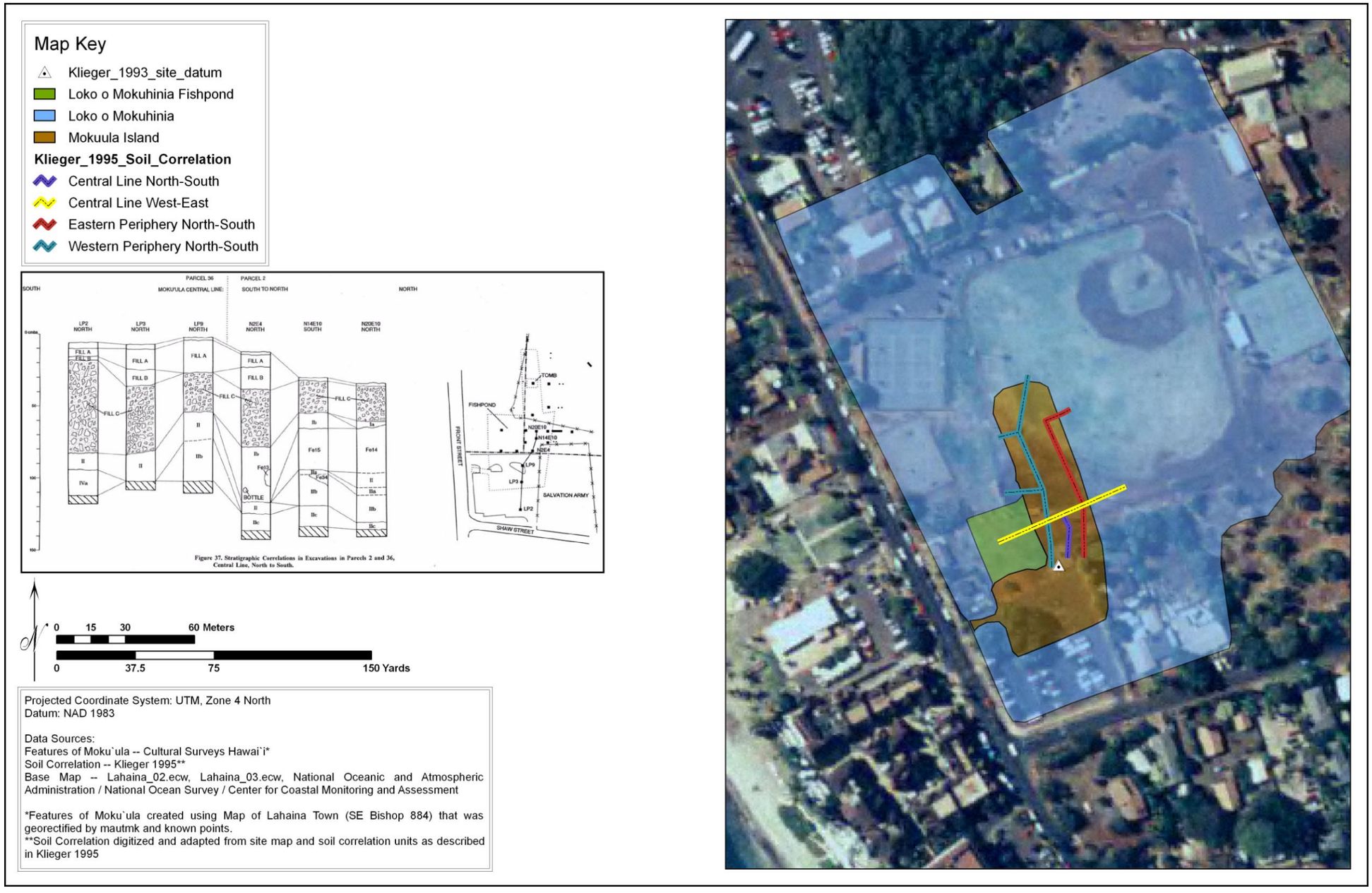


Figure 11. Orthophoto showing features of Moku‘ula and soil correlation extending along the north to south centerline of the Klieger 1995 archaeological inventory survey.

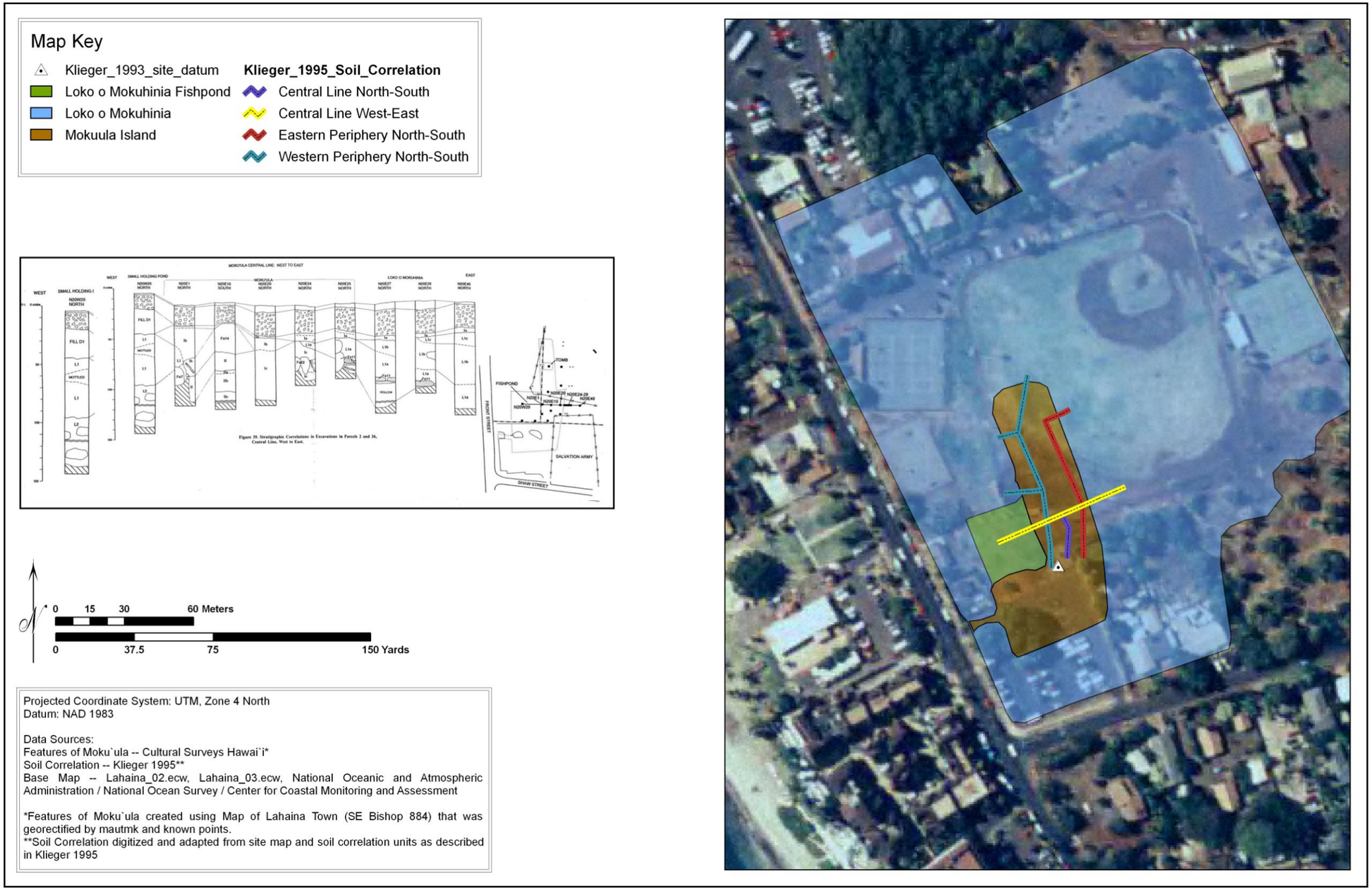


Figure 12. Orthophoto showing features of Moku‘ula and soil correlation extending along the west to east centerline of the Klieger 1995 archaeological inventory survey.

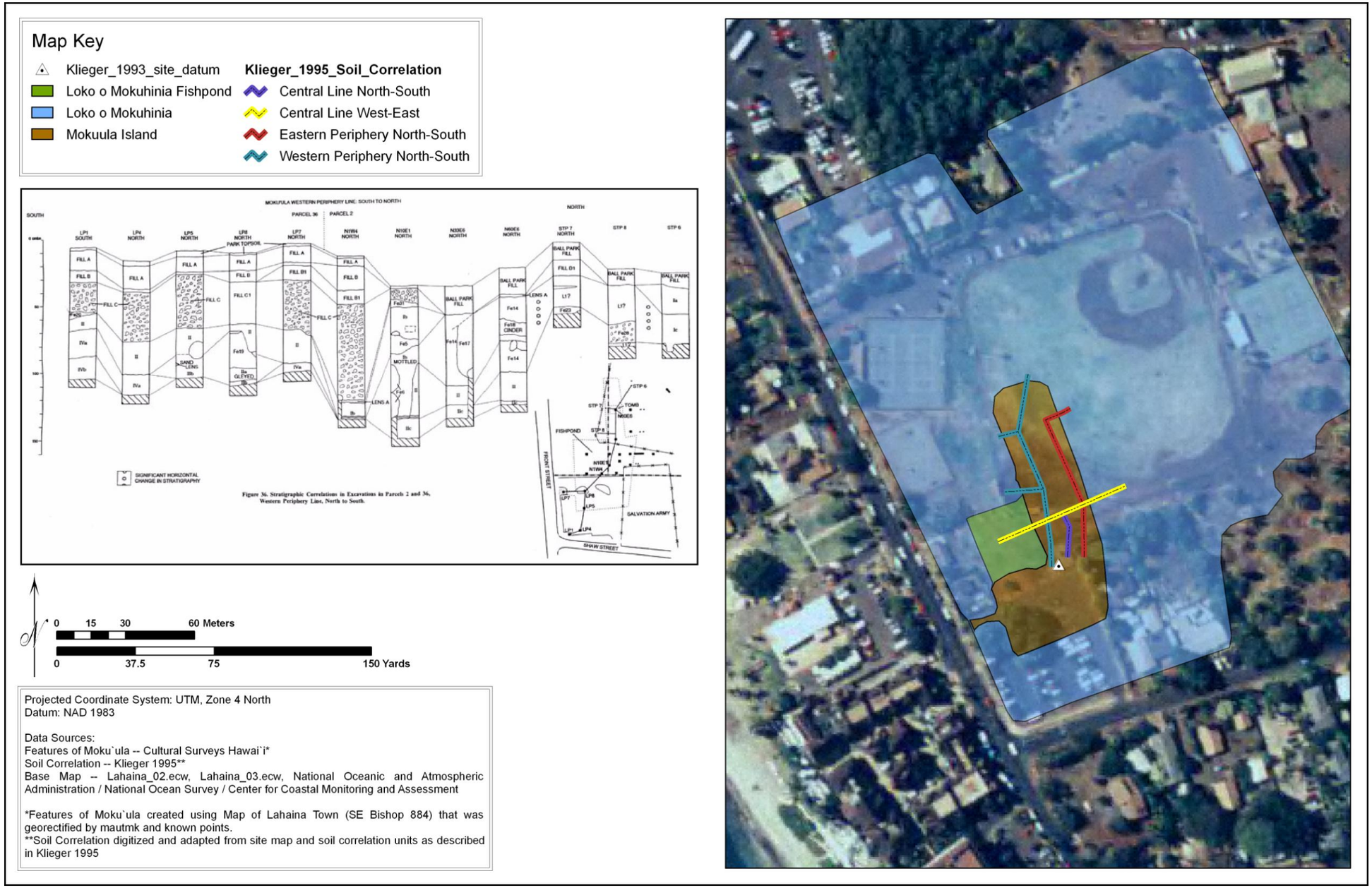


Figure 13. Orthophoto showing features of Moku‘ula and the north-south soil correlation extending along the western periphery of the Klieger 1995 archaeological inventory survey.

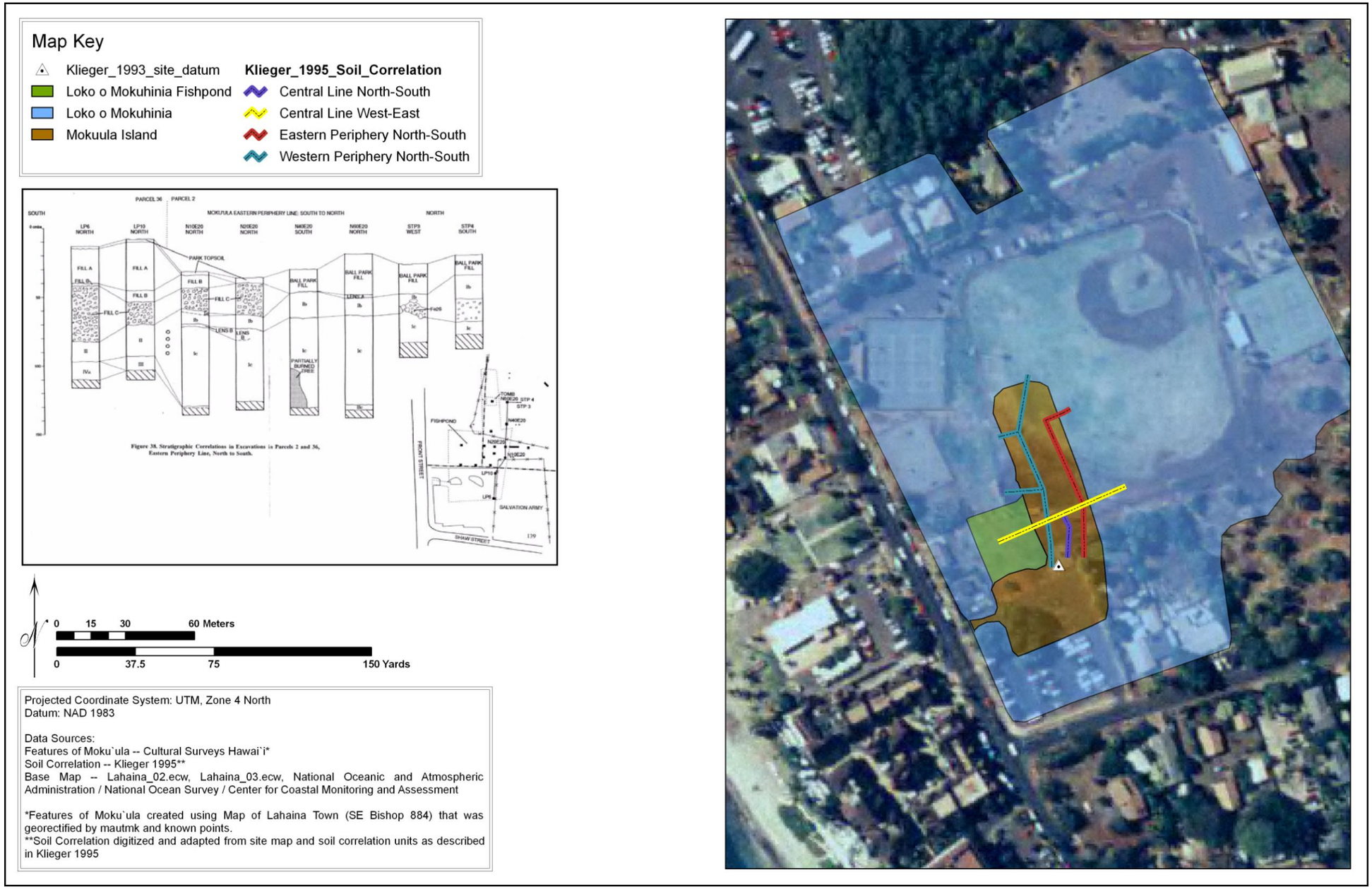
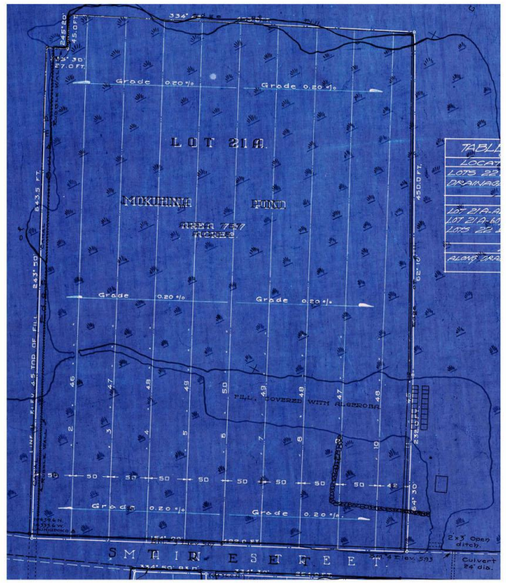
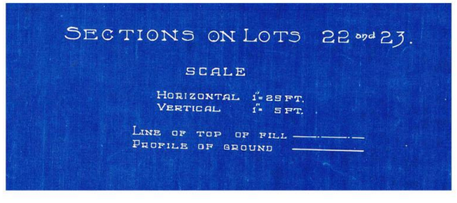


Figure 14. Orthophoto showing features of Moku‘ula and the north-south soil correlation extending along the eastern periphery of the Klieger 1995 archaeological inventory survey.





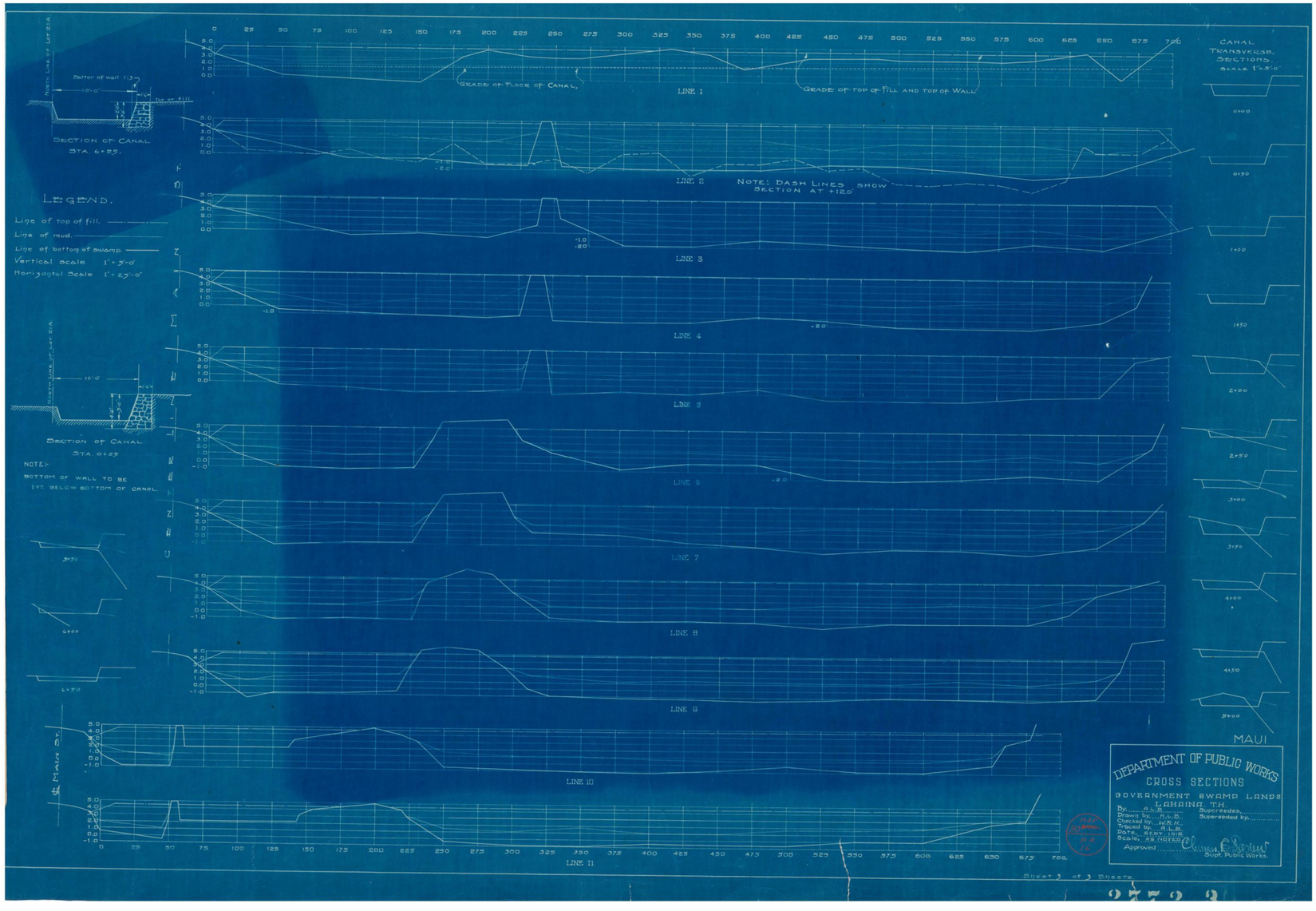


Figure 15. Public Works, September 1916, Loko o Mokuhinia, Moku‘ula, Main Frame (Sheet 3 of 3) Profiles of Lot 21A Lines 1 through 10, Inset (Sheet 1 of 3 overlay on Sheet 2 of 3): Planview of Lot 21A (Originals on file at the Hale Pa’i, Lahainaluna High School)

The Anthropology Department of the Bernice Pauahi Bishop Museum conducted an emergency mitigation program at Malu‘ulu o Lele Park located just off of Front Street (Klieger and Somer 1995). The construction of a new backstop at the baseball field located on the corner of Front and Shaw Streets by the Parks and Recreation Division of the County of Maui uncovered a portion of the foundation of an early building site. Fill material that overlies Loko Mokuhinia/Moku‘ula, the fishpond and island which formed the former residence of King Kamehameha III and the Capitol of the Hawaiian Kingdom, was breached by the construction of the backstop. An emergency mitigation program was put into effect following the halt of construction in order to assess the degree of damage to the underlying historic property. Examination of all previously dug trenches, as well as back dirt mounds from mechanical excavations, was undertaken. Manual archaeological testing was then conducted within the area of disturbance. The investigation found that the Moku‘ula sediments had indeed been penetrated during the excavations for the backstop, that the excavations had breached the island perimeter retaining wall, and that the excavations had possibly damaged a portion of the northern/southern holding pond *kūapa*. No human remains were found in the backfill of the backstop excavations and the tomb area had not been disturbed.

The Anthropology Department of the Bishop Museum conducted an archaeological inventory survey of approximately 1.12-acres adjacent to the former location of Loko o Mokuhinia and the royal residence of Moku‘ula (Major and Klieger 1995). Three backhoe trenches and one manually excavated test unit were dug to groundwater level resulting in the identification of SIHP 50-50-03-18 and 50-50-03-19. The seven features of SIHP -18 appeared to indicate a high status early- to mid 19th- century residence, as well as, associated with the inland pond of Loko o Mokuhinia that once surrounded the royal residence of Moku‘ula. SIHP-19 consisted of an early 20th Century plantation style house.

As a part of phase II archaeological investigations and supplement to the 1995 report, Klieger and Lebo (1999) revisited the Moku‘ula project site. The primary objective was to follow up on a remote sensing experiment conducted by the Bishop Museum in 1993 in order to define the outer perimeter of Moku‘ula Island. This type of remote sensing technology would prove useful in being able to “see” below the surface without physically testing at random, thus subsequently preserving the intact cultural layers below the fill. To this end, an electromagnetic survey covering approximately one hectare, using and EM 31, was undertaken and a total of seven test units were excavated to ground truth the EM 31 findings. Radiocarbon samples of charred *milo* wood recovered from test unit N40 E20, excavated during Moku‘ula Phase I work, and test units 3, 4, and 7, excavated during Moku‘ula Phase II work, were submitted for 14C analysis and returned a date range that indicated a late pre-contact to early post-contact association (Klieger and Lebo 1999). The cultural material context in which the samples were recovered, however, contained a mixed assemblage of both traditional Hawaiian and non-traditional artifacts (Klieger and Lebo 1999), a factor that led to the conclusion that the 14C results represented early post-contact occupation of the inland island rather than pre-contact occupation, as definitive archaeological signatures for pre-contact *ali‘i* occupation or construction was not present.

The final EM31 results indicated that while useful for generalizing the location of the body of the island, the technique was limited in that it could not distinguish the actual perimeter walls (Klieger and Lebo 1999). Supporting excavations during the Phase II work further supported a

Klieger and Lebo’s hypothesis that while the core of Moku‘ula may have been present prior to the Kamehameha Dynasty, the construction improvements to the island were likely the primary creation of Kauikeauoli (Kamehameha III) and/or his immediate family during the early post-contact period (Klieger and Lebo 1999).

Section 5 Summary and Preliminary Recommendations

The cultural and spiritual significance of Moku‘ula and Loko o Mokuhinia are manifold. From the time of Pi‘ilani to Kamehameha III, the island of Moku‘ula has served as a place of residence for high ranking *ali‘i* while in Lāhainā (Klieger 1998:9). The area achieved greater significance when, upon her death, the daughter of Pi‘ilani, Kalā‘aiheana, was deified at Moku‘ula as the *mo‘o* goddess and referred to as Kihawahine Mokuhinia Kalama‘ula (Klieger 1998:9). It is from her that the *loko* (pond) surrounding the island of Moku‘ula receives its name – “Loko o Mokuhinia”. During the time of Kamehameha III, Moku‘ula was noted again as the resting place for high ranking *ali‘i* when he transformed the home of Nahi‘ena‘ena, his sister, into a mausoleum following her untimely death (Klieger 1998:40). He then placed the remains of Keopuolani and other *ali‘i* in the mausoleum during his residence at Moku‘ula (Kamakau 1992:342 and Klieger 1998:40). This is a sacred place, with its spiritual and cultural significance lying in the *mana* of the gods, demi-gods, and *ali‘i* who came before and the spiritual connection that remains. Klieger (1998:40) equates the site of Moku‘ula and Loko o Mokuhinia to the spiritual *piko o*f the Hawaiian Kingdom. The proposed project may provide the beginning for re-establishing that center in the consciences of the Native Hawaiian people.

With this powerful connection in mind, the proposed project must proceed with extreme caution during all ground disturbing activities as excavation and grading activities will form a large part of the restoration effort. Great strides have been made in the utilization of GPS in the construction trades, specifically the operation of heavy machinery, remote sensing technology, and the effectiveness of GIS modeling to try and predict the boundaries of subsurface man-made structures and place them in a real-time spatial context. Moreover, extensive archaeological excavations within Malu‘ulu o Lele Park (Klieger 1995 and Klieger and Lebo 1999) have provided a fairly sound and detailed stratigraphic sequence that may aid in the overall restoration efforts when attempting to control for elevation or depth of excavation. With regard to the restoration approach as it relates to archaeologically sensitive areas the following recommendations are submitted:

1. Improve upon the GIS data that serves as the companion data to this report and incorporate into the initial planning stages. It should be noted that while this data is in draft form and accurate within ± 8 meters it should initially be useful as a reference data set for preliminary planning. This could be accomplished by:
    a. Revisiting the survey controls from the Department of Public Works (1916) plan set (full size scans submitted separately) and ground truthing the 1916 corner “pins” with the modern project area followed by laying out and surveying the profile lines as indicated in the plans. This could help to pinpoint and flag the southern holding pond walls as indicated in Lines 9 and 10 as well as the distance to the island from the Front Street (Main Street) centerline (Lines 6-10).
    b. Acquiring the spatial data directly from the archive of the Bishop Museum and previous archaeological investigations which could prove useful in refining the provided spatial and raster data.

2. The improved GIS data sets could be incorporated as base files for heavy equipment operating off of GPS Rovers. For a project of this size it has been suggested (Ted Kapoi, grade setter for Goodfellow Bros., personal communication) that either a D5 grader or C4 excavator with a blade and GPS would be capable of attaining an elevation within an inch of the desired depth (see Appendix A for examples of Trimble Grade Control Systems). To this end the following procedures under the watchful eye of an archaeologist familiar with the stratigraphy of Moku‘ula and Loko o Mokuhinia are suggested:
    a. Establish a 10-meter buffer around the approximate location of the island in the event that the restoration of the Loko o Mokuhinia occurs first (Figure 16). This would allow for an acceptable margin of error to ensure that excavating equipment stays well away from Moku‘ula Island;
    b. When necessary, grading of the park fill sediments overlying Moku‘ula Island using a D5 controlled by an operator extensively skilled with the machine and GPS equipment for that machine. Elevations or grade should be initially set according to the minimum depths of each fill layer (see Figure 11 through Figure 14). Following each pass, the surface should be inspected by the onsite archaeologist, and if possible the use of an EM 31, in the event that subsurface features and/or the outer perimeter wall and/or associated fishpond becomes evident. The “peeling away” of the fill layers may eliminate any background noise for the EM31 that may have been present during the 1999 EM survey;
    c. Hand excavation of the outer perimeter wall or edge of the island, and or associated fishpond, when the boundaries become evident to ensure minimal disturbance of the *in situ* elements and features of Moku‘ula Island. This phase of work could be conducted through public participation and volunteers under the overall guidance of experienced archaeologists.
3. A draft archaeological monitoring plan, *Archaeological Monitoring Plan for Ground-Altering activities During the Grading and Excavations for Construction Associated with the Moku‘ula/Mokuhinia Ecosystem Restoration Project, Phase I, Lahaina, Island of Maui* (Collins 2007), is on file at the Department of Land and Natural Resources/ State Historic Preservation Division. Archaeological monitoring during restoration activities should be consistent with and follow the guidelines of the approved final monitoring plan.

The recommendations suggested above may limit the amount of unnecessary ground disturbance to the physical remnants of Moku‘ula Island and any intact features associated with the habitation of the island. In essence, the very same construction equipment used to efficiently develop vast tracts of land on Maui Island would also allow for the restoration of the Moku‘ula/Mokuhinia Ecosystem to “tread lightly” over the culturally significant lands of Kalua o Kiha and considered by some in the community as a spiritual *piko* of native Hawaiians.

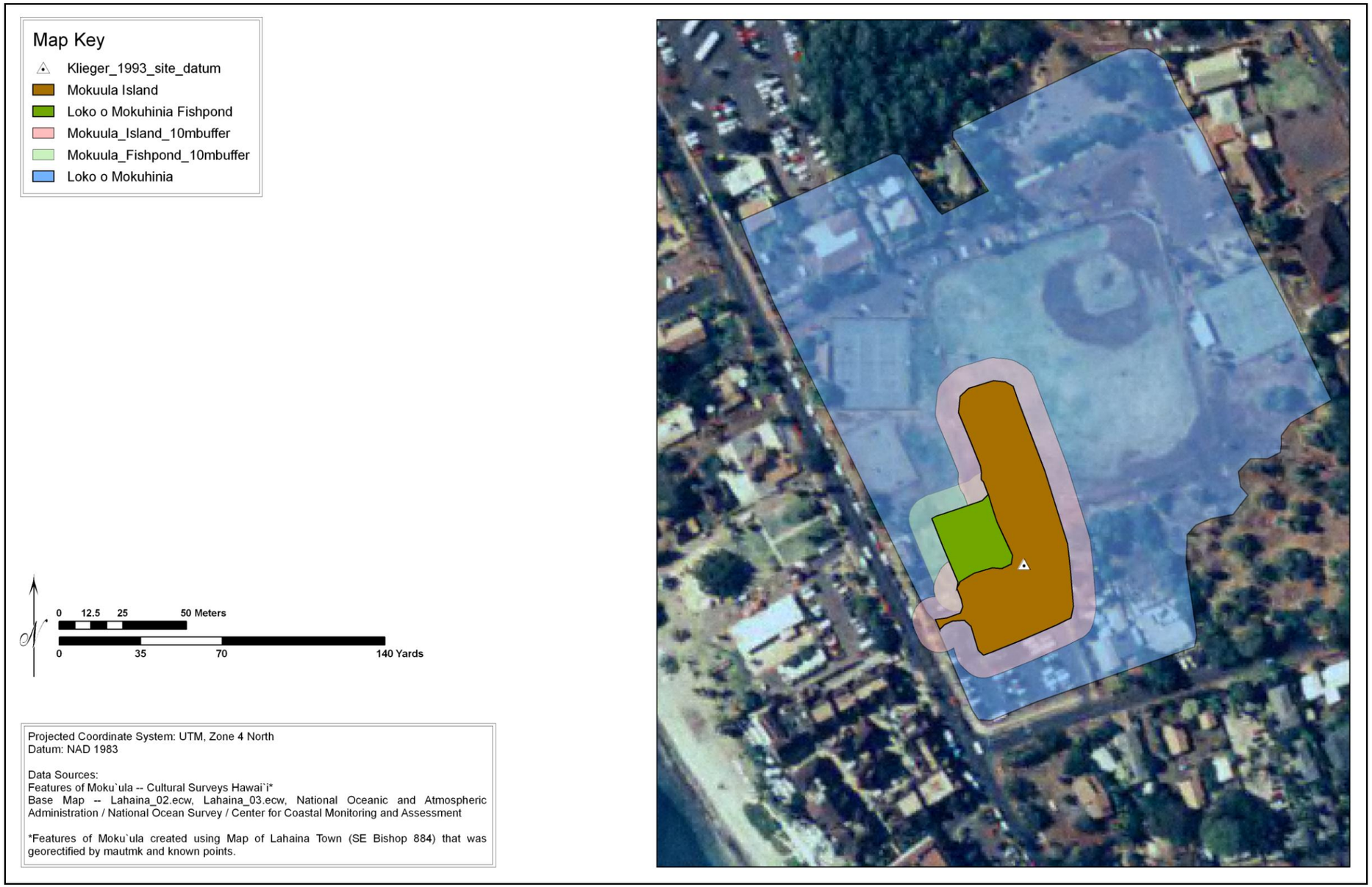


Figure 16. Orthorectified shoreline photo showing the current built environment surrounding the project area (National Oceanic and Atmospheric Administration/ National Ocean Survey [NOAA/NOS]) showing the approximate location of the features of Moku‘ula Island and a 10-meter buffer surrounding the edges of the both the island and associated fishpond.

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Appendix A Examples of Grade Control Systems for Construction Equipment

A.1 Trimble - GCS900 Grade Control System

GCS900 Grade Control System

Trimble Home > Construction Home > Grade Control > GCS900 Grade Control System

Product Info
- GCS900 - Top Ten Advantages over other After Market Systems
- Brochure
- White Paper

Customer Stories
- Trimble construction solutions in the press

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- Site Positioning Systems
- Construction Asset Management
- Building
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One of the most revolutionary changes in the way earthworks are performed has been the introduction of 3D systems originally by Trimble in 1995. The Trimble® GCS900 Grade Control System represents the next-generation 3D system from the company that invented 3D grade control.

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TRIMBLE GCS900: WHICH MACHINE / WHICH SOLUTION?

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Using the different positioning technologies provides blade control to the following accuracies

- Trimble MS980/MS990 Smart GPS Antenna - blade control to 20-30 millimeters (0.1 foot)
- Trimble SPS930 or SPS730 Universal Total Station - blade control to 2-5 millimeters (0.007 to 0.016 feet)
- Trimble GPS with Laser Augmentation - blade control to 3-6 millimeters (0.01 to 0.02 feet)

Inserted from <http://www.trimble.com/GCS900.shtml>

A.2 Trimble - GCS600 Grade Control System for Excavators

GCS600 Grade Control System for Excavators

Trimble Home > Construction Home > Grade Control > GCS600 Grade Control System for Excavators

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Customer Stories

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GCS600 Grade Control System for Excavators
Productivity and Payback in One Package

The Trimble® GCS600 Grade Control System for Excavators is a highly flexible laser-based system designed for excavation, trenching, grading and profile work. The Trimble GCS600 is idea for earthmoving, site preparation and general contractors looking for a flexible, economical, and easy-to-use grade control system to improve their productivity and profitability.

The GCS600 Grade Control System uses Trimble AS300 Angle Sensor, Trimble AS310 Dual Axis Sensor and Trimble LC300 Laser Catcher that measure the relationship between the body, boom, stick and bucket to determine where the cutting edge is and should be, directing the operator to the desired depth and slope. You know exactly where the bucket is at all times-with no guesswork. The system also offers the Trimble CB410 Control Box for Excavators to give you a powerful range of features specifically designed for unobstructed vision and in-cab excavator control.

Using the Trimble GCS600 gives you a system that indicates depth and slope, or a combination of both. You can control the and carry out desired depth or slope without a grade checker or laborer in the ditch. This capability significantly reduces the costs and downtime associated with staking or in the ditch grade checking, and also increases site safety by eliminating the need for a person to be present near the operating excavator.

Applications

- Excavating basements, foundations and footers
- Flat bottom and simple slope trenching
- Flat and simple slope grading and embankments
- Profile excavation and canals or batters

Inserted from <http://www.trimble.com/gcs600exc.shtml>

A.3 Trimble - Trimble SPS710 and SPS610 Robotic Total Stations

Trimble SPS710 and SPS610 Robotic Total Stations

Trimble Home > Construction Home > Trimble SPS710 and SPS610 Robotic Total Stations

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- Construction Fleet Management Services
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Trimble SPS710 and SPS610 Robotic Total Stations

The Trimble® SPS710 and SPS610 Robotic Total Stations help contractors perform layout tasks significantly more efficiently than with conventional mechanical systems for residential and building construction. Designed specifically for concrete and general construction contractors, the Trimble SPS710 and SPS610 total stations offer construction-specific functionality and one-person operation so you can perform all jobsite layout and measurement tasks for maximum flexibility and cost savings.

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- Layout of excavation lines
- Layout of concrete forms and anchor
- As-built checks
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- Light topographical measurements

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- Display clearly and eliminate errors
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APPENDIX D
Cultural Impact Assessment

DRAFT -- Cultural Impact Assessment for the Proposed Mokuhinia Ecosystem Restoration Project in Waineʻe Ahupuaʻa, Lāhainā District, Maui Island

TMK: (2) 4-6-007:001; 002; 036 - 038

Prepared for

CH2M Hill, Inc

US Army Corps of Engineers

Prepared by

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and

Hallett H. Hammatt, Ph.D.

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The Friends of Moku‘ula shared the following chant written by Akoni Akana in 2006 granting permission to Moku‘ula:

Eia no ho‘i o ka wai ola e
E inu i ka wai, ka wai awa‘awa
No ka wahine mai ka waihau e
E komo mai ‘oukou I loko nei
Me ka welina o ke aloha,
E ola e!

Management Summary

Reference	A Cultural Impact Assessment for the Mokuhinia Ecosystem Restoration Cultural Impact Assessment, Waine‘e Ahupua‘a, Lāhainā District, Maui Island, TMK (2) 4-6-007:001;002; 036 - 038
Date	April 2013 (DRAFT)
Project Number (s)	Cultural Surveys Hawai‘i (CSH) Job Code: WAINEE 3 U.S. Army Corps of Engineers (USACE) Contract No. W9128A-08-D-0007
Project Location	Lower Waine‘e Ahupua‘a, Lāhainā District, Maui Island. TMK: (2) 4-6-007:001;002; 036-038. The former inland pond of Mokuhinia and island of Moku‘ula currently lies beneath fill within Malu‘ulu o Lele Park, a Maui County park site. The project area is bounded by Shaw Street to the south, Front Street to the west, an open drainage ditch to the north and private property occupied by the Lāhainā Hongwanji Mission and the Waine‘e Protestant Church (Waiola Church) to the east.
Land Jurisdiction	(2)4-6-007:001 State of Hawaii (assigned to the County of Maui by Executive Order 3430 in October 1989) (2)4-6-007:002 State of Hawaii (assigned to the County of Maui by Executive Order 52 in April 1918) (2)4-6-007:036 State of Hawaii (assigned to the County of Maui by Executive Order 02889 in February 1978) (2)4-6-007:037 Salvation Army (2)4-6-007:038 Salvation Army
Agencies	U.S. Army Corps of Engineers (USACE) – Federal Sponsor Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD) – State Reviewing Agency Department of Health, Clean Water Branch – State Reviewing Agency Department of Planning, County of Maui - Non-Federal Sponsor Office of Environmental Quality Control – State Reviewing Agency

Project Description	At the request of the County of Maui, the USACE is conducting a feasibility study for the Mokuhinia Ecosystem Restoration Project, which would involve restoration of wetlands associated with Loko o Mokuhinia, one component of a larger effort by the County of Maui to preserve and restore the overall site. Historically, Loko o Mokuhinia was a 17-acre wetland, but was filled in the early 20th century and turned into a County park. Given the extent of development that now surrounds Malu‘ulu o Lele Park, the project can be more accurately described as a partial restoration of the wetland, which would be accomplished by excavating fill material to intercept the groundwater in the area where Loko o Mokuhinia was historically located. The project would also include the restoration of surface flow from Loko o Mokuhinia to the ocean, via an existing drainage ditch. The restored wetland would create aquatic habitat for native and endangered water birds and would contribute to the subsequent restoration of cultural and historical resources (such as the restoration of Moku‘ula). Based on previous consultations with the community, a 10-meter buffer has been established around Moku‘ula to ensure that the island and associated fishponds are not disturbed by the Mokuhinia Ecosystem Restoration Project.
Proposed Project Acreage	Approximately 8.5 acres
Region of Influence (ROI)	As the surrounding area has been built out as a result of the development of Lāhainā Town, the Area of Direct Effect, where lands will be directly impacted by ground altering activity for this project extends no further than area limited to the boundary of Malu‘ulu o Lele Park and is considered the “project area”. For the purpose of the CIA, a broader region of influence (ROI), also determined as the overall Area of Potential Effect (APE) is referred to as the “study area”, is defined as the chiefly area known as Kalua‘ehu and lands of the modern day Lāhainā Historic District
Regulatory Context	As the proposed project is being carried out by a federal agency on lands owned by the State of Hawaii (and assigned to the County of Maui), this undertaking is subject to compliance with the National Environmental Policy Act of 1969, as amended (NEPA), Hawaii Revised Statutes (HRS) Chapter 343 (the State of Hawaii’s environmental review law), as well as both federal and state hHistoric preservation regulations. With regard to federal regulations, this undertaking is subject to historic preservation review under Section 106 of the National Historic Preservation Act (NHPA). In the event that human burials of Native Hawaiian descent are encountered, all consultation and subsequent work would be conducted under the State of Hawai‘i Administrative Rules (HAR) Title 13 §13-300.
Fieldwork Effort	Community consultation and interviews were conducted by Ms. Colleen Medeiros B.S. and Ms. Anna Cordova between November 2012 and March 2013. Ethnographic interviews conducted by the Friends of Moku‘ula (FOM) in 2010 were also utilized.

Summary of Findings	Background research as well as community consultation identified both past and current traditional cultural practices which included agricultural pursuits, gathering for terrestrial and marine plant resources, and other aquatic resources in Lāhainā and the area immediately surrounding the proposed project area. Burials practices, both traditional and historic, occurred within the proposed project area, as well as, within a one-mile radius. Central to these practices are the religious and ceremonial aspects which guide them. Christian religious practices were a central part of the the lives of ali‘i in the historic era and in Lāhainā, the Waine‘e Church (modern day Waiola Church) was the house of worship. Specific to the proposed Mokuhinia Ecosystem Restoration Project, and perhaps most important finding of this study is the recognition of Loko o Mokuhinia as a wahi la‘a, highly sacred place, and the continued worship and veneration of the the mo‘o goddess Kihawahine (Section 6 Traditional Cultural Practices). Though there appears to be overall support for the restoration, there are concerns and reservations about the work that would occur at this sacred site. Recommendations for the types of plants to be used, cultural and historic training, archaeological and cultural monitoring, and continued community consultation were made (Section 7 Summary and Recommendations).

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Section 1 Introduction

1.1 Project Background

On behalf of the U.S. Army Corps of Engineers (USACE), and CH2MHill, Cultural Surveys Hawaii, Inc. (CSH) has compiled this Cultural Impact Assessment (CIA) for the proposed Mokuhinia Ecosystem Restoration Project (project) in the town of Lahaina on the Island of Maui. The purpose of this CIA is to provide information pertinent to the assessment of the project's impacts to cultural practices and resources, based on background research and community consultation. This report summarizes the results of the background research, previous archaeological studies, and community consultation efforts, and provides recommendations based on these findings.

The area of direct effect is the area that will be directly impacted by the restoration activities and will hereafter be referred to as the "project area". The project area includes Malu‘ulu o Lele Park, a County of Maui recreational park, and the Salvation Army Lahaina Outpost. The project area is bounded on the west-southwest by Front Street, on the north by the Alano Club of Lahaina and Malu'ulu o Lele Cultural Center. Fronting these buildings on their southern side is an open drainage ditch constructed of cut basalt and concrete. The project area is bounded on the south-southeast by Shaw Street and on the east by the Waiola Church and Waine‘e Cemetery and Lahaina Hongwanji Mission.

The "project area" is located centrally within the CIA "study area" which is a broader region generally defined by traditional *ahupua‘a* boundaries. Research on the scale of the broader study area ensures that potential impacts to traditional cultural practices which may not occur within the boundaries of the project area, but may nonetheless be affected by the proposed project, are taken into consideration (e.g., where a proposed action that may not physically alter gathering practices but may affect access to gathering areas). But unlike the typical *ahupua‘a*, which extends continuously from the mountains to the sea, the *ahupua'a* of Lāhainā are small and discontinuous; *lele* (meaning to jump) *ahupua‘a* are located both *mauka* and *makai*, as well as in the *kula* lands (meant to represent the *ahupua'a* of Lāhainā and how they "jump" from coastal region to mountain regions).

Historically, Loko o Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the coast of West Maui. Mokuhinia was known as the home of Kihawahine, the *mo‘o* (lizard) goddess and an ancestor of Maui's royal family. From 1837 to 1845, the island of Moku`ula, located within Mokuhinia, was the royal residence of King Kamehameha III when Lahaina served as the capital of the Hawaiian Kingdom. In 1845, the capital of the Hawaiian Kingdom was relocated to Honolulu, and Loko o Mokuhinia and Moku`ula began to decrease in prominence. In the early 20th century, a public project was implemented to fill Loko o Mokuhinia, and in 1918, Executive Order 52 established the site as Malu Ulu o Lele Park, which is managed by the County of Maui. Loko o Mokuhinia and Moku`ula currently lie approximately two to six feet under the ground surface of the park.

The objective of the Mokuhinia Ecosystem Restoration Project is to re-establish the wetland of Loko o Mokuhinia, one component of a larger effort by the County of Maui to preserve and

restore the overall site. Given the extent of development that now surrounds Malu‘ulu o Lele Park, the project can be more accurately described as a partial restoration of the wetland, which would be accomplished by excavating fill material to intercept the groundwater in the area where Loko o Mokuhinia was historically located. The project would also include the restoration of surface flow from Loko o Mokuhinia to the ocean, via an existing drainage ditch. The restored wetland would create aquatic habitat for native and endangered water birds and would contribute to the subsequent restoration of cultural and historical resources (such as the restoration of Moku`ula). Based on previous consultations with the community, a 10-meter buffer has been established around Moku‘ula to ensure that the island and associated fishponds are not disturbed by the Mokuhinia Ecosystem Restoration Project.

With regards to the study area for this CIA, one could not attain a comprehensive picture of the traditional and cultural practices related to Mokuhinia and Moku‘ula by looking at the coastal Waine‘e and Waiokama *ahupua‘a* alone, the immediate *ahupua’a* that the majority of the project area falls within. Because the project area was a chiefly area, with the Kamehameha III Royal Complex located there, it was also recognized as a social and political center. To our knowledge the extent of the chiefly area spanned from Pāhumanamana Stream (present location of Dickenson Street) to Kaua‘ula Stream, and was known as Kalua‘ehu. For this CIA study, research was focused on the coastal portion of Kalua‘ehu and include lands of the modern day Lahaina Historic District and thus make up the CIA “study area” (Figure 1, Figure 2, and Figure 3).

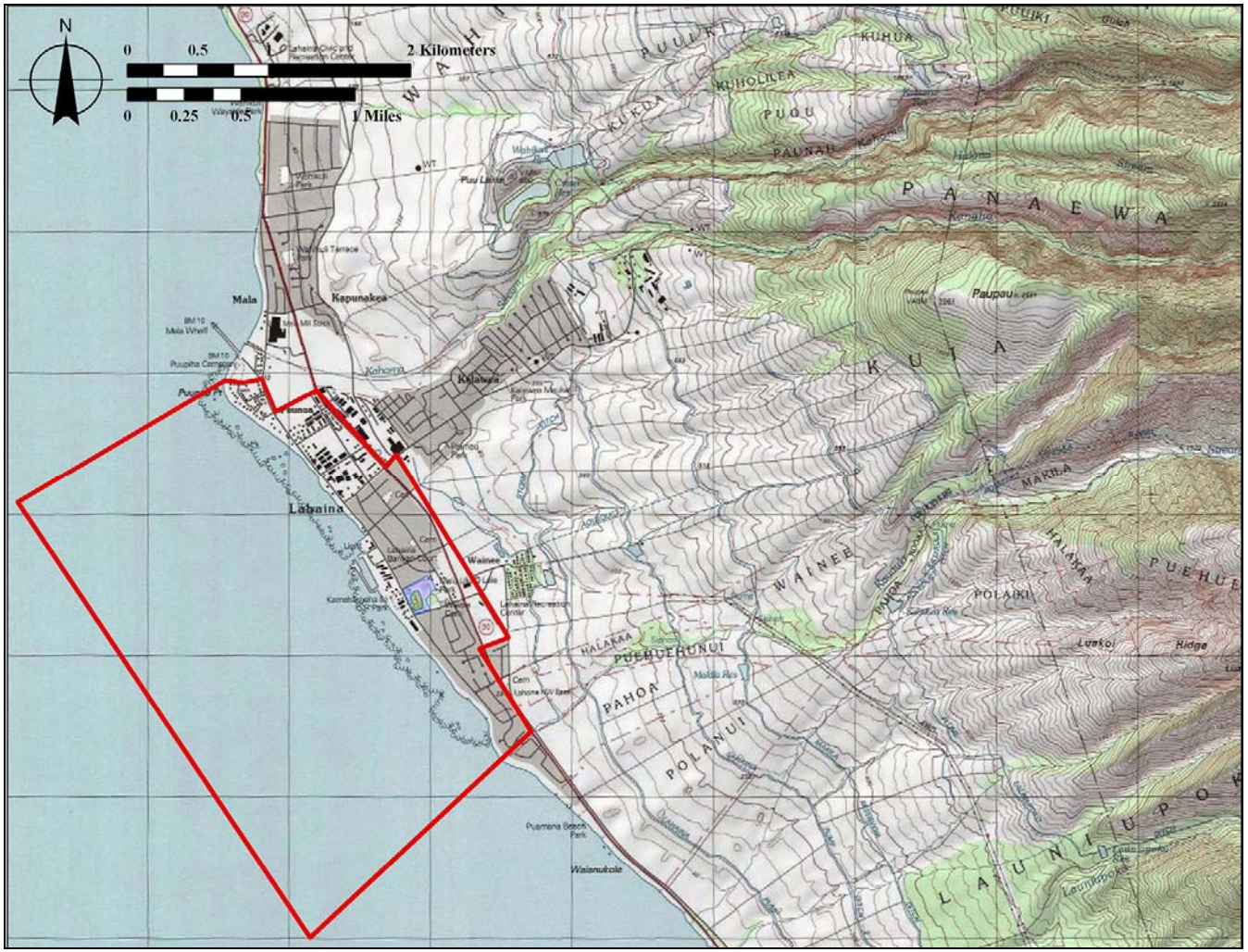


Figure 1. A portion of the USGS 7.5 minute series topographic map, Lāhainā Quadrangle (1992), showing the CIA study area; Lahaina Historic District boundaries in red, and Mokuhinia Ecosystem Restoration Project area in purple.

Figure 2. TMK map showing project area (pond in purple, restoration boundary in orange); Moku‘ula Island (green) and Friends of Moku‘ula proposed parking and facilities site (brown) are not part of the proposed project area.

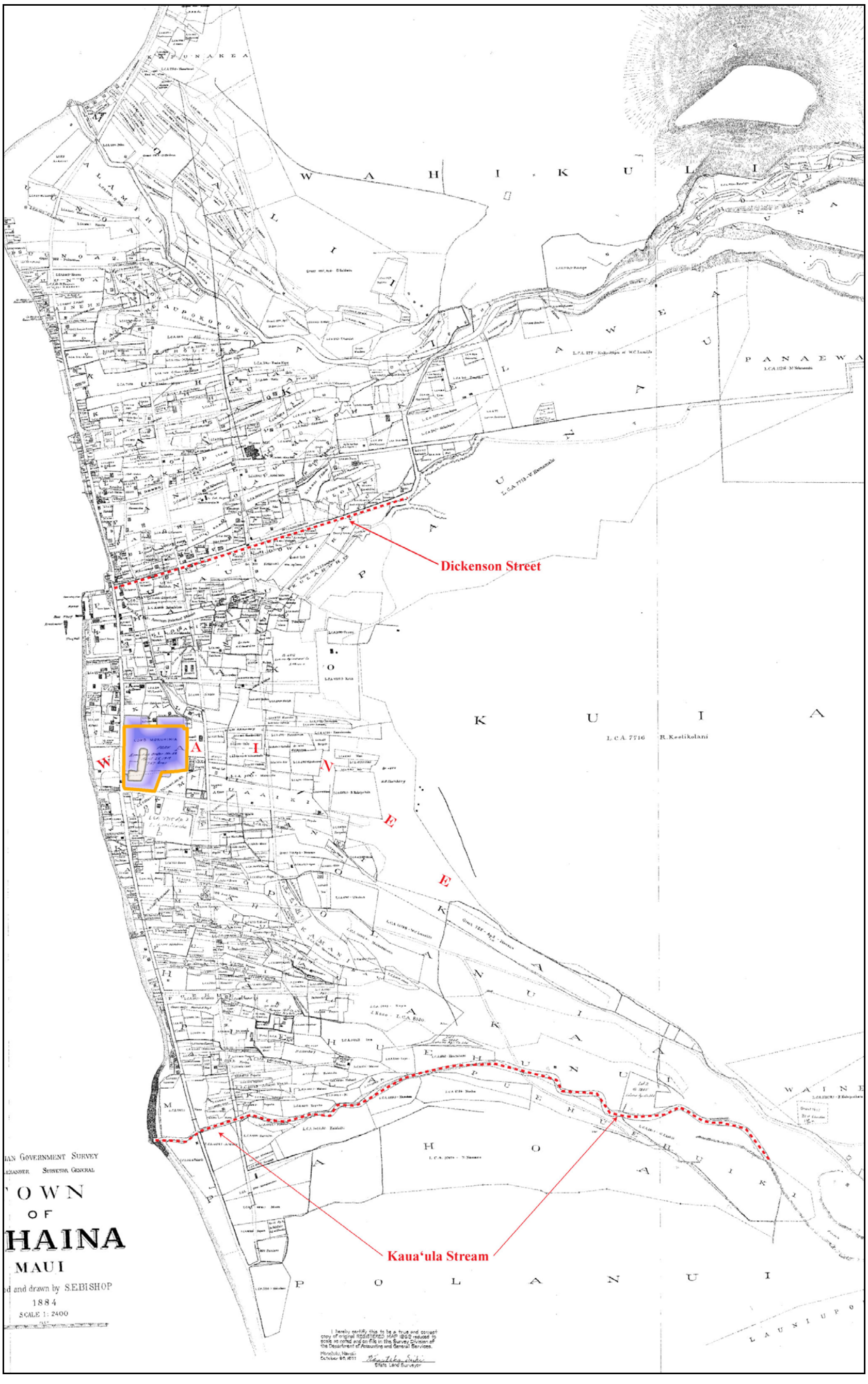


Figure 3. Bishop Map (1884) Showing the historic array of Lahaina *ahupua'a* in relation to the Mokuhinia Pond (purple), restoration project area (orange), and the boundaries of the chiefly area known as Kalua‘ehu (in red).

1.2 Environmental Setting

1.2.1 Natural Environment

The project area is located along the Lāhainā shoreline at an elevation that rises slightly above sea level to approximately 3 to 6 feet above mean sea level (AMSL). The primary landform of the area is an alluvial plain developed from eroded sediments deposited by Kanaha, Kahoma, Waine‘e and Waiokama Streams. These streams, prior to diversion for plantation use, once traveled through the valleys of each *ahupua‘a*, fed by rains at points high in the West Maui Mountains.

In general, the soils of the intermediate elevations surrounding Lāhainā are of the Waiakoa-Keahua-Molokai association. The soils within the project area are classified as soils of the Ewa Series (Figure 4) and are defined as well-drained soils with a moderately fine textured subsoil that, occur on the “low uplands”. More specifically, the soil units specific to the project area are classified as Ewa Silty Clay Loam (EaA), with a substratum of dark reddish-brown silty clay loam, a soil type that is noted for its suitability for sugar cane (Foote et al. 1972:30, 136, 144). These soils at the time of the USDA soil survey were commonly used for sugar cane, pineapple, and pasture.

Rainfall along the leeward coastline of Lāhainā averages 13 inches annually, a fraction of the 389 inches per year that occurs at the Pu‘u Kukui, the highest point of the West Maui Mountains located only 6 miles away (Stearns and MacDonald 1942:32). The proposed project area receives an average of 13 inches of rainfall per year, due to the “rain shadow” effect caused by the West Maui Mountains (Giambelluca et al. 1986:15-16). Temperatures range from an approximate high of 90ºF to an approximate low of 60ºF, with the greatest variations occurring between day and night rather than winter and summer.

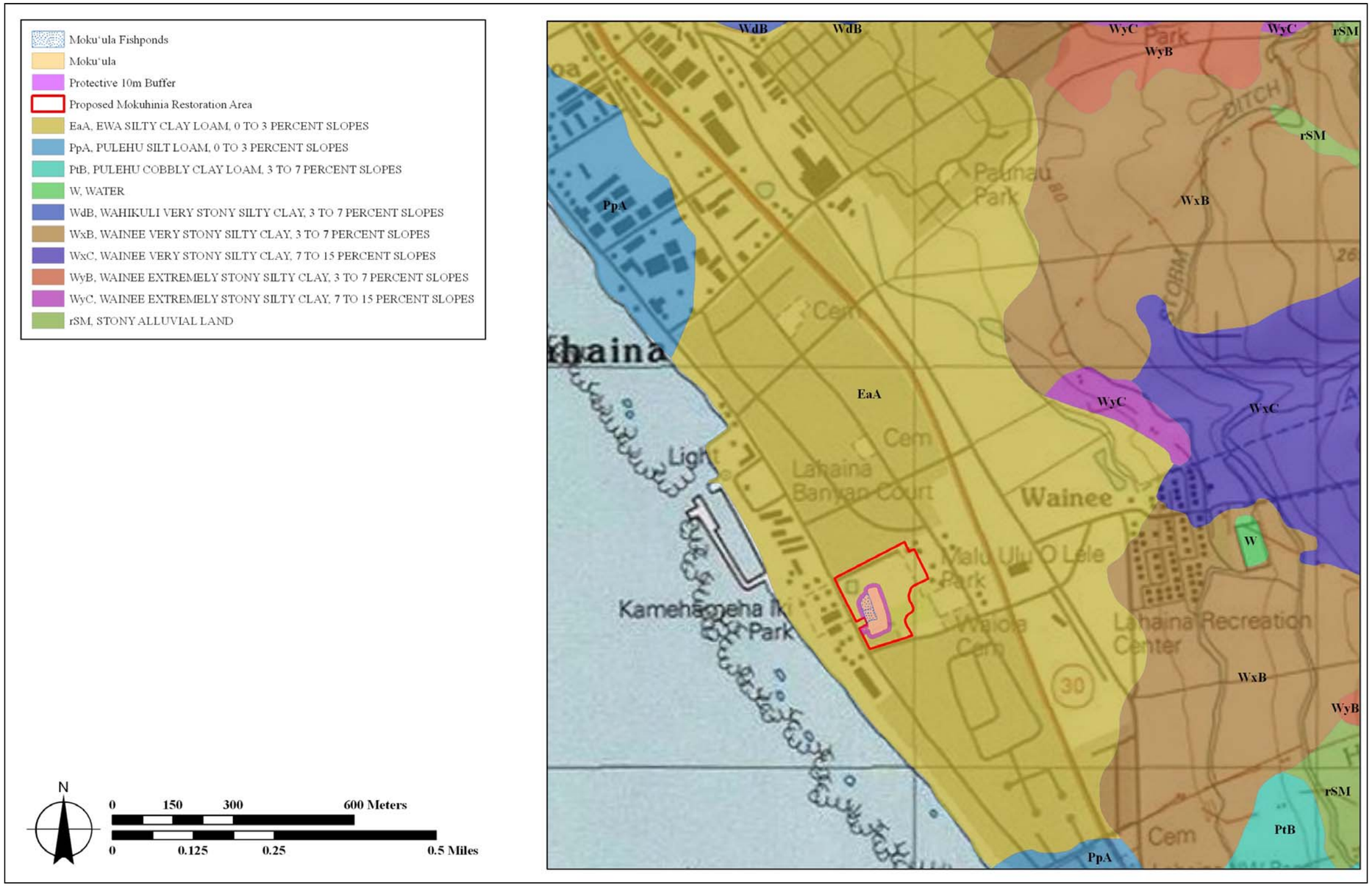


Figure 4. A portion of the USGS 7.5 minute series topographic map, Lāhainā Quadrangle (1992) , showing project area relative to the surrounding local soil series (U.S. Department of Agriculture 2001)

Pollen analysis from soil cores collected during previous archaeological investigations within Malu‘ulu o Lele Park indicates that prior to Polynesian arrival, the paleo-environment of the area surrounding Loko o Mokuhinia was dominated by *loulu* palms (*Pritchardia hillebrandii*) (P. C. Klieger 1998:103). Following Polynesian arrival, there was an apparent decrease in the occurrence of *loulu* pollen and an introduction of native Hawaiian heritage crops, or plants that were brought during Polynesian migration to the Hawaiian Archipelago as a part of the traditional diet, such as *niu* (*Cocos nucifera*) and *kalo* (*Colocasia esculenta*) (P. C. Klieger 1998:103). The current vegetation of the project area, however, consists of a number of recent introductions of ground cover species. The park has been planted in Bermuda grass (*Cynodon dactylon*), with peripheral vegetation consisting of *koa haole* (*Leucaena leucocephala*), and *hau* (*Hibiscus tiliaceus*) interspersed with large breadfruit trees (*Artocarpus altilis*) and mango trees (*Mangifera indica*) to the north, and *kiawe* trees (*Prosopis pallida*) toward Shaw Street. Small stands of Hawaiian shore grass (‘*aki* ‘*aki* grass) (*Sporobolus virginicus*) occur throughout.

1.2.2 Built Environment

The built environment of the project area consists of an approximately 7-acre county park that was developed to include a baseball field, four tennis courts, two rest rooms, and two parking lots (Figure 5). The County of Maui operates a wastewater pump station on the western edge of the park, which is not included as part of the project area. Two main roadways in Lāhainā town, Front Street and Shaw Street, intersect at a point just east of the present-day municipal park. The Salvation Army Lahaina Outpost and a commercial parking lot are located between the project area and Shaw Street to the southwest.

Former *konohiki* lands, now built out as church properties, form the northern boundary of the project area. The two churches that are located along the northern boundary of the project area, include the Lahaina Hongwanji Mission, which also operates as a children’s daycare facility, and the historic Waiola Congregational Church, with its associated cemetery that serves as the final resting place for prominent figures, both *ali‘i* and missionary, of the Hawaiian Kingdom. Residential house lots are located at the intersection of Waine‘e and Shaw Streets, southeast of the present project area.

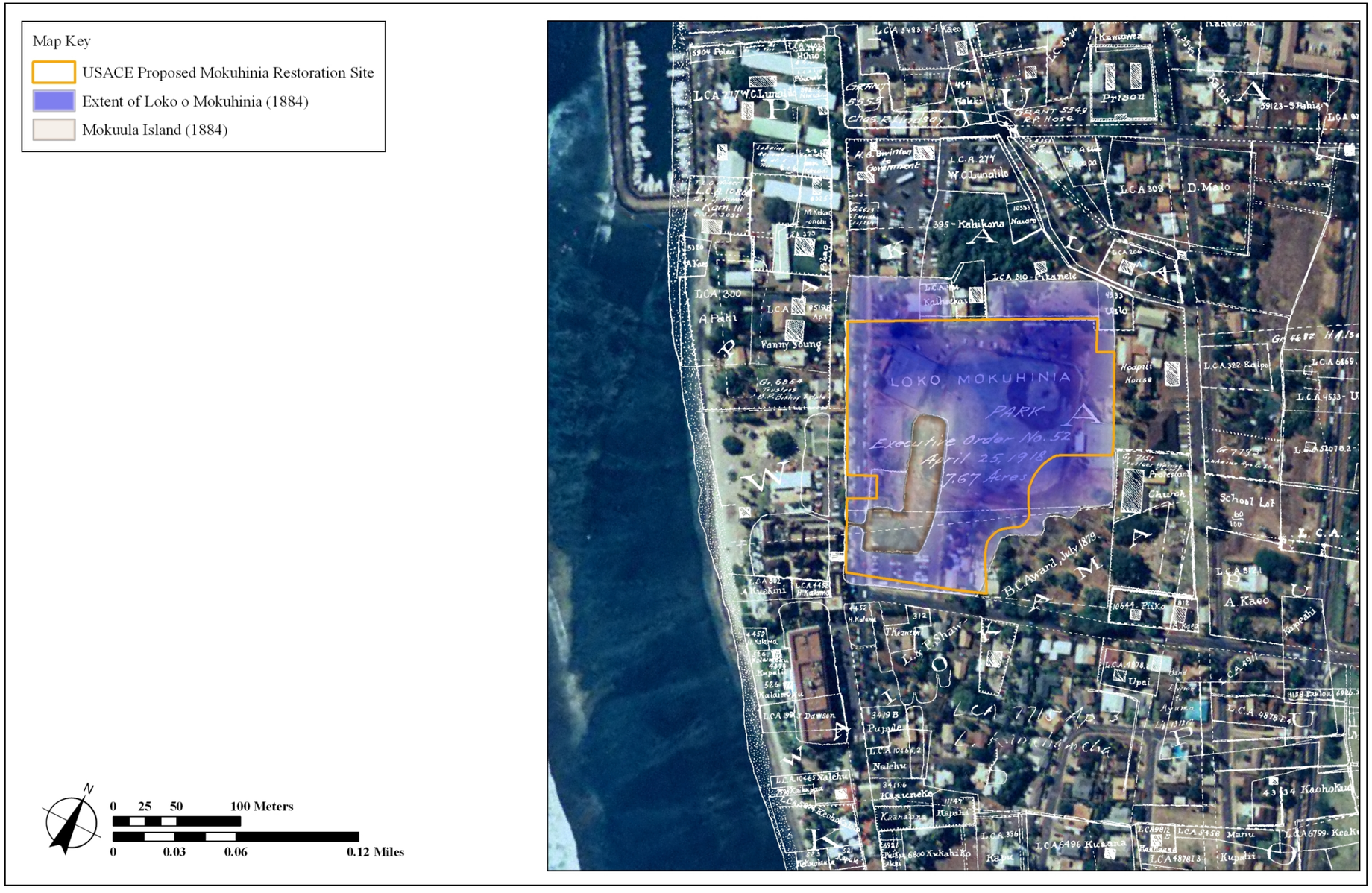


Figure 5. Orthorectified shoreline photo showing the current built environment surrounding the project area (National Oceanic and Atmospheric Administration 2002a, b) with the S.E. Bishop 1884 map as an overlay to show the built environment during the historic era.

Section 2 Methods

2.1 Document Review and Research

Background research was conducted to obtain information relative to the following cultural and historic resources, practices, and beliefs: religious and ceremonial knowledge and practices; traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; *wahi pana* (storied places) and associated *mo‘olelo* (stories, oral traditions).

Historical documents, photographs, maps and existing archaeological information pertaining to the sites in and near the study area were researched at venues including the State Historic Preservation Division of the Department of Land and Natural Resources, the Survey Office of the Department of Accounting and General Services, the CSH library and other archival resources such as the Bailey House Museum and other private collections. Information on Land Commission Awards (LCAs) was accessed using a combination of historic maps, the Waihona ‘Aina Corporation’s Māhele Data Base (2002) and the Office of Hawaiian Affairs Papakilo Database (2011). Hawaiian language newspaper articles were translated by Auli‘i Mitchell, B.A. and Cori-Ann Lorenzo, B.A.

In addition to the above, traditional and cultural practices information was utilized from ethnographic interviews conducted by the Friends of Moku‘ula (FOM), as well as community scoping meetings conducted for the project. Consultation methods, which include formal and informal interviews, are further described below.

2.2 Scoping and Community Outreach

Public informational meetings and community briefings were conducted by the USACE on May 15, 2012 and May 30, 2012 as a part of the overall scoping process, in compliance with the consultation requirements for NEPA, HRS Chapter 343 and NHPA Section 106. In addition to these meetings, Ms. Dawn Chang (with the consultant firm Ku‘iwalu) also conducted small-group meetings with families and organizations with cultural ties to the site (including Nā Kia‘i o Waine‘e (the Waiola Church Cemetery Committee)) as a part of the overall scoping and community outreach process for the project. While these meetings were conducted independently of the formal CIA process, *mana‘o* regarding traditional cultural practices, potential project impacts, and *mo‘olelo* of the area was shared by *kama‘āina*, and *kūpuna* of Lāhainā, and are included in this study with their permission. The following sections detail the community consultation methods, including informal and formal interviews conducted specifically for the current study.

2.2.1 Initial Cultural Impact Assessment Scoping Letter

In order to identify individuals with knowledge of the traditional cultural practices of the APE for the proposed project as it relates to this study, CSH initiated contact with a letter mailed to government agencies, advisory councils, and local community organizations; the list of individuals and organizations that were contacted is discussed further in Section 4. For this study, two follow up calls were made in a good-faith effort to contact all individuals and groups

on the initial mailing list. Letters and project area maps showing the location of the proposed project were mailed out with the following accompanying text:

> Cultural Surveys Hawaii, Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Mokuhinia Ecosystem Restoration Project (project) in the town of Lahaina on the Island of Maui. The CIA is one component of a feasibility study process, which is being conducted by the County of Maui and the United States Army Corps of Engineers (USACE). This letter is seeking input to the CIA, as further described below.
>
> Historically, Loko o Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the coast of West Maui. Mokuhinia was known as the home of Kihawahine, the mo‘o (lizard) goddess and an ancestor of Maui’s royal family. From 1837 to 1845, the island of Moku`ula, located within Mokuhinia, was the royal residence of King Kamehameha III when Lahaina served as the capital of the Hawaiian Kingdom. In 1845, the capital of the Hawaiian Kingdom was relocated to Honolulu, and Loko o Mokuhinia and Moku`ula began to decrease in prominence. In the early 20th century, a public project was implemented to fill Loko o Mokuhinia, and in 1918, Executive Order 52 established the site as Malu Ulu o Lele Park, which is managed by the County of Maui. Loko o Mokuhinia and Moku`ula currently lie approximately two to six feet under the ground surface of the park.
>
> The USACE objective of the Mokuhinia Ecosystem Restoration Project is to re-establish the wetland of Loko o Mokuhinia, one component of a larger effort by the County of Maui to preserve and restore the overall site. Because the original footprint of Mokuhinia is unknown and limited by the boundaries of the County Park, the project can be more accurately described as a partial restoration of the wetland and would be accomplished by excavating fill material and restoring water to the area where Loko o Mokuhinia was historically located. This in turn would create aquatic habitat for native and endangered water birds in the area. The restoration of Moku`ula is not part of the USACE project. Based on consultations with the community, a 10-meter buffer has been established to ensure that the island of Moku‘ula and associated fishponds are not disturbed by the Mokuhinia restoration project.
>
> The area of direct effect is the area that will be directly impacted by Mokuhinia restoration activities and will hereafter be referred to as the “project area”. The project area is defined by the boundary of the Malu Ulu o Lele Park, a County of Maui recreational park. The park is bounded on the south-southwest by Front Street, on the north by the Alano Club of Lahaina and Malu Ulu o Lele Cultural Center. Fronting these buildings on their southern side is an open drainage ditch/canal constructed of cut basalt and concrete. The project area is bounded on the south-southeast by Shaw Street and on the east by the Waiola Church and Waine‘e Cemetery.
>
> The “project area” is located centrally within the CIA “study area” which is a broader region generally defined by traditional ahupua‘a boundaries. Research on the scale of the broader study area ensures that potential impacts to traditional cultural practices which may not occur within the boundaries of the “project area”, but may nonetheless be affected by the proposed project, are taken into

consideration (e.g. where a proposed action that may not physically alter gathering practices but may affect access to gathering areas). But unlike the typical ahupua‘a which extends continuously from the mountains to the sea, the ahupua’a of Lahaina are small and discontinuous with lele, meaning to jump, ahupua‘a located both mauka and makai and often in the kula lands as well (meant to represent the ahupua’a of Lahaina and how they “jump” from coastal region to mountain regions). With regards to the study area for this CIA, one could not attain a comprehensive picture of the traditional and cultural practices related to Mokuhinia and Moku‘ula by looking at the coastal Waine‘e Ahupua‘a alone, the immediate ahupua’a that the majority of the project area falls within. Because the project area was a chiefly area, with the Kamehameha III Royal Complex located there, it was also recognized as a social and political center. To our knowledge the extent of the chiefly area spanned from Pāhumanamana Stream (present location of Dickenson Street) to Kaua‘ula Stream, and was known as Kalua‘ehu. For this CIA study, research will be focused on the coastal portion of Kalua‘ehu and include lands of the modern day Lahaina Historic District and thus make up the CIA “study area”.

We are seeking your kōkua or help and guidance regarding the following aspects of our study:

General history and present and past land use of the project area.

Knowledge of cultural resources which may be impacted by the Mokuhinia Ecosystem Restoration Project - for example, traditional plant gathering sites, historic sites, archaeological sites, and burials.

Knowledge of traditional gathering practices in the area – both past and ongoing.

Cultural associations of the project area, such as legends and traditional uses.

Referrals of kūpuna or elders who might be willing to share their cultural knowledge of the project area and the surrounding ahupua‘a lands.

Any other cultural concerns the community might have related to Hawaiian cultural practices within Lahaina and/or in the vicinity of the proposed Mokuhinia Ecosystem Restoration Project area.

I invite you to contact me, Colleen Medeiros, at 1-808-242-9882. You may also contact me by e-mail at *cmedeiros@culturalsurveys.com* if you have any information you would like to share.

Mahalo,

Colleen Medeiros, Historic Research

Cultural Surveys Hawai‘i, Inc.

2.2.2 Group Consultation, Informal Interviews, and Formal Interviews

Interviews and consultation specific to the current study were conducted either in a group setting, informally via telephone, or as a part of a formal sit-down interview between the researchers and the participating individual. Handwritten notes of all consultations and interviews were made by the researchers, and with the permission of the participants, formal

interviews were recorded using either a Sony ICD-SX25 Digital Voice Recorder or Olympus VN-4100PC.

Transcriptions of all recorded interviews conducted by CSH staff, as well as interviews conducted by FOM were completed by Sarah Wilkinson, B.A., Momi Wheeler, B.A., and Kelene Pfennig, B.A using the Sony Digital Voice Editor Software. Following transcription, the interview transcript was returned to the interviewee for correction, approval, and release. Segments of interviews in which the interviewee chose to withdraw have been indicated by isolated ellipses (…) while a double dash (--) indicates either a pause in speech or unfinished thought. Authorized transcriptions from formal interviews and associated release forms are included in Appendix C.

Section 3 Background Research

The division of Maui's lands into political districts occurred during the rule of Kaka‘alaneo, under the direction of his *kahuna*, Kalaiha‘ōhi‘a (M. W. Beckwith 1970:383). This division resulted in twelve districts or *moku* during traditional times: Kula, Honua‘ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko‘olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Ka‘anapali, and Lāhainā. Moku‘ula is located on shores of Mauna o E‘eka, in the *moku* of Lāhainā, *kalana* of Lāhainā, Waine‘e Ahupua‘a. The workings of traditional Hawaiian land tenure are often reflective of the socio-political intricacies of particular places that were favored among the *ali‘i* (ruling class), and the area surrounding the *kalana* Lāhainā is illustrative of that fact.

An understanding of the land tenure distinction between the Hawaiian *moku* and *kalana* is implicitly necessary in order to grasp the cultural and political context of the project area within Lāhainā. The *moku o loko*, or *moku* as it is most commonly called, literally means "to cut across, divide, separate" (Lucas 1995:77). When used in terms of traditional land tenure, a *moku* is most readily akin to a political district, an overall land division that can contain smaller divisions of land such as *‘okana, kalana, ahupua‘a, ‘ili,* and *mo‘o*. Lāhainā Moku, located on the south facing flanks of Mauna o E‘eka, or the West Maui Mountains as it is commonly called today, consists of multiple *ahupua‘a* that extend from Launiupoko to Makaiwa in earlier maps (Figure 6) and Ukumehame to Hanakao‘o in later maps (Figure 7).

The term *kalana* literally translates to mean a thing loosened or released – "to loosen" (*kala*) with the nominal suffix of "*na*" added at the end (Handy et al. 1991:47). In reference to land tenure, *kalana* is a term that is sometimes interchanged or synonymous with the term *‘okana*, which is a sub-division of land that is smaller than a *moku* (Alexander 1890; Lucas 1995:47). On Maui Island, W.D. Alexander (1890) observes that there are five *‘okana* or sub-districts within Hāna Moku, while Lāhainā is termed a *kalana*. Handy and others (1991:47) speculate that the land divisions that were designated as *kalana* were politically released from the *‘okana* or even *moku* that they had been a part of during the original division of the islands. These land divisions were then given as separate domains to *ali‘i* of first rank, remaining as autonomous heritages. Curtis J. Lyons, a surveyor during the Māhele, specifically states that the *kalana* of Lāhainā belonged to no *moku* (in Handy et al. 1991:47).

The *kalana* of Lāhainā, as a distinct land division from the *moku* of Lāhainā, has been known by three other names in times past. The oldest name was said to have been Na-hono-a-Pi‘ilani, the lands of Pi‘ilani as it was surrounded by other islands (G.H. Hanakauluna in Sterling 1998:37). Lāhainā then becomes known as Lele, a name that has been acknowledged as the ancient name of Lāhainā (Sterling 1998:34, 37) in the story of Kamalalawalu and Halemano in their flight from the O‘ahu Chief Aikanaka in the *Legend of Halemano* (Fornander 1919a:238) and in the *Legend of Pupukea* as home to Maui Chief Kamalalawalu (referred to frequently as Kama), a contemporary of Kakuhihewa on O‘ahu (Fornander 1919b:436). A third name for Lāhainā is mentioned in the story *Relating to Kekaa* (S. Kaha in Fornander 1919d:540-544)where Keka‘a is noted as the capital of Maui when Kaalaneo was reigning over West Maui. Fornander speculates that the name of Keka‘a predates that of Lele as the story predates the introduction of breadfruit, the primary food source that is referred to when speaking of the area as Lele (Fornander 1919d:540, Footnote 542; H.L. Sheldon in Sterling 1998:35).

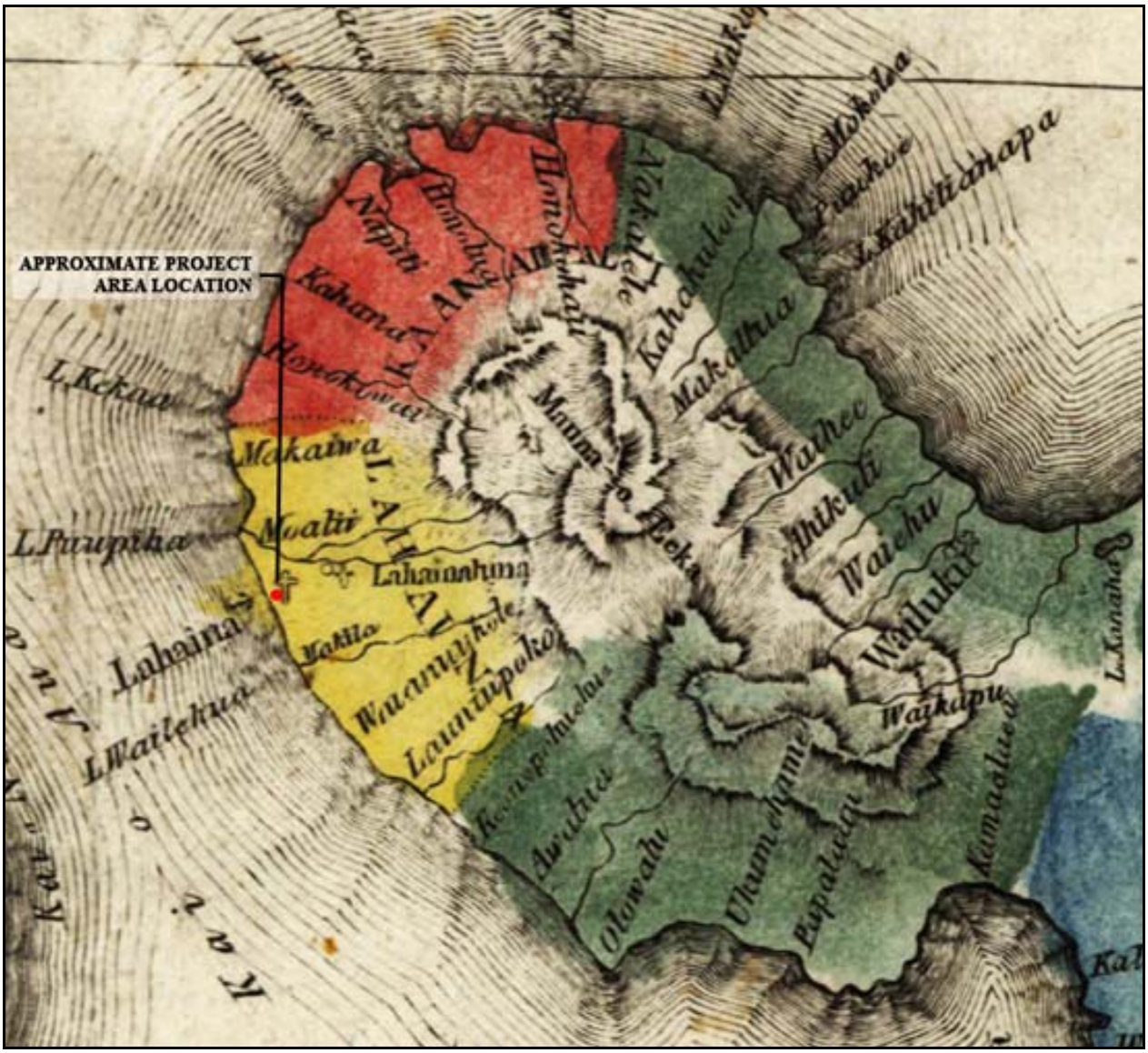


Figure 6. A portion of the 1837 S.P. Kalama map illustrating the *moku* of West Maui as it was known to surveyors at that time (Ka‘anapali Moku [red], Wailuku Moku [green], Lāhainā Moku [yellow])

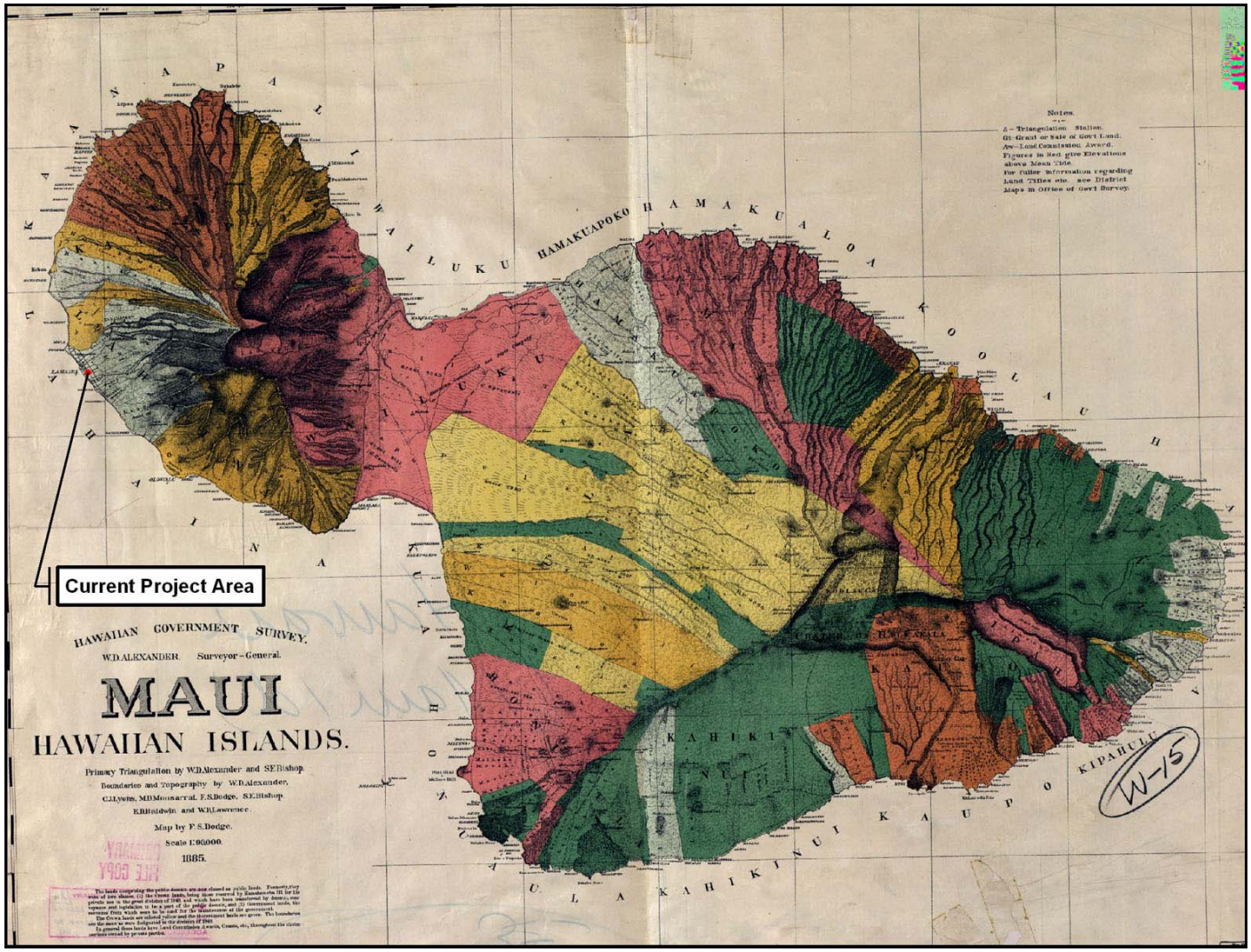
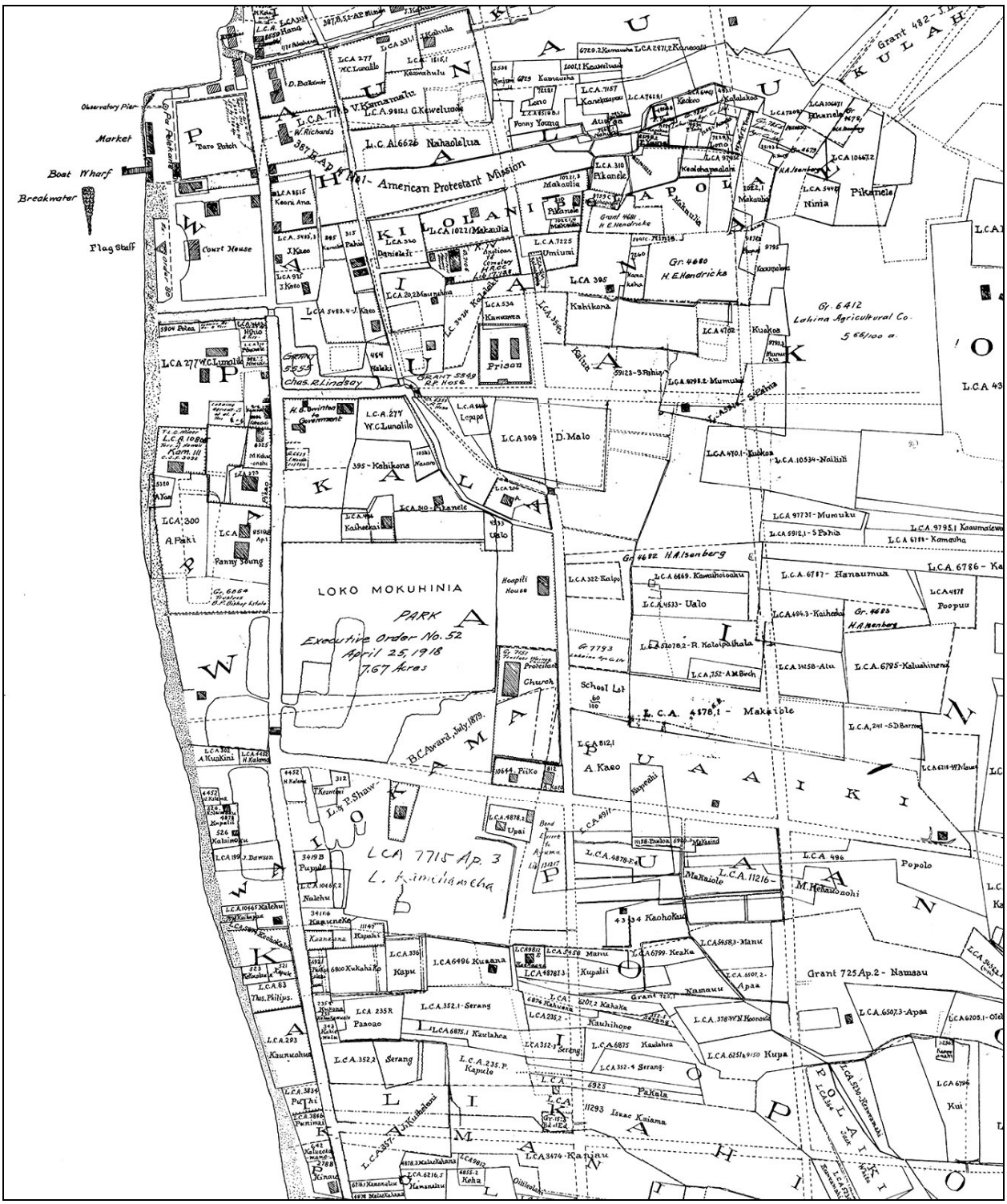


Figure 7. A portion of the F.S. Dodge map (1885) showing the *kalana* of Lāhainā and the approximate location of the current project area (in red) in relation to the traditional *moku* of Lāhainā (crown lands in yellow).


Observatory Pier
Market
Boat Wharf
Breakwater
Flag Staff
Court House
American Protestant Mission
Prison
LOKO MOKUHINIA
PARK
Executive Order No. 52
April 25, 1918
7.67 Acres
LCA 7715 Ap. 3
L. Kaimilamelia
Grant 725 Ap. 2 - Namaau
Grant 482 - J. Kulah
Gr. 6412
Lahina Agricultural Co.
5.68/100 a.
Gr. 4680
H. E. Hendricks
Gr. 4682 H.A. Isenberg
Chas. R. Lindsay
R.P. Rose
B.C. Award, July 1879
School Lot
Church
Pikanele
Makaulia
Kahikona
Umiumi
Kaiheokau
Ualo
Hoapili House
Popolo
Kaohokau
Kupa
Paaoao
Serang
Kaulahea
Kapu
Kukahi
Kupalii
Manu
Keaka
Kaiahea
Kaiama
Kaiama
Kaiama

Flanked by excellent fishing grounds the *kalana* of Lāhainā served as the primary seat of the *ali‘i* when residing in West Maui (Handy et al. 1991) and later as the center of government for the Kingdom of Hawai‘i. The *ahupua‘a* that comprise the *kalana* of Lāhainā contained a dense collection of *kuleana* (smaller, fee-simple land divisions awarded to families during the Great Māhele; see also Figure 8), and the lands that immediately surrounded Loko o Mokuhinia were traditionally reserved for the *ali‘i* and those in service to the *ali‘i* (P. C. Klieger 1998:64-65). The coastal portion of the largest *ahupua‘a* within the *kalana* Lāhainā, commonly referred to as Lower Waine‘e, is home to Loko o Mokuhinia and Moku‘ula the preferred West Maui residence of the high chiefs of Maui.

3.1 Traditional and Historical Background

In the preface of *Place Names of Hawaii* (Pukui et al. 1974:x), Samuel Elbert states that:

> Hawaiians named taro patches, rocks and trees that represented deities and ancestors, sites of houses and heiau, canoe landings, fishing stations in the sea, resting places in the forests, and the tiniest spots where miraculous or interesting events are believed to have taken place.
>
> Place names are far from static … names are constantly being given to new houses and buildings, land holdings, airstrips, streets, and towns and old names are replaced by new ones … it is all the more essential, then to record the names and the lore associated with them (the ancient names) now.

Inherent in the statements of Elbert is the knowledge that the oldest place names held meaning and told the story of an area prior to European contact. A study of the place name meanings for the study area may yield some insight into the stories, resources, patterns of life and land use within Honua‘ula Moku. The place names listed below are for land areas, *loko* (ponds), land divisions, markers, and other resources identified through research of available historic literary resources such as the Hawaiian Government Survey Map (Bishop 1884), Māhele Records (Office of Hawaiian Affairs 2011); and USGS Topographic 7-Minute Series, Lāhainā Quadrangle (1992).

Alio (*ahupua‘a*)	No available definition; Noted only as a land section in Lāhainā, Maui (U.S. Coast and Geodetic Survey 1903:401)
Halaka‘a (*ahupua‘a*)	*Lit.,* “rolling pandanus” (Pukui et al. 1974:36)
Haleu, Haliu (*ahupua‘a*)	*Lit.,* “to turn” (U.S. Coast and Geodetic Survey 1903:402)
Ilikahi (*ahupua‘a*)	No available definition.
Kalua o ka Mano	*Lit.,* “the shark pit”; the name of a parcel of land owned by the Lindsey *ohana* (family) on present day Front Street (see also Section 0 below; LCA 642 to Kaluaokamano)
Kamakaluukalo	No available definition; Place name noted in land award to Dawson (Helu 199)
Kamani (*ahupua‘a*)	A large tree (*Calohpyllum inophyllum*) which produced a hard wood that was formerly made into calabashes (Pukui and Elbert 1986:125)

Kapewakua (*ahupua‘a*)	No available definition; Noted only as a land section in Lāhainā, Maui (U.S. Coast and Geodetic Survey:409)
Kaua‘ula Stream	*Lit.,* “the red rain” (Pukui et al. 1974:91)
Kaulalo (*ahupua‘a*)	Possible derivative of the term for “undertow” – *Au kō malalo* (Pukui and Elbert 1986:30)
Kilolani (*ahupua‘a*)	*Lit.,* “sky observing” (Pukui et al. 1974:112)
Ko‘okā (*ahupua‘a*)	*Lit.,* “push strike” (Pukui et al. 1974:50)
Kopili (*ahupua‘a*)	*Lit.,* “white kapa” (U.S. Coast and Geodetic Survey 1903:413)
Kulahuhu (*ahupua‘a*)	No available definition.
Kuloloia	Place name noted in claimant testimony recorded in the Native Register – Helu 4533, Claimant – Ualo located adjacent to and *mauka* of Loko o Mokuhinia (Office of Hawaiian Affairs 2011); name of stream that also fed into MokuhiniaK
Loko Holili	*Holili, lit.,* “rippled surface of the sea, as caused by fish; undulation or vibration of light in the hot sun; to ripple, vibrate, undulate; to close or link the eyes in bright glare” (Pukui and Elbert 1986:206); *Loko* (pond) name noted in land award to Keoni Ana (Helu 8515 Apana 1) (Office of Hawaiian Affairs 2011)
Loko Kaalolo	Name of a star, said to be the tutelary star of Ni‘ihau (Pukui and Elbert 1986:107); *Loko* (pond) name noted in land award to Keoni Ana (Helu 8515 Apana 1) and Fanny Young (Helu 8519B) (Office of Hawaiian Affairs 2011)
Loko o “Kōlea”	Possibly named for the *kōlea*, or Pacific golden plover, a migratory bird species (Pukui and Elbert 1986:162); *Loko* (pond) name noted in land award to Kalaimoku (Helu 526) (Office of Hawaiian Affairs 2011) alternatively noted as Loko o Nalehu in other land awards (see below).
Loko o Mokuhinia	*Loko* (pond) named for the *mo‘o* goddess Kihawahine Mokuhinia Kalama‘ula.
Loko o Nalehu	No available definition; *Loko* (pond) name noted in land award to Kupalii (Helu 4878I); potentially named for Nalehu – Helu 10465 and neighboring land owner to Dawson – Helu 199 (Office of Hawaiian Affairs 2011)
Lua‘ehu (*ahupua‘a*)	*Lit.,* “red-head pit”, a red haired *mo‘o* lived here (Pukui et al. 1974:134)
Makila (*ahupua‘a*)	*Lit.,* “needle” (Pukui et al. 1974:142)
Moku‘ula	*Moku, lit.,* “district, island, islet, section, forest, grove, clump, severed portion, fragment, cut, laceration” (Pukui and Elbert 1986:252) *‘ula, lit.,* “red, scarlet” (Pukui and Elbert 1986:367)
Paeohi (*ahupua‘a*)	No available definition; noted only as a land section in Lāhainā, Maui (U.S. Coast and Geodetic Survey:419)

Pahoa (*ahupua‘a*)	*Lit.,* “short dagger, sharp stone, especially as used for a weapon” (Pukui and Elbert 1986:300), also mentioned by Kamakau as the specific tool used for carving the images of the Kalai-pahoa gods Kane-i-kaulana-‘ula, Kane-mana-ia-pai‘ea, Ka-huila-o-ka-lani, and Kapo (S. Kamakau 1992:179)
Pākalā (*ahupua‘a*)	*Lit.,* “the sun shines” (Pukui et al. 1974:174)
Paunau (*ahupua‘a*)	*Lit.,* “completely chewed up” (Pukui et al. 1974:182)
Polanui (*ahupua‘a*)	*Lit.,* “large Pola” (Pukui et al. 1974:188); “great Pola” (U.S. Coast and Geodetic Survey:420); *pola, lit.,* “flap, as of a loincloth or sarong; platform or high seat between the canoes of a doubly canoe; blossoms and sheath of a banana” (Pukui and Elbert 1986:338)
Polopola (*ahupua‘a*)	*Lit.,* “recovered from sickness; Tahiti Borabora; same as *hē‘ī* the Tahitian banana; flapping; or a star name, paired with the star Melemele” (Pukui and Elbert 1986:338); “flowing robe” (U.S. Coast and Geodetic Survey:420)
Pua‘a (*ahupua‘a*)	*Lit.,* “hog”
Pua‘aiki (*ahupua‘a*)	*Lit.,* “small hog”
Pua‘anui (*ahupua‘a*)	*Lit.,* “large hog”
Puakō (*ahupua‘a* and *loko*)	*Lit.,* “sugar cane blossom” (Pukui et al. 1974:191); Reference to Loko o Puakō noted in land award to Kahikona (Helu 395)
Puakoo (*ahupua‘a*)	No available definition.
Puamana	Same as *ilioha*, horseweeds (Pukui and Elbert 1986:347); Place name noted in claimant testimony recorded in the Native Register – Helu 5874, Claimant – Keohokalole (Office of Hawaiian Affairs 2011)
Pūehuehuiki (*ahupua‘a*)	*Lit.,* “small Pūehuehu”; *Pūehuehu*, *lit.,* “spray scattered” (Pukui et al. 1974:192)
Puehuehunui (*ahupua‘a*)	*Lit.,* “large Pūehuehu”; *Pūehuehu*, *lit.,* “spray scattered” (Pukui et al. 1974:192)
Pū‘ou (*ahupua‘a*)	No available definition; noted only as a land section in Lāhainā, Maui (Pukui et al. 1974:195; U.S. Coast and Geodetic Survey:419)
Pu‘uho‘owali (*ahupua‘a*)	No available definition
Pu‘unau (*ahupua‘a*)	*Lit.,* “hill of nau” (U.S. Coast and Geodetic Survey:422)
‘Uo	Ancient surfing area in Lāhainā (Pukui et al. 1974:215)
Waianae (*ahupua‘a*)	*Lit.,* “mullet water” (Pukui et al. 1974:220)
Waianae‘iki (*ahupua‘a*)	*Lit.,* “little Waianae”
Waiokama (*ahupua‘a*)	*Lit.,* “water of Kama” (U.S. Coast and Geodetic Survey:424)

The place names surrounding Loko o Mokuhinia speak to the influences of both the ocean and freshwater sources, the plentiful terrestrial resources, the knowledge of traditional astronomy, and the veneration of the forms of Kihawahine, all of which are entwined to allow for a possible glimpse of the traditional Hawaiian landscape and worldview. From ‘Uo, the famed surf break of Lāhainā to Pūehuehuiki and Pūehuehunui, which may allude to the spray of the breaking surf, and including Kaulalo and Waianae, these references speak to the importance of the ocean and marine life in this traditionally chiefly area. The fresh and brackish water resources of the inland pond systems that were once a part of the traditional Lāhainā landscape are also called out in such names as Kaua‘ula and Waiokama, while the characteristics of the ponds themselves are noted in the rippling waters of Loko o Holili and a possible favored location of the Kōlea bird at Loko o Kōlea. Terrestrial plants and resources of the area are also acknowledged and noted in such names as Halaka‘a, Kamani, Polapola, Puamana, and possibly Polanui; as well as Pua‘a, Pua‘aiki, and Pua‘anui. A reverence for the heavenly bodies and the importance of the night sky may also be reflected in the place names of the chiefly center such as Pākalā, Kilolani, Kaalalo, and Polapola. Finally, references to the *mo‘o* herself in the naming of Loko o Mokuhinia and the allusion to the *mo‘o* at Lua‘ehu are also found in this chiefly center.

The place names of the area surrounding Loko o Mokuhinia and the characteristics of Lāhainā were venerated in poetic *kanikau* (eulogies) for lost loved ones of Lāhainā. H.G. Haulewahine dedicates the following *kanikau*, which features places of Lāhainā as well as the named natural elements such as the Ma‘a‘a wind and the *paupili* rain, to his wife Mrs. Kamealani Haulewahine of Auwaiowao, Lāhaināluna, Maui:

He kanikau aloha keia nou e Kamealani	This is a loving lamentation for you Kamealani
Kuu wahine mai ka la wela o Lahaina,	My lady from the hot day of Lahaina
Mai ka makani kuehu lepo la he Kauaula,	From the stirring-up dust wind of Kauaula
Aloha ia wahi a kaua e hele ai,	The place we loved to go
Auwe! Kuu wahme, kuu hoa pili hoi e!	Too bad my lady, my best friend
Kuu wahine mai ka malu o ka ulu o Lele,	My woman from the shade of the growth of Lele
Mai ka piha kauaka la o Keawaiki,	From the whole person of Keawaiki
Mai ke one anapu la e Waiokila,	From the shiny sand in Waiokila
Mai ka wai lanamalie hoi o Mokuhinia.	From the calm waters of Mokuhina
Auwe! kuu wahine, kuu hoa pili hoi e!	Too bad my lady, my best friend
Kuu wahine mai ke kula wela o Puopelu,	My woman from the hot pasture of Puopelu
Mai ka piina ikiki o Lelekahauli,	From the uncomfortable climb of Lelekahauli
Hoomaha aku i kaolu o ke kukui o Kau-kaweli,	Relax in the pleasantness of the light of Kaukaweli
Huli nana i ka hono o na Moku.	Turn and look to the cliffs of the islands.
Auwe! kuu wahine, kuu hoa pili hoi e!	Too bad my lady, my best friend
Kuu wahine mai ke ahe makaui he Maaa,	My woman from the wind called Maaa
Mai ka ua paupili hoi o Halona,	From the Paupili rain of Halona
Aloha ia wahi a kaua e alo ai.	Our place we loved to turn to
E pupue ai hoi ike anu me ke koekoe.	Crouch in the cold dampness
Auwe! kuu wahine, kuu hoa pili hoi e!	Too bad my lady, my best friend
Kuu wahine mai ka wai huihui o Auwaio-wao,	My woman from the cold waters of Auwaiowao
Aloha ia wai olelo mai ma ke kala o ka hale,	Your words are loved by the color of the house

I ka uwe hone mai i ke kulu aumoe,
Moe ana wau hoolana i ko aloha.
Auwe! kuu wahine, kuu hoa pili hoi e!
V. G. Hauilewahine.
Kapauhi, Honolulu. Aperila 26, 1875.

In the sweet cry of the passing day
I will lie in your love
Too bad my lady, my best friend!
W.G. Haulewahine
Kapauhi, Honolulu April 26, 1875 (Haulewahine 1875) (translated by Cori-Ann Lorenzo)

The name Lāhainā traditionally refers to the "cruel sun", possibly associated with the drought that has impacted the surrounding area from time to time (Pukui et al. 1974:127). Rich in traditional accounts, Lāhainā is associated with the chief Kaka‘alaeno, who lived in the present Lāhainā district. Kaka‘alaneo was also the father of the mischievous Kaulula‘au who cut down breadfruit trees throughout Lāhainā and was eventually exiled to Lāna‘i. Kaulula‘au subsequently out-witted the spirits of that island, making it habitable for humans. The area is also known for the goddess Hina, mother of the demigod Maui among others. In regard to Kaka‘alaeno, Beckwith (1970) explains:

> Many legends mention the name of Kaka‘alaneo ([alternate spellings] Kukaalaneo, Kaalaneo), who lived in the present Lahaina district on the hill Keka‘a (Black Rock of Sheraton Maui). He also owned fishponds in the Hana district on the opposite end of the island and planted a famous breadfruit grove in Lahaina. His wife was the Molokai chiefess whom Eleio found for him and who brought him the first feather cape ever seen on Maui, and by whom he had the mischievous son Kaululaau who killed off the spirits on Lanai. In his day Lahaina was called Lele.
>
> According to tradition, a group of strangers (*haole*) who later played an active part in court life and whose names (according to Kamakau), kept in memory as late as Captain Cook's day, arrived on Maui in Kakaalaneo's time. Kukanaloa and Kaekae (also Kakae) were the leaders of this group. The "last allusion" in this legend is a pun about chief Lolae of Oahu who abducted the pretty chiefess of Maui, Kelea (sister of Pi‘ilani's father), while she was out surfing and carried her away to Oahu in the uplands of Lihue (now Schofield Barracks). She later deserted him for his cousin Kalamakua of Ewa (and Waikiki), by whom she became mother of the high chiefess Laie-lohelohe (the drooping pandanus vine), who became the wife of her Maui cousin Pi‘ilani. All these names appear in the chant linked with the coming of Ku-kanaloa, together with the names of a wife and son of Kakaalaneo (M. Beckwith 1970:384-385).

In W.D. Westervelt's account of "Hina the mother of Maui" (1910), he presents stories of Hina as the mother of Maui, residing in the West Maui Mountains:

> A version of the Maui stories is met with representing him as the son of Hina-lauae and Hina, residing above Lahainaluna, Maui, which relate his venturing forth on mischievous pranks before birth.
>
> Reference is made to his snaring the sun that Hina might have time to dry her kapas. It says, further, that while absent on his duty Hina bore another son, an owl, which he did not treat with contempt. Setting out one day pole-fishing, Maui was to be placed on the altar the following day as a sacrifice by the king. Hina saw in a vision

> what was being done so she and the owl followed along, Hina staying at a rock by the wayside. The owl flew on to where Maui was guarded and saw that he was tied with cords. The guards were awake, so the owl waited till near dawn, but they would not sleep.
>
> Maui then spoke: “O thou Aina, retard and prolong the night.” The night being prolonged, the guards fell asleep, whereupon the owl entered and struck at Maui’s bonds till they fell off. They then set off to where Hina was waiting, by which time it was daylight. Hiding Maui under the stone, Hina sat outside of him and spread out her sleeping garment and looked for fleas as the searching party came up. To their inquiry for the man which was to be sacrificed by the chief, she said that she had not seen him, having just now arisen, and by the warmth of the sun was looking for fleas. At their departure the owl led Maui forth, and Hina followed till they reached home. Thus was Maui saved (Westervelt 1910).

At least two notable *‘auwai* (irrigation channels), that span multiple *ahupua‘a* between Kaua‘ula and Kahoma, are described in native lore. Roughly datable by the chiefs associated with them, the earliest, in the Lahainaluna vicinity, known as ‘Auwaiawao, is reportedly named for the Chiefess Wao, sister of Kaululā‘au, who ruled a portion of Maui in ca. 1390. Portions of this *‘auwai* were subsequently incorporated into the construction of the Lahainaluna Ditch. The second ‘*auwai*, known as ‘Auwai o Pi‘ilani, is associated with Pi‘ilani, who ruled Maui and the neighboring islands in ca. 1450. The ‘Auwai o Pi‘ilani has its headwaters in the Kaua‘ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna. Maly and Maly (2007a:4).

The traditional background of Moku‘ula and the immediate surrounding area have been covered extensively in the *Moku‘ula: Maui’s Sacred Island* by Paul Christiaan Klieger (1998), as well as, previous archaeological investigations (E. M. Fredericksen and Fredericksen 2001; W. M. Fredericksen et al. 1989; W. M. Fredericksen and Fredericksen 1965; W. M. Fredericksen and Fredericksen 1970; Klieger et al. 1995; Klieger and Lebo 1999). What follows is a closer examination of the *mo‘olelo* (traditions) related to Mokuhinia and Kihawahine, the *mo‘o* goddess who resided within the waters of the pond, as well as a summary of the traditional background of Moku‘ula in order to place the proposed project and current study into proper context. For more detailed descriptions of the traditional and historic background of Moku‘ula the reader should refer to the above works.

3.1.1 He Mo‘o, the Apotheosis of Kalā‘aiheana, and the Veneration of Kihawahine

In an article written for *The Journal of the Polynesian Society*, E.S. Craighill and Mary Kawena Pukui relate the following regarding the origin and worship of the *mo‘o* in Hawai‘i when discussing the *kino-lau* or forms of ancestral gods or goddesses (1953):

> The *mo‘o*, or lizard migration came under the leadership of Mo‘o-i-nanea (lizard-that-enjoys-itself), who was their chiefess. There were male and female *mo‘o* and some were benevolent and some were malignant. They first landed on the island of Oahu. I have never heard of a plant form that was a *mo‘o-kino-lau*, but the *‘o‘opu* or guppy fish, the brindled dog (*ilio mo‘o*), the skinks and geckos (the two lizards native to Hawaii) were all *kino-lau* of the *mo‘o*, who were water dwellers.

> They were found of the colour [sic] yellow. Their homes were in ponds and streams and it is said that their presence was recognisable [sic] by the yellowing of the trees and shrubbery surrounding the ponds; in the accumulation of yellowish foam on the surface of the water; and in the peculiar yellow-green hue of the water itself. (This is an illustration of the way in which a colour is associated with species of *kino-lau* that are "bodies" of a native deity.)

Martha Beckwith, in her compilation of *mo‘olelo* (traditions) of Hawai‘i entitled *Hawaiian Mythology*, writes about the goddess Kalamainu‘u, the many bodied *mo‘o ‘aumakua* to whom bodies were dedicated to become *mo‘o* who would then inhabit inland fishponds. This dedication would occur at houses called *puaniu* which were erected to her for deifying the dead (M. W. Beckwith 1970:125). Beckwith quotes Kamakau in the following description of the *mo‘o* (Kamakau in M. W. Beckwith 1970:125):

> The mo‘o that guarded these ponds were not the common gecko or skink; no, indeed! One can guess at their shape from these little creatures but this is not their real form. They had a terrifying body such as was often seen in old days; not commonly, but they were often visible when fires were lighted on altars close to their homes. Once seen, no one could preserve his skepticism. They lay in the water from two to five fathoms in length (twelve to thirty feet) and as black in color as the blackest negro. If given a drink of awa they would turn from side to side like the keel of a canoe in the water.

Beckwith goes on to note that Kihawahine is the most famous of the apotheosized human bodies (1970:125). Kalā‘aiheana was the sister to the chiefly brothers of Kiha-a-pi‘ilani and Lono-a-pi‘ilani and sister Pi‘ikea, all who were born of Pi‘ilani and Lā‘ieloheloheikawai (Fornander 1918:176; Samuel Manaiakalani Kamakau 2000:73). Thus, Kalā‘aiheana was a product of a *pi‘o* or high ranking marriage and double *mo‘o* lineage (P. C. Klieger 1998:9), a fact that would play significantly upon her death. Kihawahine Mokuhinia Kalama‘ula Kalā‘aiheana was her full given name and upon her death was transformed into a *mo‘o* and referred to as only Kihawahine Mokuhinia Kalama‘ula (M. W. Beckwith 1970; Handy and Pukui 1953; P. C. Klieger 1998:125). In this way, Beckwith (1970:126) Loko o Mokuhinia, as the place where Kihawahine Mokuhinia, the *mo‘o* goddess, resided. This *loko,* or pond, was a part of a larger complex of ponds called Kalua o Kiha, literally "The Pit of Kiha" or dwelling place of Kiha the *mo‘o* goddess.

As a part of a series of articles about the ancient traditions of Hawai‘i (Ka Mo‘olelo Hawai‘i) in the Hawaiian language newspapers, S.M. Kamakau writes of the cession or transformation of Kihawahine and her *kapu* in the following excerpt:

No ka hoolilo ana iloko o na aumakua moo.

0 Walinuu o Walinoanoa a me Kalamainuu, he poe aumakua kinolau wale no keia, a ua hoolilo ia nae, a na kakuai ia kekahi, alii wahine o ka mokupuni o Maui o Kihawahine ka inoa, a na kakuai ia iloko o Kalamainuu, a na lilo i akua kino moo. A o Kihawahine ka moo kaulana, a o ke kumu i kaulana nui ai, no ke alii paha kekahi, a he kupuna maoli no na'lii ma ke kino, ma ka hanau kino kanaka

The Cession in Respect to the Mo‘o Aumakua

Walinuu, Walinoanoa and Kalamainu‘u, ancestral spirits with many forms, each transformed to become chiefess of the island of Maui. The name is Kihawahine, who became transfigured of Kalamainu‘u into the god form of the *mo‘o*. Kihawahine was a famous *mo‘o*, perhaps because she had been a chiefess and an ancestor of chiefs, and had been born a real human being, but when

maoli ana, aka, ma ke kakuai maoli ana a lilo i kino eepa, he -moo, a ua hoomana na'lii o Maui me Hawaii me ke kapu, a me ke kukulu o na puloulou, a me na kapu no Kihawahine, a me make ke kanaka i na kapu o Kihawahine. Ma Maui kahi i kakuai ia ai o Kihawahine i akua moo a i ka wa i lilo ai o Oahu a me Maui ia Kamehameha, a ua lawe pio ia o Kekuiapoiwa a me kana kaikamahine me Keopuolani, a o Kihawahine ko laua akua, a he kupuna wahine no na moo nei no laua, a o ka poe kahu akua o ua akua nei o Kihawahine he poe alii no, o Ulnmeheihei Hoapili ma no ka poe kahu akua nei o Kihawahine, a i ka hui ana o ke aupuni Hawaii malalo o Kamehameha I, a na hoolilo aku o Kamehameha, he akua kapu o Kihawahine, he moe ke kanaka i ke kapu, ina he waa e lana mai ana he moe kanaka i ka waha o ka waa i ke kapu o nei akua. Ua ike pinepine ia o Kihawahine ma Mokuhinia, a ma Kapunakea, ma Paukukalo a me Kanaha, a na haipu aku o Kamehameha ,a Kihawahine, oia kekahi akua nana e hoohui i na aupuni a pau mai Hawaii a Kanai, a penei . "E ai aku oe ia Oahu, ia ku a ka hale o ko akua i ka lai o Waikiki, he hale puaniu no Kala—Kalamainuu no ko akua no Kihawuhine.

she was transfigured she changed into something extraordinary, a *mo‘o*. She then was worshipped greatly by the chiefs of Maui and Hawaii with such sacredness that it was required to stand the kapu sticks (*pūlo‘ulo‘u*). A person who broke Kihawahine’s kapu met death. Maui is the place she transformed to the mo`o goddess and in time when Maui and O`ahu came under the rule of Kamehameha, he captured Kekuiapoiwa her daughter Keōpuolani and their goddess Kihawahine. Kihawahine was their goddess, ancestor and guardian of the people. Kihawahine guarded the chiefly people, Ulumaheihei Hoapili ma, for the people guarded Kihawahine. When all the islands were conquered Kamehameha made her a very sacred goddess. People prostrated themselves before her image was carried by. If a man was in his canoe he would prostrate himself because the kapu was strict. She is often seen at Mokuhinia, Lahaina, at Kapunakea, Paukukalo on Maui and in other places. Kamehameha included Kihawahine amongst the gods that help to unite the islands. Here is an old saying. “Sieze thou (the island of) Oahu so that the house of the god be thatched and erected at Waikiki; A *puainiu* house for the day of Kalamainu‘u, for the goddess Kihawahine. (S.M. Kamakau 1870) (translated by Auli‘i Mitchell)

In *The Story of Kihapiilani*, Moses Manu discusses Kihawahine and her relationship to Mokuhinia:

> This mo‘o, Kihawahine, was a mo‘o on whom the parents of these chiefs relied and the place where Kihawahine lived was in a pond lying at Lahaina, Maui, by the name of Mokuhinia. The location of the tomb of the chiefess Nahienaena which stood in the pond on the east bank, was Mokuula, a little rock island. Below this was the den of this mo‘o. This hold was called, from ancient times until this day Kalua o Kiha (The-den-of-Kiha) (in Sterling 1998:39)

The blog *nupepa* (http://nupepa-hawaii.com/) provides a translation of an article submitted by T.W. Nakaikuana where the author gives an account of a child that was grabbed by a *mo‘o* at Mokuhinia:

> On the evening of the 7th of this month, that being a Friday, a couple of small children were bathing in Mokuhinia Pond in Lahaina, close to the bridge [uapo], when the sun was going down.
>
> One of them continued to bathe, his name was Lono; he was almost eight years old, and his height was four feet. Right then after, this boy plain disappeared, but his parents did not think that he disappeared in the water.

> A woman named Paahao saw a long fish in the water like an Swordfish [Auau], and its belly was white; she called out to the mother of the boy, “There is a long fish in the water with a white belly.” The mother named Kaohe said, “You must be confusing it with a Turtle.” The other responded, “Let’s go and see.” Kaohe went, and lo and behold, it was as Paahao had seen. Paahao went to go see the fish from atop the bridge while Kaohe continued to watch the fish; after a little time, Kaohe’s eyes were struck [temporarily blinded? "paia mai la ka maka"] and the water turned white, and the fish disappeared from her sight. As for Paahao, she arrived atop the bridge and the fish sprayed up dust, and it disappeared.
>
> Then after, the two thought of Lono, and that he disappeared in the water. And they concluded that this was a moo that had revealed itself for Lono. They searched and went to look on the bridge, but it was not seen.
>
> The father of the boy arrived, named Maalewa. He looked under the bridge, and come to find out, he saw the boy in the water where he was hidden by the moo; his body was attached to the coral and his hair was all that could be seen on the surface of the water.
>
> The father grabbed him by the hair, and pulled him up, and he was almost dead; his body was stiff from top to bottom, and his eyes could not see, and his skin was slimy, which was believed to be the slime of the moo.
>
> He was massaged by his parents until seven in the evening, whereupon he got slightly better but did not say a word, but later he revived.
>
> Therefore, this was something miraculous to see; let it be known to all our friends from Hawaii to Kauai.
>
> T. W. NAKAIKUAANA, PUAA.
>
> Lahaina, Maui. June 8, 1861.
>
> This is the remarkable thing; the foolishness of man. The women saw the child shaking in the water, close to dying, and they did not grab him and save him; but they just stood there saying, “A moo! A moo!” Auwe! the foolishness and heartlessness of some people. If the father had not arrived then, the child would be dead (http://nupepa-hawaii.com/2012/06/24/moo-at-mokuhinia-lahaina-1861/#comments)

The worship of the *mo‘o* occurred at a *heiau,* that was specifically constructed for that purpose, at the summit of Pa‘upa‘u. According to Fornander (1919c), this mountain rises immediately behind the village of Lāhainā, and is named for a child whose parents wearied of carrying him down and up the mountain in order to bathe him. At the summit of Pa‘upa‘u is Kamohomoho Heiau, named for a noted Lāhainā chief. Kamohomoho was the first “to build a heiau for the worship of the god called Moo. This lizard [god] excelled in strength; it had a stumped tail; that is the way the tails of the lizards of the present time appear, because of Mo‘o, the great and strong.”

In *The Legend of Ke-ao-melemele*, , Moses Manu (1885) submits another Hawaiian language newspaper article in which the names of *mo‘o* from different islands are discussed and a reference to Kihawahine is made in the following excerpt:

O Papai ka moo ma Hanapepe, he moo noho kula pili keia, a ua oleloia ma keia moolelo, o keia moo ka mea nana i huna kekahi wai ma ke kula ma kahi i kapaia ma ka inoa o keia moo a hiki i keia wa, oia hoi o Puuopapai, a mai Wahiawa a hiki i Koloa, o Poipu ko laila moo, puni o Kauai aia no kona kiowai nui ke waiho la maiaila a hiki i keia la, aia wale no lakou a pau maialo aku oka moo iaia o Haupu ka puu kiekie; o Lehuakona ko Niikau moo nona ka wai aka Paoo ma Lehua. O ko Maui moo alii, oia hoi o Kihawahine, o keia ka moo i like pu aku me Kamooinanea ka mana, a o keia ka moo i oi aku ka nui o na kahu nana oia i malama a me ka nui o ka poe nana i hoomana aku iaia i akua; ua hoomana na alii a me na makaainana iau a puni o Maui a me Molokai a me Lanai i ka wa kahiko, a no keia moo ka lua ma ka loko o Mokuhinia ma Lahaina. E nana i ka moolelo o Kihapiilani, a malalo aku o keia moo o Kalamainuu a me Kilioeikapua, he mau moo ino laua. Ua oleloia ma keia moolelo, oa kaapuni o Kihawahine ia Maui a puni, a pela no ma Hawaii, Oahu a me Kauai; a ma ia hele ana ona, ua nui waie ka poe I nana i hoomana aku iaia mai Hawaii a Niihau, a oia ka moo hookahi nana i poai puni keia mau pae moku, a penei ka moolelo e pili ana i na kanaka no keia moo no Kihawahine

Papai is the *mo‘o* in Hanapēpē, this is the *mo‘o* who possesses the golden throne and it is said in this story, this is the mo'o that hid waters in the open country in a place named after her/him called Pu‘uopapai, and from Wahiawa to Koloa, Po‘ipu is the *mo‘o* of that place. Surrounding Kaua‘i is her/his big waterhole that is there till this day. They all fall under Ha‘upu, the biggest one. Lehuakona is Ni‘ihau's *mo‘o*. The waters of the Pao‘o in Lehua belong to her/him. Maui's chief *mo‘o* is Kihawahine. This is the *mo‘o* that is possesses the same powers as Kamo‘oinanea, and she has more guardians that cares for her and more people that empower her as a god. The chiefs and commoners of Maui, Moloka‘i, and Lāna‘i empowered her in the old days, the pond of Mokuhinia in Lāhainā was hers. Look at the story of Kihapi‘ilani, and under her were Kalamainu‘u and Kilioeikapu‘u, who were both evil *mo‘o*. It is said in this story that Kihawahine travelled around Maui, Hawaii, O‘ahu, and Kaua‘i. During this travel, there were many people who empowered her from Hawai‘i to Ni‘ihau, and she is the only *mo‘o* that circumnavigated these islands, and this is the story about the people who belonged to this *mo‘o*, honoring Kihawahine. (translated by Cori-Ann Lorenzo)

With specific regard to the *kapu* and worship of Kihawahine, Mary Kawena Pukui of Ka‘u recalled a visit by a family who were descendants of Lāna‘i and Maui and to whom Kihawahine was sacred (Handy and Pukui 1953):

> There were two other things that were *kapu* to Kiha-wahine besides the lizards, brindled dogs and *‘o‘opu* fish, namely, chicken and mullet. (The mullet was also one form assumed by Kamapua‘a when Pele pursued him.) Members of the Kiha-wahine clan were not allowed to eat them. A family who were descendants of Lana‘i and Maui to whom Kiha-wahine was sacred, came to Ka-‘u when I was a child. Under no circumstances would they eat mullet, chicken or *‘o‘opu* fish, and they would not harm a lizard if they could help it. Spiders, too, are said to be akin to the *mo'o.* And so are human beings on whose skin are patches suggestive of lizard's skin.
>
> The *mo‘o* clan, if they may be called that, were not always friendly to those of the Pele family and many a battle was fought between the two.

Beckwith relays Emerson and Westervelt’s version of the *Story of Punaaikoae* which involves Kihawahine, Pele, and Kamohoali‘i (brother of Pele):

> Puna is surfing at Waimanalo, Waikiki, when he encounters the mo‘o woman and is lured by her to Molokai and hidden away in her cave home. Her brother Hinale warns him as he is going to join the surfers, and he peeps in and sees his wife feeding on spiders and their webs. He pacifies her wrath and watches his chance to escape to the pit of Pele and put himself under the protection of his former wife's (Walinu‘u's) family. He pretends to thirst after the ice-cold waters of Poliahu and gives his wife a gourd to fill which he has secretly punched with holes. During her absence he makes his escape. Kiha-wahine summons the mo‘o gods and fills the pit of Pele with their phlegm, but the place sacred to Ka-moho-ali‘i is unharmed and the mo‘o gods are many of them consumed with fire and Kiha-wahine is obliged to escape to the pond called Loko-aka (Shadow pond). Ounauna is the fellow who shows her how to make the fish basket to trap Hinale.

In her human life, Kihawahine was Kalā‘aiheana daughter of Pi‘ilani and Lā‘ieloheloheikawai, a *pi‘o* union of great *mana* (power). As the *mo‘o* Kihawahine, her supernatural powers were so great that she was among the gods that Kahekili, *kapu* chief of Maui and ruler over Maui, Moloka‘i, Lāna‘i, and O‘ahu, worshipped as a means of keeping control of his government (S. Kamakau 1992:165). Observations by Archibald Menzies, the surgeon and naturalist aboard the ship Discovery and under the command of Captain Vancouver (1792-1794), also places Chief Kahekili in the vicinity of Loko o Mokuhinia and possibly Moku‘ula:

> The royal residence was sheltered with spreading trees and cocoa-nut [sic] palms situated near some beautiful fish ponds with which it was more than half surrounded, though they were not all at this time in repair or filled with water. They were so contrived as to be filled or emptied at pleasure or in succession. Here we found Kahekili with some of his chiefs seemingly in deep consultation, seated under the shady trees in front of his house (Menzies 1920:112-113).

Kihawahine was also claimed by Kamehameha, through his marriage to Keōpuolani and during his campaign to unite the island chain under a single sovereign (Fornander 1920:397). In her honor, he set her image dressed "in deep saffron, yellow or light yellow on a patterned *tapa* cloth" as the dominant image in his *heiau* (M. W. Beckwith 1970:126). "In her name [Kamehameha] carried his conquest over the islands" and "Ulumaheihei Hoapili, who later became an active friend of the missionaries [in Lāhainā] and a leader in establishing the Christian church, was her keeper (*kahu*)" (M. W. Beckwith 1970:126). According to Klieger (1998:21), and like Kahekili, Kamehameha held Kihawahine to represent his legitimate authority for as "the conqueror had the poserful war god Kūkā‘ilimoku as his 'land snatcher' … Kihawahine was one of his 'land holders'." The prophecy of Keauhamoku on the rise of Kamehameha and his overthrow of Keoua, *Haui ka Lani* (Fallen is the Chief), makes reference to Kihawahine in *Pauku* X (Verse X) and *Pauku* XIV (Verse 14), the excerpts of which are provided below as translated by Fornander (1920):

Ka hala au a Kinaukolo,	At thy offence of inward evil thought.
Aia ka wahi kapu	At the stand of the god pardoning offence of Wakea.
Ka hainuu kalana o Wakea.	
Ka hainuu a Iku, mana a Kihawahine	The assembly of worshipers of Iku, by the power of Kihawahine.
E hia ai ana ia Puna	Greatly desiring to consume the land of

	Puna. (Fornander 1920:397)
E Hina, e Hina mele lani,	O Hina, O Hina of heavenly song:
E Kiha, e Kihawahine mana	O Kiha, O supernatural Kihawahine!
E Hina, e Hina mele lani	O Hina, O Hina of heavenly song!
E Kiha, e Kihawahine mana,	O Kiha, O supernatural Kihawahine!
E Kihawahine mana ia ke poo,	O supernatural Kihawahine, the supreme head!
I nui ka man ai ko oukou Haku	Increase the power of thy lord,
O ka mana o ka lani o Umi	The power of thy chief, Umi
Oia kaula mana hoi oia aia	That wise prophet indeed, that there (Fornander 1920:407)

From these stories, we know that Lāhainā, was a favorite residence of the Maui *ali‘i* from the time of Pi‘ilani through the time of Kamehameha I and Loko o Mokuhinia specifically belonged to Kihawahine, the *mo‘o* goddess herself.

3.1.2 Early Historic Period

Following his conquests of Maui and O‘ahu, Kamehameha I established his government at Lāhainā, but made his residence mostly either on O‘ahu or Hawai‘i island. Between 1796 and 1802, Kamehameha I prepared for his conquest of Kaua‘i by building a fleet of war canoes at Hawai‘i. A two-story brick house was constructed at the Lāhainā landing (*makai* of the present-day public library) for the use of the king, when his travels brought him to Lāhainā. Kamehameha I sailed his fleet of war canoes to Lāhainā in 1802, consecrated several *heiau*, and collected taxes. His “brick palace” was noted by many contemporary European and American explorers, as were the buildings within Loko Mokuhinia. The first horses seen on Maui were landed at Lāhainā in 1803; a mare and a stallion were presented to Kamehameha and although the king was 67 years old, he soon became an accomplished rider. Kamehameha moved his invasion forces to O‘ahu, and over the next seven years planned his invasion of Kaua‘i. His residence was then moved to Hawai‘i island until his death in 1819.

According to Fornander (1880:300), the custom following the death of a high chief was to re-divide and distribute the land of the region between the chiefs and favorites of the new monarch. This custom was responsible for many civil wars. The rule of Kamehameha I brought about a new degree of permanence and security, and with the accession of his son Liholiho (Kamehameha II) to the throne in 1819, no general redistribution of lands took place thus setting a precedent for future succession. In the 1830s and 1840s, the island of Moku‘ula was the preferred residence of Kauikeaouli (Kamehameha III) and the stage on which the political changes of the Hawaiian Kingdom were to play out (P. C. Klieger 1998:2).

According to Klieger (1998:69), the neighborhood extending out from the royal residence of Moku‘ula and surrounding *loko* resembled concentric layers or bands and where a person lived within these circles depended on ones rank and/or position in government. From Moku‘ula and

the King's residence as the center or *piko*, the subsequent rings were as follows: Kalua o Kiha for the government and court; Kalua‘ehu for the *ali‘i* and extended family; and Lāhainā for the traders and Lāhainā *maka‘ainana* (P. C. Klieger 1998:Figure 19, p.70).

3.1.3 Mid- 1800s and the Great Māhele

The most significant event in the change of land-use patterns and allocation came with The Great Māhele of 1848 and the privatization of land in Hawai‘i. This action hastened the shift of the Hawaiian economy from that of a subsistence based economy to that of a cash based economy. By the mid 1800's, Hawai‘i was infiltrated by a growing community of foreign business entrepreneurs, transient whalers, and Calvinist-minded missionaries; all of whom had personal interests to protect and virtues to impress upon the Hawaiian people. Encouraged by these foreign factions, the western-like land divisions of the Māhele were instigated under Kamehameha III (Kauikeaouli). The series of acts to "Organize the Executive Ministry" known commonly as the Organic Acts of 1845 and 1846, initiated the process of the Māhele, or division of Hawaiian lands, which would introduce private property ownership into Hawaiian society, as well as, transform the governance of the Kingdom from a full monarchy to a constitutional monarchy (Van Dyke 2008:32-33).

In 1848 the crown and the *ali‘i* (royalty) received their land titles and awards for both individual parcels within an *ahupua‘a* and whole *ahupua‘a* which were then subsequently granted in 1850 (Alexander 1890:114). Crown Lands were lands defined as follows:

> … private lands of His Majesty Kamehameha III., to have and to hold for himself, his heirs and successors forever; and said lands shall be regulated and disposed of according to his royal will and pleasure subject only to the rights of tenants. (Kingdom of Hawaii 1848)

At the death of Kamehameha IV, it was decided by the Supreme Court that …under the confirmatory Act of June 7th, 1848, "the inheritance is limited to the *successors* to the *throne*," "the wearers of the crown which the conqueror had won," and that at the same time "each successive possessor my regulate and dispose of the same according to his will and pleasure as private property, in the manner as was done by Kamehameha III" (Alexander 1890:121).

Lands were further partitioned and set aside as Government lands which were defined and managed as indicated below:

> … those lands to be set apart as the lands of the Hawaiian Government, subject always to the rights of tenants. And we do hereby appoint the Minister of the Interior and his successors in office, to direct, superintend, and dispose of said lands, as provided in the Act … (p)rovided, however,that the Minister … shall have the power, upon the approval of the King in Privy Council, to dispose of the government lands to Hawaiian subject, upon such other terms and conditions as to him and the King in Privy Council, may seem best for the promotion of agriculture, and the best interests for the Hawaiian Kingdom … (Kingdom of Hawaii 1848)

In 1850, most of the chiefs ceded a third of their lands to the Government in order to obtain an allodial title for the remainder and thus greatly increasing the Government land base (Alexander 1890:114). The designation of lands to be set aside as Government lands, paved the way for land

sales to foreigners and in 1850 the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995:41-51).

As illustrated above, in designations of lands as either Crown or Government, and through all awards of whole *ahupua‘a* and *ili*, the rights of the native tenants were expressly reserved, "*Koe na Kuleana o Kanaka"* (Reserving the Rights of Native Tenants) (Alexander 1890:114). In an Act ratified on August 6th, 1850, the gathering rights of the common people for personal use, which included the gathering of both terrestrial and marine resources, in addition to the right to water and the right of way on the lands of the Konohiki, were guaranteed and embodied in Section 10477 of the Civil Code (Alexander 1890:114-115). By this same Act, resolutions passed by the Privy Council granted fee simple titles, free of all commutation, with the exception of awards granted within the towns of Honolulu, Lāhainā, and Hilo, to all native tenants for their cultivated lands and house lots (hereafter referred to as *kuleana* land) (Alexander 1890:115). Claims of the native tenants, or *kuleana* land claims, were presented to and heard by the Land Commission whose duty was to:

> …ascertain the nature and extent to each claimant's rights in land, and to issue an Award for the same which is *prima facie* evidence of title "and shall furnish as good and sufficient a ground upon which to maintain an action for trespass, ejectment or other real action against any other person or persons whatsoever, as if the claimant, his heirs or assigns had received a Royal Patent for the same." (Alexander 1890:110)

Kuleana land awards, or *kuleana* claims that were approved by the Land Commission (hereafter referred to as Land Commission Awards [L.C.A.]), were granted to tenants of the land, native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners, who could prove occupancy on the parcels prior to 1845. These claims were recorded under a single *helu*, or case number, and brought before the Land Commission for consideration. Despite the effort to allocate lands to the *maka‘āinana*, the *ali‘i* control of the majority of lands persevered and, as the future would indicate, much of these lands were ultimately obtained by foreigners for commercial agriculture enterprises.

A large number of house lot LCAs were conveyed in the immediate area surrounding Loko o Mokuhinia and Moku‘ula (Table 1 and Figure 8). The initial work of compiling the following table was performed by P. Christiaan Klieger (1998), as a portion of his archaeological research project "Moku‘ula, Maui's Sacred Island". Subsequent additions were made by cross-referencing SE Bishop's 1884 map with the Waihona Aina online database (2000) and scans of the documents of the Māhele ‘Āina made available in the Papakilo online database (Office of Hawaiian Affairs 2011).

Table 1. LCAs located in or near the present project area at Moku‘ula adapted from Klieger 1998 and updated using Waihona ‘Aina (2000) and Papakilo (Office of Hawaiian Affairs 2011)[1].

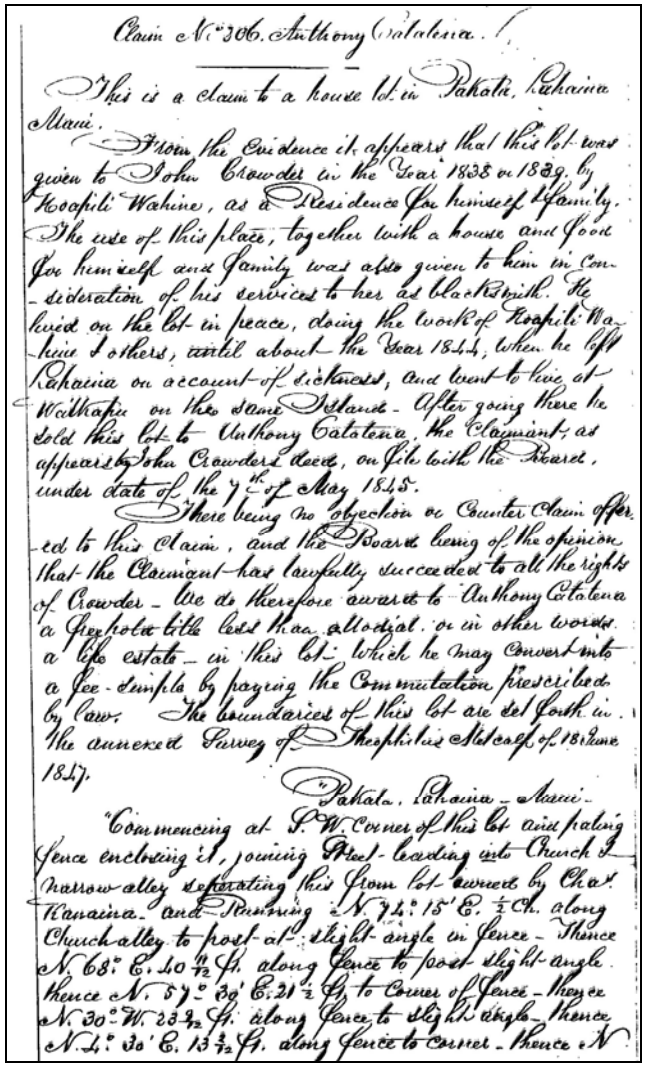
LCA# Date	Claimant	Ahupua‘a	Notes
00199 4 September 1846	Dawson, John	Kamakalaukalo	One house lot, obtained by Dawson from the King ca. 1840 through the efforts of the chief Kapu and Hoapili Wahine ; Noted that included in the survey of the lot was a part of the fish pond (Loko o Kōlea or Loko o Nalehu) between John Dawson's house lot and Alanui Aupuni Lahaina Maui.
00206	Catalena	Pākalā	The survey commenced at the S.W. corner of the lot joining to the street leading into the Church (Waine‘e Church [currently known as Waiola) of which the map shows the presence of a narrow road labeled "Church" with pond or swamp land to the west (Figure 9 and Figure 10) likely the eastern extent of Mokuhinia in 1847 (0.24 acres)
00277	W.C. Lunalilo	Pākalā	Awarded 0.81 acres With regard to the current study, in testimony to the Land Commission, Kanaina states that the lot (*pa*) of Uaea is north of loko o Mokuhinia (4. *Pa ia Uaea ma ke ko Akau o ka loko o Mokuhinia*) and that the lot of Ninia is *makai* of the road to Moku‘ula (7. *Pa Ninia mauka o Luaehu makai o ke alanui hele i Mokuula*)
00300	A. Paki	Pākalā	Map shows that a portion of this award included Loko o Kalolo (1.18 acres)
00302 25 December 1846	Kuakini	Waiokama Waine‘e	In his testimony, Kuakini notes that his houselot is connected to and south of Mokuhinia (*ma ka pahale ma Lahaina nei e pili ana ma ka aoao hema o Mokuhinia nei*) which is also depicted in the survey map of the lot (Figure 11)[2]
00309	D. Malo	Pākalā	--
00310	Pikanele	Pākalā	In his testimony for Pa 3 (Apana 3), Pikanele notes that his houselot is connected to Mokuhinia (*e pili ana keia pa o ka loko kapaia o Mokuhinia*) which is also depiceted in the survey map of the lot (Figure 12) (1.168 acres)
00312:5	T. Keaweiwi	Waiokama	Mahele survey metes and bounds note that a portion of the award is bound by *loko* Nalehu (0.16 acres)

[1] It should be noted that the *ahupua‘a* and *‘ili* of this area of Lahaina are unique in that many do not extend from *mauka* to *makai* in the traditional manner, but rather "jump" and/or are repeated across the landscape (see also Maly and Maly 2007). This area of Lahaina is densely populated resulting in land divisions surrounding the royal residence of Moku‘ula that were intricately complex. This fact, coupled with the difficulty of westerners surveying and understanding Native Hawaiian land tenure often resulted in the land division terms and place names being misrepresented both in the transcripts of Native Testimony and on the government survey maps. The *‘ili* and *ahupua‘a* place names are listed as presented in Klieger (1998) and Waihona Aina (2000).

[2] Note discrepancy between Klieger's map (Klieger 1998: Figure 18) where the pond to the north of Kuakini is labeled as as Loko o Nalehu

LCA# Date	Claimant	Ahupua‘a	Notes
00373	La‘ahili	Pākalā	0.28 acres
00392	Ninia	Waianae	Next to the big road (*pili me Alanui*)
00395	Kahikona	Pākalā	The survey commenced on the South westerly corner of this lot on the Loko called Mokuhinia belonging to Kalaipaihala N57 30E 1 27/100 chains following the westerly side of said Loko … thence N 50 W 91/100 chains passing along the northerly side of Loko called Puako thence N.-42W 1 05/100 chains passing along the northerly edge of said Loko and House Lot belonging to Namauu, thence S.59W. 2 57/100 chains crossing said Loko and following along an adobe wall being bounded by land owned by H Swinton … (0.84 acres)
00484:1	Kaihe‘ekai	Pākalā	0.2 acres
00526 7 September 1846	Kalaimoku	Waiokama	Survey notes for Apana (Section) 1 and 2 make reference to loko o “Kolea”, sketch map shows Loko o Kolea comprising the eastern boundary of both *apana*.
00812M 25 October 1847	Kaeo, A.	Pua‘a, Lāhainālalo	Apana 1: 1 acre 24 rods, Apana 2: 15 rods
03419B 12 November 1852	Pupule	Waiokama	Survey notes that the *Alanui* comprises a portion of the boundary (36 rods)
04452	Kalama	Waiokama	Kekai testifies on behalf Kalama that he knows the lot of Kalama at Waiokama which is bounded on the Ka‘anapali side by the Loko called “Mokuhinia” which he received from the King about the year 1836 (0.1 acres)
04533:1	Ualo	Kuloloia	In the survey notes for Apana 1, the description notes as North 36° West 1.96 Chains along Mokuhinia (*Akau 36° Komohana 1.96 Kaulahao e pili ana me Mokuhinia*) 1 Rood and 5 Rods (*Hookahi Ruda & Elima Roda*); also depicted on the lot sketch map (Figure 13)
04878I	Kupalii	Waiokama	Survey notes that the one of the boundaries of this award follows Loko o Nalehu (11 rods)
04878:2	Upai	Waiokama	Testimony by Muaa on behalf of Upai notes that the lands consisted of 9 *kalo* (taro) patches and 1 *kula* (pasture) land (0.11 acres)
06325M 3 June 1854	Kekauonohi	Puako	36 rods
07715:3	Kamehameha V and Shaw (1879)	Waiokama Ahupua‘a	25.86 acres
08466 9 February 1854	Kapapa	Puako	25 acres

LCA# Date	Claimant	Ahupua‘a	Notes
08515	Keoni Ana	Puako	Survey notes that one of the boundaries of Apana 1 follows Loko o Kaalolo; survey sketch map shows that the awarded lot contains Loko Holili (noted as Hoolili on Klieger's Figure 18 (1998) and Loko Kaalolo (3 Rods and 10 Roods).
08519B	Fanny Young	Pākalā	Survey notes and sketch map shows the southwestern boundary crossing Loko o Kaalolo (1 acre and 22 rods)
10465:1 and 2	Nalehu	Waiokama	Survey map and notes shows that the northern boundary of Apana 1 follows a freshwater pond (*Lokowai*) (0.25 acres) Survey notes describes the boundary of Apana 2 as following another *loko* (*kekahi loko*) (1 Rood and 17 Rods)
010533	Namauu	Pākalā	Survey notes describe one of the boundaries as following the Church Road (*Alanui Luakini*) 27 Rods
010644:1	Pi‘iko	Waiokama	Survey notes describe the eastern boundary as following the government road (*Alanui*); southern boundary as the road to the ocean (*Alanui iho ma i kai*); the western boundary as the narrow path to the church (*Alanui haiki hele pule*); and northern boundary as the wall or fence of the church (*Pa o ka Halepule*) *(*0.32 acres)
10806:77	Kamehameha III	Pākalā	Survey map shows the location of the a tomb in the southern portion of Part 77 Pa "Halekamani" (0.69 acres) (Figure 14)
GR 5555	C. Lindsey	Pākalā	--
GR 6854	V. Kamamalu	Pākalā	--



Claim No. 206. Anthony Catalena.

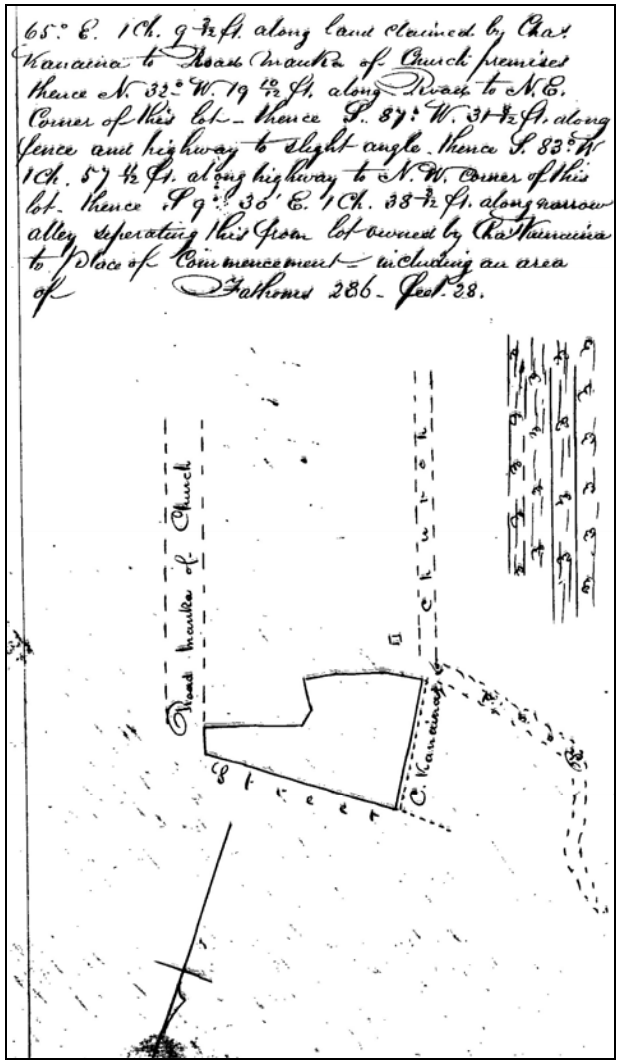
This is a claim to a house lot in Pahala, Lahaina Maui.

From the Evidence it appears that this lot was given to John Crowder in the Year 1838 or 1839. by Hoopili Wahine, as a Residence for himself & family. The use of this place, together with a house and food for himself and family was also given to him in Consideration of his services to her as blacksmith. He lived on the lot in peace, doing the work of Hoapili Wahine & others, until about the Year 1844, when he left Lahaina on account of sickness, and went to live at Waikapu on the same Island. After going there he sold this lot to Anthony Catalena, the Claimant, as appears by John Crowder's deed, on file with the Board, under date of the 7th of May 1845.

There being no objection or Counter Claim offered to this Claim, and the Board being of the opinion that the Claimant has lawfully succeeded to all the rights of Crowder. We do therefore award to Anthony Catalena a Fee-simple title less than allodial, or in other words a life estate in this lot which he may convert into a fee-simple by paying the Commutation prescribed by Law. The boundaries of this lot are set forth in the annexed Survey of Theophilus Metcalf of 18th June 1847.

Pahala, Lahaina, Maui.

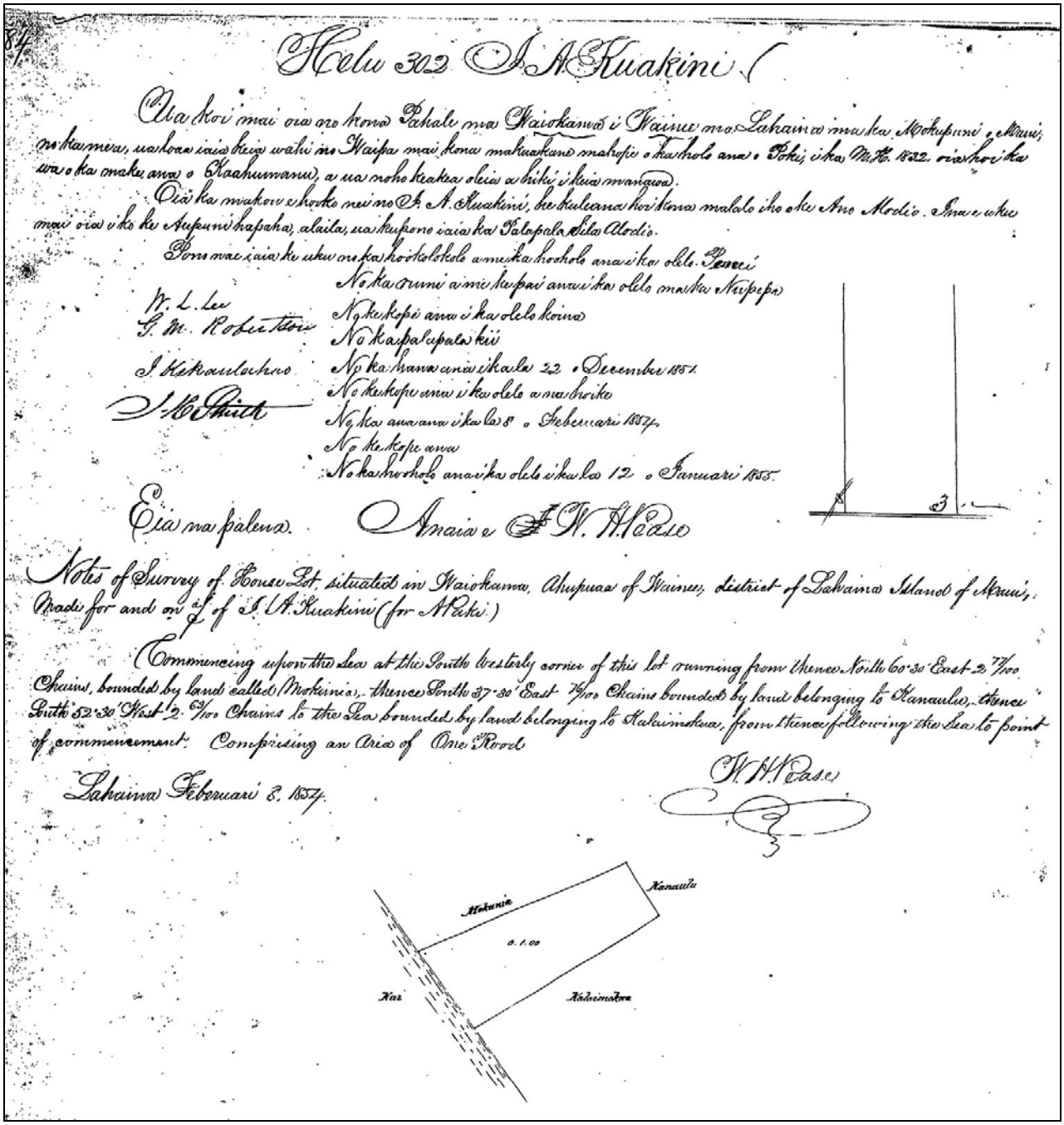
"Commencing at S.W. Corner of this lot and paling fence enclosing it, joining Street leading into Church & narrow alley separating this from lot owned by Chas. Kanaina. and Running N. 74° 15' E. ½ Ch. along Church alley to post at slight angle in fence. Thence N. 68° E. 10 11/12 ft. along fence to post slight angle. thence N. 57° 30' E. 21½ ft. to Corner of fence. Thence N. 30° W. 23½ ft. along fence to slight angle. Thence N. 4° 30' E. 13 3/12 ft. along fence to corner. Thence N.



65° E. 1 Ch. 9 3/12 ft. along land claimed by Chas. Kanaina to Road in front of Church premises thence N. 32° W. 19 10/12 ft. along Road to N.E. Corner of this lot. Thence S. 87° W. 31½ ft. along fence and highway to slight angle. Thence S. 83° W. 1 Ch. 57½ ft. along highway to N.W. Corner of this lot. Thence S. 9° 30' E. 1 Ch. 38½ ft. along narrow alley seperating this from lot owned by Chas Kanaina to Place of Commencement — including an area of Fathoms 286 — feet 38.

Figure 9. Helu 206 to Anthony Catalena (p1) (Office of Hawaiian Affairs 2011)

Figure 10. Helu 206 to Anthony Catalena (p2) (Office of Hawaiian Affairs 2011)



Helu 302 J. A. Kuakini

Ua koi mai oia ma ko kono Pahale ma Waiokama i Wainee ma Lahaina ma ka Mokupuni o Maui; no ka mea, ua koa iaia keia wahi ma Waipa mai kona makuakane makua o ka hoolo ana o Poki; i ka M.H. 1832. oia hoi ka wa o ka make ana o Kaahumanu, a ua noho kualua oleia a hiki i keia manawa.

Oia ka makou e hoike nei no J. A. Kuakini, he kuleana hoi kona malalo iho o ke Ano Modio. Ina e uku mai oia i ko ke Aupuni hapaha, alaila, ua kupono iaia ka Palapala Hilo Modio.

Pono wae iaia ke uku ana pa hoolokolo a me ka hoohola ana i ka olelo Penei

No ka rumi a me ke pai ana i ka olelo ma ka Nupepa

No ke kope ana i ka olelo kona

No ka palapala kii

No ka hana ana i ka la 22 o December 1851.

No ke kope ana i ka olelo a me ke ike

No ka ana ana i ka la 8 o Februari 1854.

No ke kope ana

No ka hoohola ana i ka olelo i ka la 12 o Januari 1855.

W. L. Lee
G. M. Robertson
J. Kekauonohi
J. M. Smith

Eia ma palena. Amaia e J. W. H. Pease

Notes of Survey of House Lot situated in Waiokama, Ahupuaa of Wainee, District of Lahaina Island of Maui, made for and on L of J. A. Kuakini (for Waki)

Commencing upon the Sea at the South Westerly corner of this lot running from thence North 60°30' East 2 7/100 Chains, bounded by land called (Mokinia), thence South 37°30' East 7/100 Chains bounded by land belonging to Kanaula, thence South 52°30' West 2 6/100 Chains to the Sea bounded by land belonging to Kakuimakua, from thence following the Sea to point of commencement. Comprising an Area of One Rood

Lahaina Februari 8. 1854.

J. W. H. Pease

Mokunia
Kanaula
0.1.00
Kai
Kakaimakua

Figure 11. Helu 302 to A. Kuakini, note label north of the boundary line as “Mokunia” or Mokuhinia.

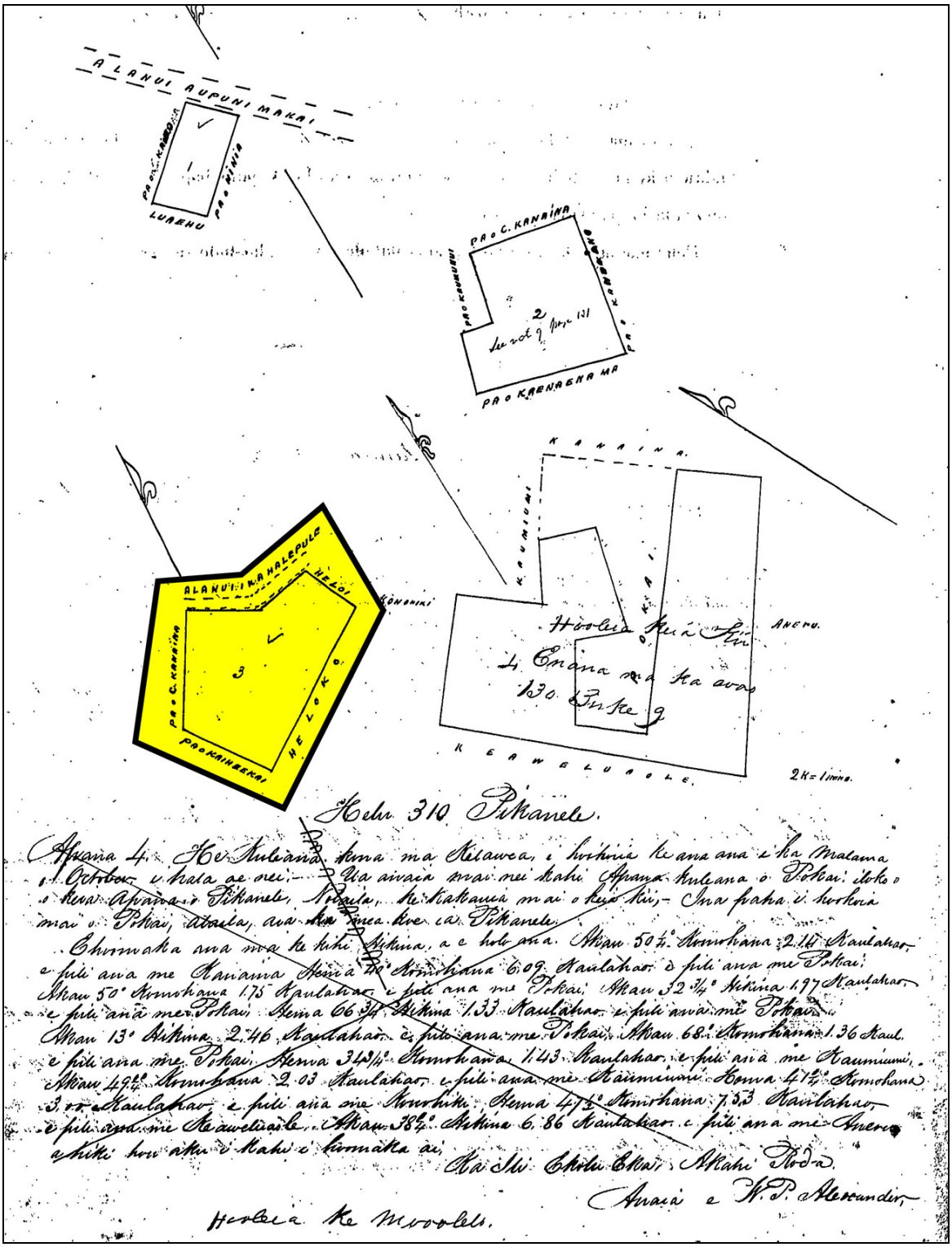


Figure 12. Helu 310 to Pikanele showing lot sketch of Apana 3 (highlighted in yellow), note label “He Loko” along the south-southeast boundary in reference to the location of Loko o Mokuhinia.

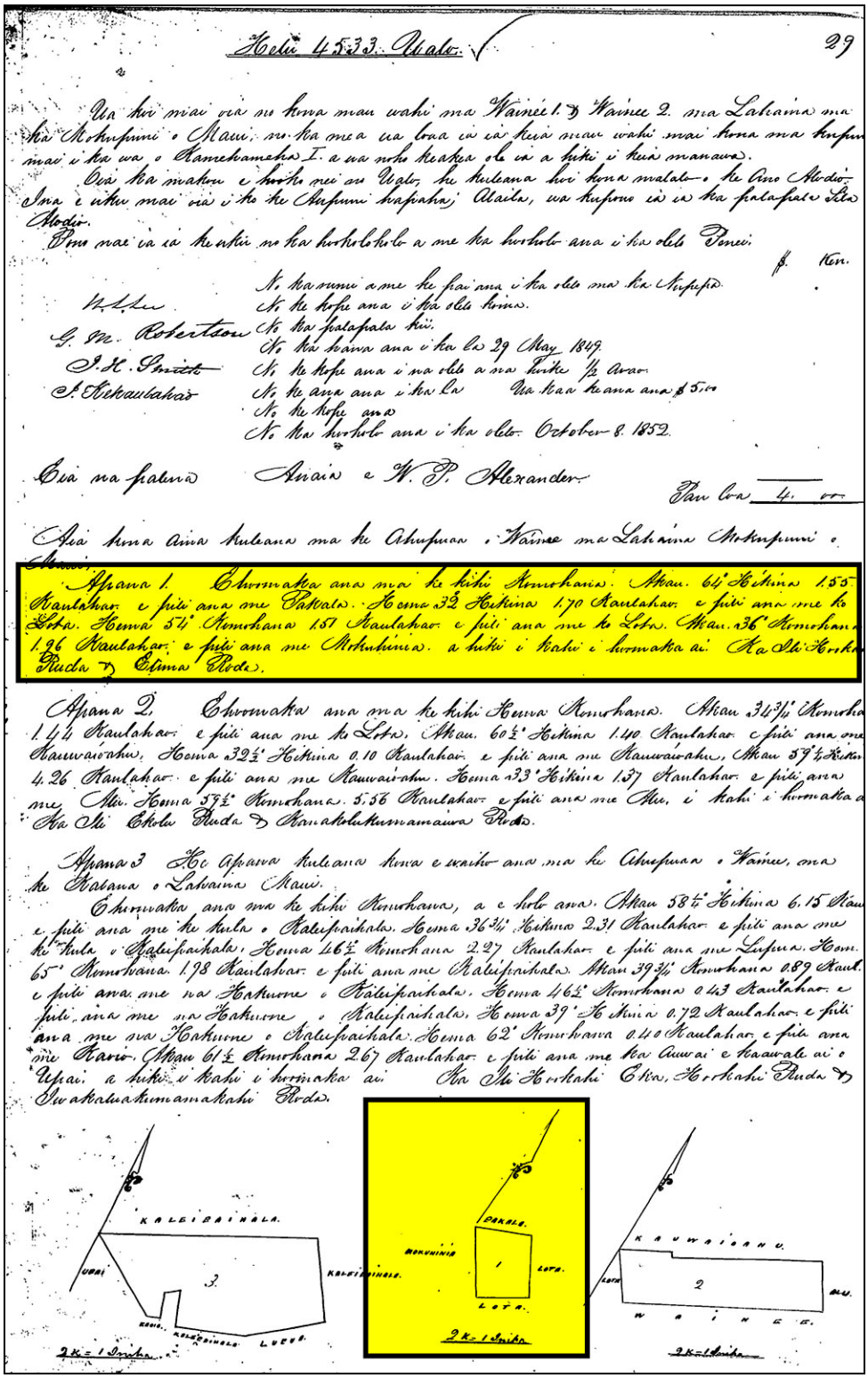


Figure 13. Helu 4533 to Ualo, Apana 3 (highlighted in yellow) adjacent to Mokuhinia.

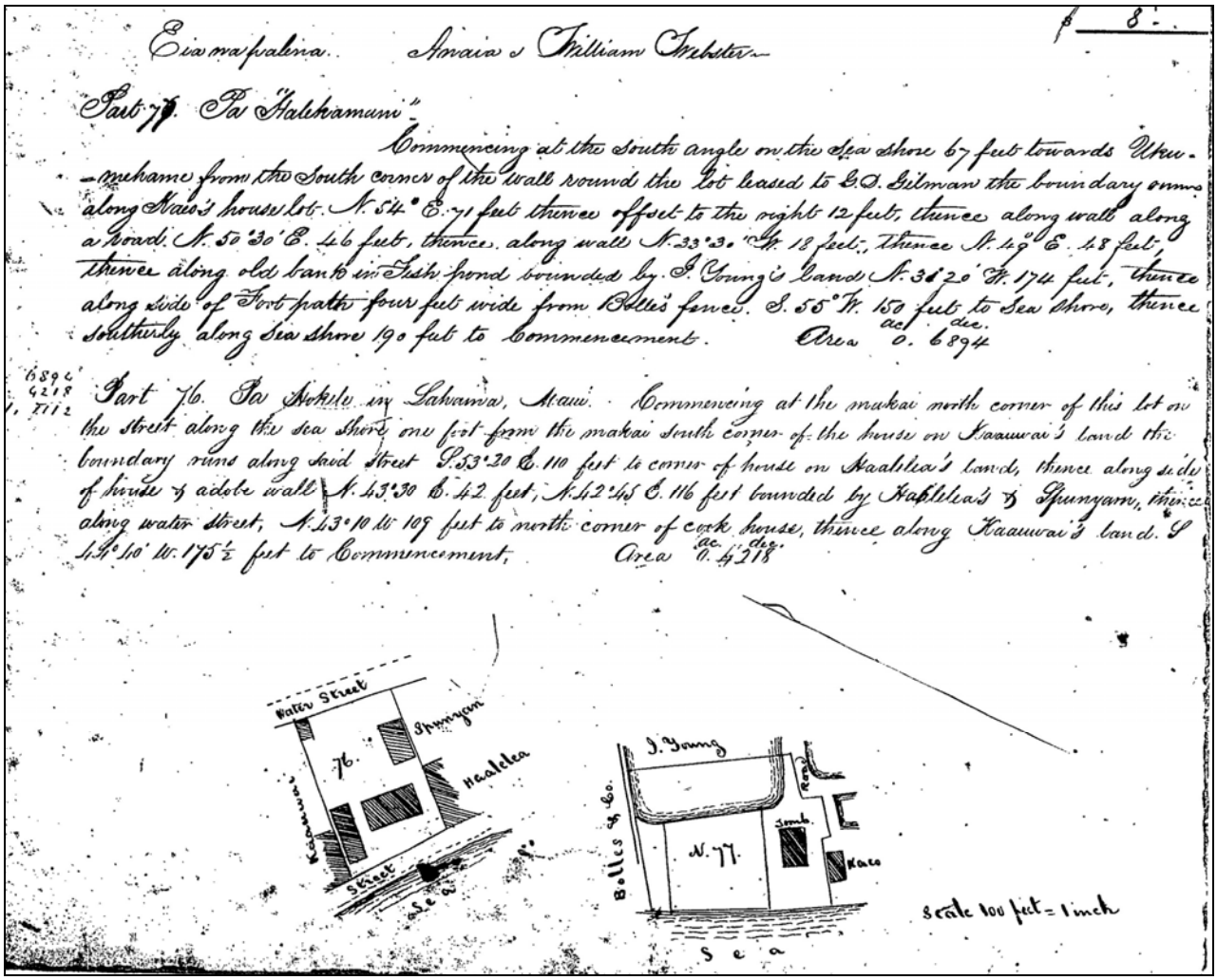


Figure 14. Helu 10806, Part 77 to Kamehameha III, note tomb location within Part 77.

3.1.4 1900s and Modern Land Use – Urbanization and the Effects on the Cultural Landscape of Lāhainā

At the turn of the twentieth century, following the annexation of the Hawaiian Islands to the United States of America, the lands of Loko o Mokuhinia came under scrutiny of the Commissioner of Public Lands, Edward S. Boyd (Maly and Maly 2007b:897-898).

According to oral testimony collected by Klieger (1998:96), soil from Honokōwai was transported by railroad to Loko o Mokuhinia in 1914 and a steam shovel was used to spread the soil over the stagnant waters, and fill in the wetlands. A Department of Public Works Map (Figure 16), however, shows that while a portion of Loko o Mokuhinia pond was filled in by 1916, the pond waters immediately surrounding the inland island of Moku‘ula were still intact. Nevertheless, it is possible that the earlier date of 1914 is a reference to the filling in of the peripheral edges of the pond. The final "reclamation of government swamp lands" in Lāhainā consisted of filling and grading approximately 11.5 acres of wetlands, including that of Loko o Mokuhinia and Moku‘ula, as well as construction of drainage canals and storm sewers. According to the records of the U.S.

Department of the Interior, this task was completed in December of 1917 (United States Department of the Interior 1919:665-666).

3.2 Previous Archaeological Research

The following section will provide an overview of previous archaeological work in the surrounding area with specific emphasis on the excavations conducted within Malu‘ulu o Lele Park. Beginning in the late 1920's and continuing in recent decades, archaeological studies have been conducted within the *kalana* of Lāhainā, in the region of the Lower Waine‘e Ahupua‘a (Figure 15). Studies conducted here show patterns of Hawaiian activity during the pre-contact and early post-contact periods. The renowned fishing grounds and fertile agricultural regions of Lāhainā were best described by missionaries stationed there beginning in 1820, and had been noted earlier by explorers such as Captain George Vancouver and his naturalist Archibald Menzies (Menzies 1920:112) as well as letters from Captain de Freycinet (Arago 1823:119).

Between 1928 and 1929, Winslow Walker of the Bishop Museum attempted the first island-wide systematic archaeological survey of Maui. Walker recorded one major site in Waine‘e: Halekumukalani Heiau (Walker Site 7) near the present project area. Halekumukalani Heiau was described as “a small sacrificial heiau, now totally destroyed” which was located, “(i)n cane lands of Puehuehunui in the ahupuaa [sic] of Halekaa, mauka to railroad of Pioneer Mill Co.” (Walker 1931:64). Three other *heiau* were described by Walker in the general region of the present project area. In the Polanui Region, Makila Ahupua‘a, Walker (Walker 1931:64) noted Wailehua, a shoreline *heiau*, that measured 130 by 80 feet. In Kuia Ahupua‘a, in the cane fields above Waine‘e, Walker (Walker 1931:65) noted Apahu‘a Heiau which Thrum (in Walker 1931:65) attributed to Hua-nui. In Paunau Ahupua‘a, Walker (1931:65) described Waiie Heiau, located in the Kapualu district south of Lahainaluna Road, in the cane fields. He noted that it was totally destroyed.

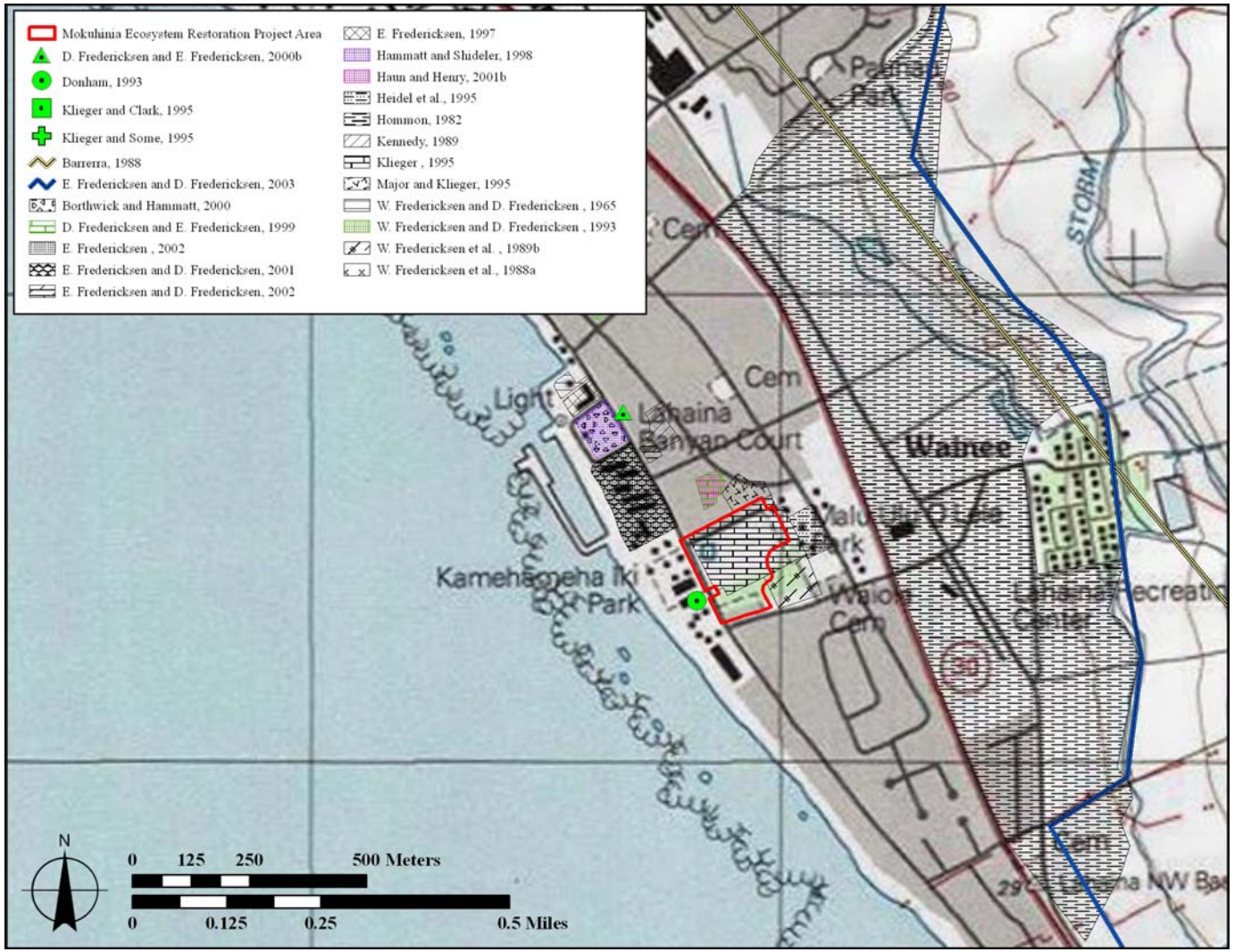


Figure 15. Portion of the 7.5 minute USGS topographic map, Lāhainā Quadrangle (1992), showing locations of previous archaeological work

Archaeological excavations were conducted at the former location of the “Brick Palace” of Kamehameha I in Paunau Ahupua‘a by Xamanek Researches (W. M. Fredericksen and Fredericksen 1965). Original estimations of the palace footprint placed the dimensions at 20 ft. by 40 ft. (Ellis 1823 in W. M. Fredericksen and Fredericksen 1965:Appendix A). Through thorough archaeological investigation, the measured dimensions of the footprint were not too far off from the original observations of Reverend William Ellis at 15 ft. by 41 ft. The location of the palace was also verified on the Government Survey maps of S.E. Bishop (1884) and discovered to be approximately 25 ft. from location documented by Freycinet in 1819. While most of the historical documentation of the palace did not completely correspond to the excavation results, the majority of the original sources were consistent with the orientation of the palace as discovered through excavation. In addition to confirming the dimensions and location of the palace, the following conclusions were reached:

1. The palace was built of locally made bricks of a sand and coral matrix that varied in size and thickness;
2. The foundation of the brick structure was built atop a mound or platform that was retained by a dry-stacked stone wall.
3. The brick wall construction consisted of the first four courses being laid in alternating axial directions;
4. Three types of mortar were used in the brick structure construction: (a) the classic early historic mortar of reduced coral with sand and some soil; (b) a clay and sand mortar that contained some coral pieces that did not prove to be as hard as the first; and (c), a sand and lime mortar mixed in roughly equal quantities that was used to plaster the exterior of the palace structure;
5. The palace walls were located on and leveled by a sand lens, which was then superimposed of the traditional dry-masonry foundation that rested on the mound or platform mentioned previously;
6. The 90 degree turn made by the traditional retaining wall may be connected to the orientation of the canoe landing that was observed by early visitors but was not extant at the time of the archaeological investigation conducted by Xamanek Researches;
7. While the location of the palace proper was verified during the course of the excavations, indications of traditional wall structures of an indeterminate function were encountered on the southeast end of the site area; and
8. The high frequency of water-rounded *‘ili* indicated the entire mound area was paved

A follow-up report for the “King’s Palace” site by Walter and Demaris Fredericksen in 1970 detailed the actions by the archaeological team to preserve and display a portion of the “palace” building foundation under a plexi-glass viewing dome.

Xamanek Researches conducted an archaeological investigation of the outbuildings adjacent to the Baldwin House (W. M. Fredericksen and Fredericksen 1977) in anticipation of possible lease agreements between the Lāhainā Restoration Foundation and private commercial interests. Of primary concern was the possible impact of commercial activities on remnants of the “Spare

Room” of the Baldwin House. Results of the excavations in the area under consideration for lease however did not yield evidence that the “Spare Room” was once located in the vicinity. Xamanek then concluded that the “Spare Room” was likely located under the concrete slab for the former Arbor Shops Complex (W. M. Fredericksen and Fredericksen 1977).

Robert J. Hommon (1982) conducted a reconnaissance survey of an area near the former plantation village at Waine‘e. This survey determined that the area had previously been cultivated in sugar cane, and no significant archaeological sites or materials were found.

Xamanek Researches performed archaeological excavations at the Hale Pa‘i Site (SIHP 50-50-03-1596) or “House of Printing” on the campus of Lahainaluna High School (W. M. Fredericksen and Fredericksen 1982) in conjunction the historic restoration work. Xamanek concluded that the original ground level of the Hale Pa‘i in the area adjacent to the southern wall was approximately 1.5 meters below the then current ground surface (W. M. Fredericksen and Fredericksen 1982:14-17) . Traditional dry-stacked masonry was likely the original form for the foundation, with the European/American style of architecture built upon it.

Xamanek Researches conducted an archaeological inventory survey with subsurface excavation at a parcel of land located on the Lāhainā shoreline (W. M. Fredericksen et al. 1988a). The parcel was once the site of a military armory building built in 1912. The parcel was also reported to have been the site of Hale Piula, a metal-roofed “palace” built during the administration of Kamehameha III in the mid-1840’s. The parcel became a public park in 1988, and the subsurface excavations undertaken in the seaward portion of the 1.797-acre parcel did not reveal any structural features that could be definitively associated with Hale Piula. Archaeological monitoring was recommended for future plans to remove pavement and asphalt from the project parcel.

In 1988, Xamanek Researches conducted an archaeological inventory survey at the Aus Site, a parcel of commercial zoned property located on the seaward side of the Seaman’s Cemetery in Lāhainā (W. M. Fredericksen et al. 1988b). A total of six trenches and 14 auger tests were excavated where possible in order to assess the underlying stratigraphy and cultural context of possible subsurface deposits. While subsurface testing did uncover individual artifacts of historical and archaeological interest, no pre-contact or historic structures were present. Due to the extent of built features, however, W. M. Fredericksen and others (1988b) were unable to assess the significance of the area in its entirety and recommended further testing following the demolition of existing buildings.

Archaeological Consultants of Hawaii conducted a limited archaeological subsurface testing program on an approximately one-acre lot within Paunau Ahupua‘a (Kennedy 1989). Three backhoe trenches were excavated in the southern portion of the lot. While portable remains were present within the trenches, it was apparent that they were from a mixed context as the diagnostic age for the artifacts ranged from the modern era to early post-contact. It was also notable that the portable remains were only encountered below the water line. This pattern of distribution, along with the soil stratigraphy and high water table appeared to point to a previously marshy environment that had been back filled sometime during the late historic period.

Xamanek Researches conducted an archaeological inventory survey of approximately two acres located directly adjacent and to the east of Malu‘ulu-o-lele Park, the former location of

Kamehameha III’s residence at Moku‘ula (W. M. Fredericksen et al. 1989). A total of 19 test trenches and 6 auger tests were excavated during the sub-surface investigation of the parcel. Testing results led to the conclusion that the survey parcel was likely used as open space and/or lake shore when Lāhainā served as the Capitol of the Hawaiian Kingdom and open space thereafter. Pond sediments over a portion of the parcel also indicated the soils had been submerged for some time and was likely that this portion was a part of Loko Mokuhinia prior to the land filling activities during the turn of the century.

Theresa Donham (1993) completed the disinterment of a flexed burial which had been found during trenching performed by utility workmen at the former Lāhainā Armory parcel. A flake of highly polished basalt was found at 40 cm below surface.

An archaeological inventory survey of a portion of a parcel that was slated for new construction was conducted by Xamanek Researches (D. L. Fredericksen and Fredericksen 2000a). Subsurface testing consisting of two test units and six auger cores was undertaken within the 240-square foot project area. Result from the auger tests revealed previously disturbed subsurface conditions that appeared to consist primarily of fill layers and re-deposited silty sand. Results of the manually excavated test units revealed the presence of one previously disturbed pre-contact burial. Examination of the test unit side walls indicated that the burial pit and remains were likely disturbed during the construction of the neighboring Wharf Cinema and re-deposited to the location of discovery.

Xamanek Researches (D. L. Fredericksen and Fredericksen 2000b) conducted an archaeological inventory survey for the proposed West Side Resource Center to be located within a portion of Waine‘e Village, an old sugar plantation camp. A pedestrian surface survey followed by subsurface test using a backhoe identified SIHP 50-50-03-5042, comprised of two structural remnants of the former Waine‘e Village on the surface and cultural materials consistent with the plantation time period in a subsurface context. No recognizable pre-contact materials or features were observed during testing, thus leading to the conclusion that while the Land Commission Award data had indicated that portions of the study parcel had been used for *lo‘i* agriculture, post-contact ground alteration associated with sugar cane cultivation followed by the construction of Waine‘e Village had effectively eliminated any pre-contact remnant in this area.

Cultural Surveys Hawai‘i, Inc. conducted a subsurface archaeological investigation on the grounds of the historic Lahaina Courthouse (Hammatt and Shideler 1998). Three backhoe trenches and two manually excavated test units were dug on the Canal Street and Hotel Street sides of the courthouse. One trench was also placed on the corner of Hotel and Wharf Street. The excavations resulted in the identification of six distinct soil layers. Stratum IA and IB consisted primarily of imported top soil and mixed construction layer associated with construction or infrastructure improvements around the Lahaina Courthouse. Stratum II, present in only two of the four backhoe trenches, consisted of a beach sand deposit likely representing a high surf event. Strata II/III consisted of a construction layer and mixed A-Horizon that likely reflected the early Courthouse construction. Stratum IIIB, an intact and discontinuous pre-contact habitation deposit (SIHP 50-50-03-4754) was identified in only two of the four trenches. Stratum IV, identified within all four backhoe trenches, consists of a cultural sterile beach sand deposit with some organic material dispersed throughout.

An archaeological inventory survey was conducted by Haun & Associates (Haun and Henry 2001) of a 0.845-acre parcel located west of Front Street, south of Prison Street, and east of Luakini Street. The completion of the inventory survey resulted in the relocation and further documentation of SIHP-4682, a portion of Loko o Puako Fishpond and SIHP-4690, a stone wall (Feature A) and subsurface cultural deposit (Feature B) that was previously interpreted as associated with LCAs 395 (to Kahikona) and 339 (to Kalaipaihala) (D. Fredericksen and E. Fredericksen 1999a and b; Haun and Henry 2001: Table 1). Further documentation and test excavations conducted during the course of the Haun and Henry (2001) inventory survey however, indicated that the wall was not directly associated with the original parceling out of the two LCAs in the 1840s but was rather a more recent construction based on the materials used to either initially construct or rebuild the wall, as well as the mixed nature (both recent and older items) of cultural material deposits directly underlying the wall. Haun and Henry (2001) further asserted that because the wall was constructed directly on the modern surface, it was not likely that cultural deposit and wall are associated. Data and artifact analysis of the pre-contact materials from Feature B of SIHP -4690 resulted in the determination that the cultural deposit reflected a habitation time period correlating to the late 1400s to late 1600s and further inferring that the deposit or pre-contact habitation activity was not confined to the LCA house lots and presumably not directly associated with the 1840s habitation of the area (Haun and Henry 2001:46).

Xamanek Researches monitored the electrical system upgrade for King Kamehameha III Elementary School located just *makai* (seaward) of historic Front Street in Lāhainā (E. M. Fredericksen and Fredericksen 2001). During the course of monitoring, four previously unidentified historic properties were located. SIHPs -4982, 4983, 4984, and 5174 had all been previously impacted by ground alteration associated with the development and construction of school in the early part of the 20th century and subsequent years. SIHP -4982 was interpreted as a probable post-contact burial area consisting of four burial and probable burial features. One of the four probable burials contained a secondary bundle burial. The remaining features consisted of a waterworn cobble burial platform encountered 45-55 cm below surface and two pit outlines that were discovered during trenching and preserved *in situ* without further investigation. SIHP -4983 consisted of a distinct subsurface cultural layer with subsurface posthole features indicative of habitation and approximately five associated human interments. Wood charcoal dates indicate a late pre-contact to early contact time frame for the occupation and use of this site. SIHP -4984 was a probable pre-contact to early post-contact Native Hawaiian human burial site consisting of approximately 12 *in situ* interments that had been heavily impacted by the reconstruction of the school in the early 1950s. In addition to the 12 *in situ* interments, a minimum of 11 previously disturbed individuals were discovered within the fill soil associated with the classroom construction (E. M. Fredericksen and Fredericksen 2001:28). While an associated cultural layer could not be discerned during the course of mitigation work, it seemed likely that one was present based on the quantity of indigenous artifacts distributed throughout the disturbed sediments. SIHP -5174 consisted of a remnant *‘ili‘ili* pavement and associated refuse or cooking pit feature. Post-contact cultural material remains were noted in both the pavement matrix and pit fill.

Xamanek Researches (E. M. Fredericksen and Fredericksen 2002) conducted an archaeological inventory survey of two adjacent parcels comprising a total of 1314 square

meters. Subsurface excavation was carried out only on Parcel 48 as Parcel 53 was used as a commercial parking lot at the time of the survey. Six backhoe trenches were excavated across Parcel 48. Result of the testing indicated that much of the parcel consisted of early 20th-century fill, based on the formal material type. Four post-contact refuse pits and an informal “backyard” water worn pavement were identified during the course of testing and designated as SIHP 50-50-03-5203.

An archaeological inventory survey of a 10,500 foot (3,200 meter) long project corridor was conducted by Xamanek Researches in anticipation of the Lāhainā Watershed Flood Control project (E. M. Fredericksen and Fredericksen 2003). A pedestrian sweep of the corridor and subsequent subsurface testing, both manual and mechanical, identified one previously unrecorded pre-contact burial (SIHP 50-50-03-5239). Based on the burial discovery and the ubiquitous LCAs within and adjacent to the project corridor, it was postulated that intact cultural deposits, as well as additional interments were possible in un-tested areas.

3.2.1 Previous Archaeological Research Specific to the Moku‘ula Complex (SIHP 50-50-03-2967)

An archaeological investigation of the inland island of Moku‘ula and private residences of King Kamehameha III, as well as his family’s mausoleum, was conducted by the Anthropology Department of the Bernice Pauahi Bishop Museum (Klieger et al. 1995). The excavations confirmed the existence of the island beneath the coral and soil fill of the park, as well as several architectural features in a good state of preservation. Klieger and others (1995) posited that much of the island is still preserved under the overlying fill deposits. According to testimony gathered during the course of the excavation work, the coffins that occupied the mausoleum were removed by Bernice Pauahi Bishop and re-interred at the nearby Waine‘e (Waiola) Church yard following the death of Kamehameha III, further indicating that the caretakers of the island had remained at Moku‘ula until it was filled in 1914.

Information resulting from excavations and further research also found that the Loko o Mokuhinia that surrounded the island of Moku‘ula was most likely a natural pond and that the island itself was likely a mud bar resulting from alluvial deposition that was modified significantly for habitation. During the course of this work, the stratigraphic sequence for the filling over of Moku‘ula and filling in of Loko o Mokuhinia was established and is summarized below.

Figure 16. Public Works, September 1916, showing Loko o Mokuhinia, Moku‘ula, and the surrounding environment (Maui Department of Public Works 1916).

A total of eight modern or recent fill components overlying sediments associated with the occupancy of Moku‘ula were identified across the project area. The fill sequence included the ball park top soil that ranged from 1 to 3 cm (0.4 to 1.18 in) thick, underlain by “Ball Park Fill” that was apparently laid down in four to nine separate events represented by several layers and ranges in thickness from 8 to 35cm (3.15 to 13.78 in) (Klieger et al. 1995:142). Following the “Ball Park Fill” there are four major fill events that Stephan Clark (in Klieger et al. 1995:142-149) identifies as Fill A through D (see Table 2 for Fill A-D summary). In total, the modern or recent fill deposits range from approximately 35 to 120 cm thick (13.78 to 47.24 in) (Klieger et al. 1995:142-147). It is important to note that in units where Fill C soils are absent, both Fill A and Fill B soils are absent as well, and “Ball Park Fill” was found directly overlying sediment layers associated with the Moku‘ula Sequence (described below) and the habitation of the in-land island (Figure 17 and Figure 18).

Table 2. Summary of Fill Sequences (adapted from Klieger et al. 1995:142-147)

Layer	Soil Color	Soil Characteristics	Cultural Materials	Comment
Park Topsoil	Dark brown (7.5YR3/2)	Silt loam, ranging in thickness from 1 to 3 cm (0.39 to 1.18 in)	Modern era artifacts and rubbish.	Loosely compacted with an abrupt, smooth lower boundary.
Ball Park Fill	Strong brown (7.5YR4/6); Dark reddish brown (5YR3/3); very pale brown (10YR8/2), dark reddish brown (5YR3/2), white chalk lenses	Gravelly, sandy loams; cinder gravels; coral sands; silty clays	Modern cultural materials	Overall consists of four to nine thin layers (3-10 cm [1.18 to 3.93 in]).
Fill A	Very dark brown to very dark grayish brown (10YR2.5/2)	Silt, ranging in thickness from 3-37 cm thick (1.18 to 14.57 in)	Modern era artifacts	Base course under asphalt pavement and directly under the park top soil
Fill B	Dark brown (7.5YR3/2)	Silty clay with discontinuous lenses of sandy, silty clay (Fill B1) identified in discrete instances, ranges from 1 to 25 cm thick (0.4 to 9.84 in).	Late historic to modern era artifacts	Layer was discontinuous throughout the project area

Table 2 (continued) Summary of Fill Sequences (adapted from Klieger et al. 1995:142-147)

Layer	Soil Color	Soil Characteristics	Cultural Materials	Comment
Fill B1	Dark brown (7.5YR3/3)	Sandy, silty clay with 15% fine to medium coral sand that grades to very pebbly (angular basalt), sandy silty clay in areas; ranges from 10-15 cm thick (3.93-5.90 in)	Culturally Sterile	Occurred in discontinuous lenses directly overlying Fill C sediments.
Fill C	Grayish brown to dark grayish brown (7.5YR3/3)	Consists primarily of subangular coral cobbles, pebbles and gravels, ranges from 12 to 78 cm thick (4.72 to 30.71 in)	Historic era artifacts	This layer was identified almost continuously across the project area, with the exception of units that appear to fall adjacent to the area where the tomb was located and along the northern extent of eastern periphery line.
Fill C1	Yellowish brown (10YR5/4); dark brown (7.5YR3/2) to dark reddish brown (5YR3/2)	Mixed coral sands, sandy loam and silty clay loam	Modern artifacts, no midden observed	Occurred in place of Fill C deposits in one locality (LP8) and directly overlying Layer II Moku‘ula deposits.
Fill D1	Dark reddish brown (5YR 3/2)	Pebbly, cobbly, silt loam ranging in thickness from 12 to 50 cm (4.72 to 19.69 in).	Historic era artifacts	Observed only in the two units excavated with the area of the holding pond that extends off of the western edge of the in-land island.

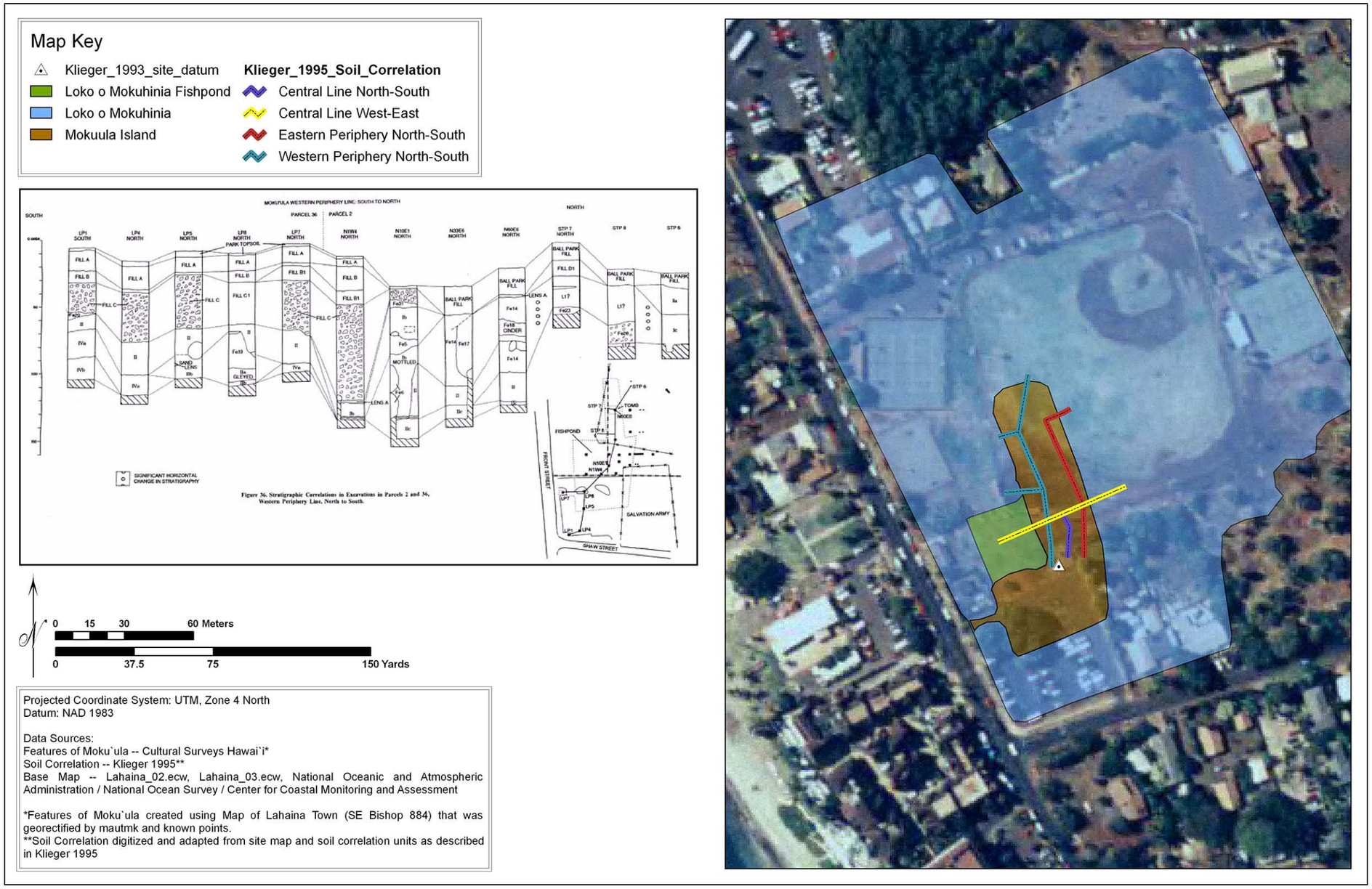


Figure 17. Orthophoto showing features of Moku‘ula and the north-south soil correlation extending along the western periphery of the 1995 archaeological inventory survey (Klieger et al. 1995).

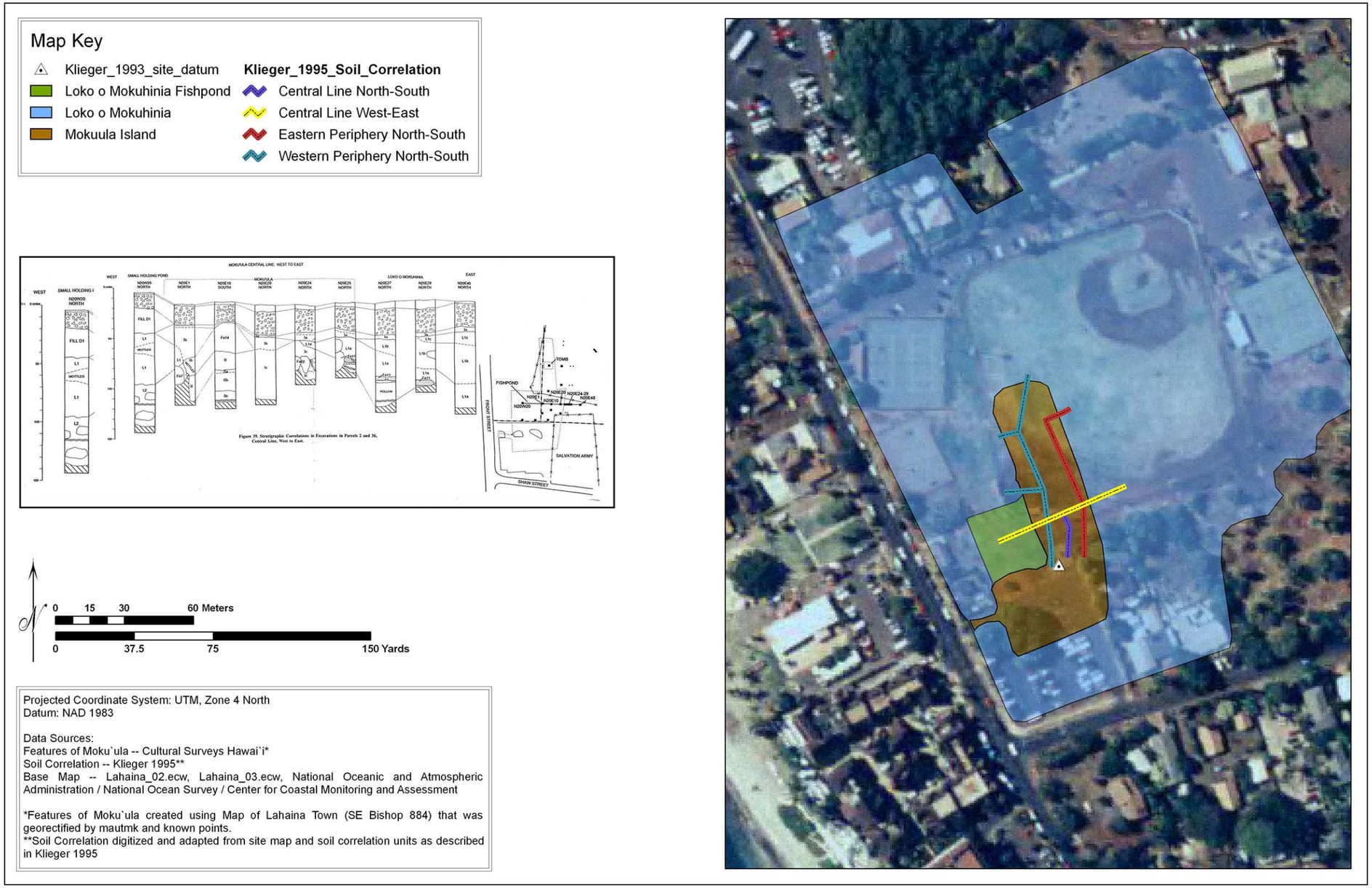


Figure 18. Orthophoto showing features of Moku‘ula and the north-south soil correlation extending along the eastern periphery of the 1995 archaeological inventory survey (Klieger et al. 1995).

The Moku‘ula Sequence (Klieger et al. 1995:149-166) (see Table 3) is the stratigraphic sequence that correlates to the occupation or habitation of the inland island of Moku‘ula. This sequence underlies the Ball Park Fill Sequence in the vicinity of Moku‘ula Island and is characterized by two discreet cultural layers made up of multiple sub-strata, lenses, and sub-surface features.

Table 3. Summary of Moku‘ula Sequence (adapted from Klieger, et al. 1995:149-166)

Layer	Predominant Soil Color	Soil Characteristics	Cultural Materials	Comment
Ia	Dark reddish brown (5YR 3/2.5)	Disturbed layer of silty clay loam ranging from 1 to 6 cm thick cemented deposits to 15 to 22 cm thick (5.9 to 8.66 in).	Sparse amount of faunal material	Directly underlies Fill C where present and Ball Park Top Soil were fill soils are absent. Un-cemented deposits believed to be located near the edge of Moku‘ula Island
Ib	Dark reddish brown (5YR 3/2.5)	Silt clay loam grading to sandy clay loam, weakly to strongly cemented ranging from 5 to 25 cm thick (1.97 to 9.84 in).	Intact subsurface archaeological features, discreet concentrations of midden and charcoal, indigenous and historic artifacts, a boulder alignment, possible intact burial) with the upper and lower portions of the layer	Discontinuous across the island, pedologically similar to Ia.
Ib mottled	Dark brown (7.5YR3.2)	Silty clay to silty clay loam ranging in thickness from 20 to 40 cm thick (7.8 to 15.75 in).	Recovery of faunal and wood charcoal, no artifact identified.	Limited to the east side of the basalt retaining wall.
Ic	Dark brown (7.5YR3.2)	Silt loam with fine to large mottles of dark reddish brown silty clay ranging from 42 to 86 cm thick (16.53 to 33.86 in).	Subsurface features included a wall segment and a possible wooden pier. Recovered remains included both indigenous and historic artifacts, faunal remains, and floral remains.	Identified only along the eastern periphery of Moku‘ula.
Id	Gleyed (5Y5/1)	Silty clay	None indicated	Organic layer identified just above the ground water table on the eastern periphery of Moku`ula and directly underlying Layer Ic.

Table 3 (continued). Summary of Moku‘ula Sequence (adapted from Klieger, et al. 1995:149-166)

Layer	Predominant Soil Color	Soil Characteristics	Cultural Materials	Comment
Feature 14	Mottled	Ranges from 9 to 56 cm thick (3.54 to 22.05 in)	Recorded subsurface features (one post hole and a charcoal concentration), recovered both floral and faunal remains.	C14 date returned an adjusted radiocarbon age of 670 ± 130 yrs BP
II	Dusky red (2.5YR3/2)	Silty clay ranging in thickness from 11 to 45 cm (4.33 to 17.72 in).	Recorded subsurface features (boulder alignment and mottled sediment zone), recovered sparse floral and faunal remains.	
IIa	Dark reddish brown (5YR 2.5/2)	Silty clay ranging from 4 to 6 cm thick (1.57 to 2.36 in).	No artifacts or midden, sparse faunal remains.	Discontinuous across the island.
IIb	Reddish brown (5YR 4/3)	Silty clay ranging from 15 to 21 cm thick (5.91 to 8.27 in).	No artifacts or midden, sparse faunal remains.	
IIc	Gleyed (5Y5/1)	Silty clay ranging from 5 to 15 cm thick (1.97 to 5.91 in).	None indicated	Organic layer identified.

The Loko o Mokuhinia Sequence (Klieger et al. 1995:166-169) consists of two sediment layers (noted as L1 and L2 in the archaeological inventory survey report) with multiple sub-layers and is clearly related to the government reclamation of swamp land in Lāhainā. L1 consisted of a mixed deposit of late historic era artifacts and faunal remains. L2 sediments also included late historic era artifacts intermixed with post-contact faunal remains. Layers L1 and L2 where identified primarily in the area of the southern holding pond. In contrast to these sediments, layers L1a through L1c were identified in the larger area of Loko o Mokuhinia to the east of Moku‘ula (Klieger et al. 1995:166-169). Excavations within the area of Loko o Mokuhinia encountered the water table at approximately 110cm (over 3 ½ ft) below surface.

Table 4. Summary of Loko o Mokuhinia Sequence (adapted from Klieger, et al. 1995:167-171)

Layer	Predominant Soil Color	Soil Characteristics	Cultural Materials	Comment
L1	Dark brown (7YR 3/3) to very dark grayish brown (10YR 3/2)	Silt loam containing approximately 5% subangular to subrounded basalt pebbles, saprolitic basalt pebbles, and occasional basalt cobbles. Approximately 10% coarse coral sands with dark reddish brown silty clay, light brownish gray clay, and white mottles that increase in frequency with depth. Thickness ranges from 49 to 52 cm (19.29 to 20.47 in).	Metal artifacts, marine and mammal faunal remains.	Identified directly underlying Fill D1, Feature 29 and 5, and Layer Ib. L1 directly overlie Layer L2.
L2	Grayish brown (10YR 5/2)	Gleyed silty clay found just above the water table. Contains >5% subangular basalt gravels, pebbles, and cobbles; 5% fine, subrounded coral sand grains, and sparse cobble-sized pieces of branch coral. Ranges in thickness from 35 to 45 cm (13.77 to 17.71 in).	Sparse metal artifacts dating to the nineteenth or twentieth centuries. Faunal remains include marine shell, fishbone, and small to large mammal bone.	Underlies Layer L1 and overlies silt layers below the ground water table.
L1a	Dark reddish brown (5YR 3/3) to dark grayish brown (10YR 3/2)	Silt loam to sandy loam with dark reddish brown silty clay and dark gray clay. Contains approximately 10 % fine to very fine basalt and coral sands. Ranges in thickness from 10 to 35 cm (3.93 to 13.77 in).	Milled 2” X 4” lumber, aluminum nails; marine and mammal faunal remains.	Overlies mixed deposits of Layers Ia and Ib and directly underlies Layer Ic.

Table 4. Summary of Loko o Mokuhinia Sequence (adapted from Klieger, et al. 1995:167-171)

Layer	Predominant Soil Color	Soil Characteristics	Cultural Materials	Comment
L1b	Very dark Gray (10YR 3/1 to 7.5YRN3/)	Silt loam with few to common, small to large mottles of dark reddish brown silty clay. Contained >10% rounded to sub rounded, smooth basalt pebbles and cobbles, and >5% very fine basalt and coral sands. Ranges in thickness from 8 to 30 cm (3.14 to 11.81 in).	Historic artifacts included glass, metal, ceramic, and plastic items. Dating from the nineteenth and twentieth centuries. Faunal remains include marine shell, fishbone, and medium sized mammal bone.	Overlies Layer L1a and underlies Layer L1c.
L1c	Very dark grayish brown (10YR 3/2)	Silt loam with sparse mottles of dark reddish brown silty clay and pieces tentatively identified as tar. The textural “feel” is greasy. Ranges in thickness from 5 to 15 cm (1.96 to 5.91 in).	Sparse glass fragments dating to the nineteenth or twentieth century. Faunal remains include marine shell, fishbone, and medium to large mammal bone.	According to Figure 54 (Klieger, et al. 1995:170), Layer 1c directly overlies Layer L1b and underlies recent fill event Fill C.

The Anthropology Department of the Bernice Pauahi Bishop Museum conducted an emergency mitigation program at Malu‘ulu o Lele Park located just off of Front Street (Klieger and Somer 1995). The construction of a new backstop at the baseball field located on the corner of Front and Shaw streets by the Parks and Recreation Division of the County of Maui uncovered a portion of the foundation of an early building site. Fill material that overlies Loko o Mokuhinia/Moku‘ula, the fishpond and island which formed the former residence of King Kamehameha III and the capital of the Hawaiian Kingdom, was breached by the construction of the backstop. An emergency mitigation program was put into effect following the halt of construction in order to assess the degree of damage to the underlying historic property. Examination of all previously dug trenches, as well as back dirt mounds from mechanical excavations, was undertaken. Manual archaeological testing was then conducted within the area of disturbance. The investigation found that the Moku‘ula sediments had indeed been penetrated during the excavations for the backstop, that the excavations had breached the island perimeter retaining wall, and that the excavations had possibly damaged a portion of the northern/southern holding pond *kūapa*. No human remains were found in the backfill of the backstop excavations and the tomb area had not been disturbed.

The Anthropology Department of the Bishop Museum conducted an archaeological inventory survey of approximately 1.12-acres adjacent to the former location of Loko o Mokuhinia and the royal residence of Moku‘ula (Major and Klieger 1995). Three backhoe trenches and one manually excavated test unit were dug to groundwater level resulting in the identification of

SIHP 50-50-03-18 and 50-50-03-19. The seven features of SIHP -18 appeared to indicate a high status early- to mid-19th century residence, as well as, sediments associated with the inland pond of Loko o Mokuhinia that once surrounded the royal residence of Moku‘ula. SIHP-19 consisted of an early 20th Century plantation style house.

As a part of Phase II archaeological investigations and as a supplement to the 1995 report, Klieger and Lebo (1999) revisited the Moku‘ula project site. The primary objective was to follow up on a remote sensing experiment conducted by the Bishop Museum in 1993 in order to define the outer perimeter of Moku‘ula Island. This type of remote sensing technology would prove useful in being able to “see” below the surface without physically testing at random, thus preserving the intact cultural layers below the fill. To this end, an electromagnetic survey covering approximately one hectare, using an EM31, was undertaken and a total of seven test units were excavated to ground truth the EM31 findings. Radiocarbon samples of charred *milo* wood recovered from test unit N40 E20, excavated during Moku‘ula Phase I work, and test units 3, 4, and 7, excavated during Moku‘ula Phase II work, were submitted for C-14 radiocarbon analysis and returned a date range that indicated a late pre-contact to early post-contact association (Klieger and Lebo 1999:8). The cultural material context in which the samples were recovered, however, contained a mixed assemblage of both traditional Hawaiian and non-traditional artifacts (Klieger and Lebo 1999:8), a factor that led to the conclusion that the C-14 results represented early post-contact occupation of the inland island rather than pre-contact occupation, as definitive archaeological signatures for pre-contact *ali‘i* occupation or construction was not present.

The final EM31 results indicated that while useful for generalizing the location of the body of the island, the technique was limited in that it could not distinguish the actual perimeter walls (Klieger and Lebo 1999:5-7). Excavations during the Phase II work further supported Klieger and Lebo’s hypothesis that while the core of Moku‘ula may have been present prior to the Kamehameha Dynasty, the construction improvements to the island were likely the primary creation of Kauikeauoli (Kamehameha III) and/or his immediate family during the early post-contact period (Klieger and Lebo 1999:7-8).

Section 4 Community Consultations

Based on the methods described in Section 2, CSH contacted *kama‘āina*, Hawaiian cultural advisors, and Hawaiian organizations requesting their *kōkua* and guidance regarding knowledge of traditional cultural practices and cultural resources of the study area. The following table lists the contacts that were made in support of the community consultation effort, and a summary of the input received.. Individuals who expressed personal knowledge of the study area and gave their consent to share their *mana‘o* for this study are presented in Section 5. Formal letters of response to the scoping letter sent out by CSH have been appended to this study as Appendix B.

Table 5. Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Mr. Foster Ampong	Lineal descendant of Waine‘e and Waiokama Ahupua‘a	Y	Y	See Section 5.2.4 and Appendix B
Mr. Sam Ahia	Lāhainā *kama‘āina*	Y	Y	FOM interview, see Section 5.1.5 and Appendix B.
Ms. Pua Aiu, PhD - Administrator Ms. Jenny Pickett – Assistant Archaeologist, Maui Island Mr. Hinano Rodrigues - Culture and History Branch	DLNR, State Historic Preservation Division (SHPD)	A	--	--

[3] Key:

Y=Yes
N=No
A=Attempted (at least 2 attempts were made to contact individual, with no response)
S=Some knowledge of project area
DC=Declined to comment
DP=Declined to participate
U=Unable to contact, i.e., no phone or forwarding address, phone number unknown

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Ms. Clair Apana	Great Granddaughter of the last Kahuna at Moku‘ula, Victoria Kaluna	Y	Y	Offered the following comments at CRC Meeting: She likes the original restoration plan that Chris Hart helped design. Is concerned about the proposed location of the FOM parking lot Believes the pond-ocean connection is critical (For futher detail see Section 5.3.4)
Mr. Edward Halealoha Ayau	Hui Malama I Na Kupuna O Hawaii	Y	N	No Comments
Ms. Puanani Badoyan-Robinson	Lineal descendent Lāhainā *kama‘āina*	Y	Y	Known as Aunty Nani in Lāhainā, she is the great-great granddaughter of Kamehameha III. Would like to see the area restored as a place of reverence and education; not for the amusement of visitors. Very concerned about proper protocol, specifically that related to Kihawahine, during any work being performed there. Would like to see the nonnative/invasive plants removed so the native plants will return. (For further detail see Section 5.2.12 and Appendix B)
Mr. Norm Bezane	Community Member	A	--	--

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Dr. Kamana‘opono Crabbe – Chief Executive Officer (CEO) Ms. Thelma Shimaoka – Community Resources Coordinator	Office of Hawaiian Affairs (OHA)	Y	Y	Made referrals to: ▪ Maui/Lāna‘i Island Burial Council ▪ Friends of Moku‘ula ▪ Aha Moku Council ▪ Stanely Manuia ▪ Keola Sequeira
Ms. Grale Chong -- Lay Minister Ms. ‘Anela Rosa -- Lay Minister, Ms. Glynis Kukahiko	Waiola Church	Y	Y	Interview pending
Ms. Elle Cochran	County Council – West Maui Representative Board of Directors for Waiola Church Na Kia‘i o Wainee	Y	Y	Supportive of the project, hopes for successful restoration of the pond with the county, community and all parties coming together harmoniously. Spoke to the cultural significance of the area. Made referrals to: ▪ Aha Moku Council ▪ Tama Kaeleiki ▪ Haunani Teruya ▪ Uncle Joe Padua
Ms. Christina Currie	Lāhainā Community Member	Y	Y	Expressed that knowing and understanding the history of any given area is beneficial to all residents, past, present and future.
Mr. Buddy Dapitan	Na ‘Aikane o Maui - President	A	--	--

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Ms. Lucienne DeNaie	Maui Tomorrow Foundation	Y	Y	Generally would like to see Mokuhinia and Moku‘ula spiritually reclaimed. Believes connectivity to waters of Waine‘e Stream is critical to overall restoration. Made references to Pikanele, the Konohiki of the area at the time of the Mahele, and questions whether there was a connection between his land in Waine‘e and his land in Makena. Mentions the Ka‘aupuni – torch march organized by Keeamoku Kapu that began and ended at Moku‘ula for reasons of cultural significance. (For further detail see Section 5.2.16)
Carl “Kale” Eldridge	Community Member	Y	Y	He believes it would be best if the original footprint of the pond was followed as closely as possible during restoration. Not originally from Lāhainā, but says that his great-great grandmother, Kalula Memehu, used to entertain Kamehameha III on Moku‘ula by singing and dancing. Made referrals to Charlie Makekau. (For further detail see Section 5.2.15)
Mr. Matthew Erickson	Lāhainā Hawaiian Civic Club	Y	N	No longer LHCC president

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Mr. Hailama Farden	Kamehameha Schools Kapalama Middle Campus Vice Principal/ Lāhainā *kama‘āina*	Y	Y	See Section 5.1.3
Ms. Blossom Feiteira	Community Member	A	Y	--
Mr. Keoki Freeland	Lāhainā *kama‘āina*	Y	Y	FOM interview (see Section 5.1.2)
Mr. Daryl Fujiwara	Lāhainā Hawaiian Civic Club	Y	N	Deferred to FOM
Mr. Timmy Gilliom	Hui O Waa - President	Y	--	Made referral to Ke‘eaumoku Kapu.
Ms.Hokulani Holt	Friends of Moku‘ula -- Cultural Advisor	Y	Y	FOM interview and telephone interview Believes Mokuhinia and Moku‘ula should be restored and recognized Nationally for its tremendous significance in Hawaiian History. Restoration is more important than the potential impact on other areas. (For further detail see Section 5.2.1)
Hongwanji Mission		A	--	--
Mr. Nameaaea Hoshino	Lāhainā *kama‘āina*/Lineal descendant	A	--	--
Mr. Raymond Hutaff – Chair Mr. Warren Osako – Vice Chair	Maui County Cultural Resources Commission	Y	Y	Warren Osako wanted to make sure that FOM would be consulted. Raymond Hutaff was concerned that a woman from Kaua‘i who attended the last meeting had not been consulted and recommended finding this woman. (For further detail see Section 5.3.4)

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Ms. Lehua I‘i	Lāhainā *kama‘āina*	A	--	--
Mr. Philip Jaentsch	Lāhainā *kama‘āina* (Kailihou *‘ohana*)	A	--	--
Ms. Mabel Jaentsch and Ms. Donnalyn Johns	Lāhainā *kama‘āina* (Kailihou *‘ohana*)	A	--	--
Mr. Sam Kadotani	Community Member	Y	Y	FOM interview (For further detail see Section 5.1.4)
Mr. Tama Kaeleiki Ms. Rita Medina	Na Kia‘io Waine‘e Committee	Y	Y	For further detail see Section 5.3.1
Ms. Shirley Kaha‘i	Friends of Moku`ula - Executive Director	Y	Y	Shared chant written by Akoni Akana granting permission to Moku‘ula, 2006: Eia no ho‘i o ka wai ola e E inu i ka wai, ka wai awaawa No ka wahine mai ka waihau e E komo mai ‘oukou I loko nei Me ka welina o ke aloha, E ola e!
Mrs. Orpha Kaina	Kaina ‘Ohana, Lāhainā kama‘āina/Aha Moku	Y	N	Made referral to: • Her daughters, Silla and Deann Kaina • Ms. Rubelite Johnson, a retired Hawaiian studies prof. • The Silva family • The Ka‘ahounui family • The Apo family • Charlie Makekau and family • Martha Medeiros • Levan Sequira • Carl Eldridge

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Ms. Silla Kaina, Ms. Deann Kaina	Kaina ‘Ohana, Lāhainā *kama‘āina*/Aha Moku	Y		Ms. Silla Kaina remembers playing ball in Malu Ulu o Lele Park as a child and some strange happenings that took place, specifically between third base and home plate, which she later found out to be the location of the sacred island. She has noticed recently that certain plants have begun to grow in the area; Noni and Lo‘ulu, which are traditionally associated with Hawaiian royalty. (For further detail see Section 5.2.11)
Ms. Victoria Kaluna Palafox	Ohana o Moku`ula/Aha Moku/lineal descendent	A	Y	Lineal descendant to kahuna at Moku‘ula. D not want any structure built there that was not there originally. Refers to the four main “veins” that originally fed the pond and noted that if these water sources are opened, only good things will come. (For further detail see Section 5.2.8)
Ms. Johanna Kamaunu	Hui Pono Ike Kanawai/ Lāhainā kama‘āina	A	--	--
Mrs. Makalapua Kanuha	Westin Ka`anapali Ocean Resort Villas/ Lāhainā kama‘āina	A	--	--
Mr. Kimokeo Kapahulehua	‘Ao‘ao O Nā Loko I‘a O Maui	A	--	--

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
	Maui/Lāna‘i Islands Burial Council	A	--	Did not meet due to lack of quorum for February or March 2013 meetings
Mr. Ke‘eamoku Kapu and Mrs. U‘ilani Kapu	Kuleana Kuikahi LLC./Aha Moku Council-Lāhainā	Y	Y	Mr. Ke‘eamoku Kapu shared the following comments and concerns at the Aha Moku Meeting (For further detail see Section 5.2.9) He would like to see FOM act as stewards of Loko o Mokuhunia. Does not want tourism of any sort on the sacred land. Does not want any structure to be built on the project area.
Mr. Kekai Kapu	Lāhainā *kama‘āina*	A	--	--
Mr. Kenneth Keaunui	Community Member	Y	--	Declined to comment
Rev. Earl Kukahiko	Minister at Waiola Church – Retired Lāhainā kama‘āina	Y	S	Recalls hitting the water table during burial interment at Waiola Cemetery.
Mr. Leslie Kuloloi‘a	Native Hawaiian Cultural Practitioner	Y	Y	See Section 5.2.3
Princess Lehuanani	Lāhainā *kama‘āina*/lineal descendent	A	--	--

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Mr. Charlie Lindsey	Lindsey ‘Ohana, Lāhainā kama‘āina	Y	Y	Telephone interview Overall, Mr. Lindsey feels that if this generation decides to restore Moku‘ula, it would be disrespectful to the generations that converted to Christianity and decided to let Moku‘ula go. Feels it would be a waste of money. Instead would like to see a display/museum created to show what the area used to be like. (see Section 5.2.5)
Mr. Edwin (Ekolu) Lindsey	Polanui Ahupua‘a Community Managed Marine Area (Polanui Hiu)—President/ Lindsey ‘Ohana	Y	Y	For further detail see Section 5.2.13)
Mrs. Roselle Lindsey Bailey	Lindsey ‘Ohana Lāhainā *kama‘āina*	Y	Y	Formal interview, See Section 5.1.1
Mr. Charlie Makekau	Lāhainā *kama‘āina* /Na Kupuna O Maui/Aha Moku	A	--	--
Mr. Kai Markell – Native Rights, Land and Culture Division, Director Mr. Keola Lindsey – Lead Advocate, Culture Ms. Apolei Bargamento -- Liaison	Native Hawaiian Historic Preservation Council (NHHPC [an advisory council to OHA])	Y	Y	See Section X

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
	Bailey House Museum/Maui Historical Society	A	--	--
Mr. Kaponoai Molitau	*Kumu Hula*, Lāhainā *kama‘āina*	A	--	--
Ms. Theo Morrison	Lāhainā Restoration Foundation - Executive Director	Y	N	No comment
Ms. Patty Nishiyama	Na Kupuna O Maui	A	--	--
Mr. Clifford Nae‘ole	Ritz-Carlton Cultural Advisor	A	--	--
Mr. Daniel Palakiko	Lāhainā *kama‘āina*	A	--	--
Aimoku Pali	Lāhainā *kama‘āina*	Y	N	Made referral to: ▪ Lori Sablas ▪ Malihini Keahi ▪ Mike White
Sir. William Roback , Jr.	Royal Order of Kamehameha – Ali‘i Nui	A	--	--
Mr. Hinano Rodrigues	State Historic Preservation Division, Cultural Historian, Maui	A	--	--

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Ms. Owana Salazar	Lineal Descendant, involved in Visionary Group	Y	Y	Informal Interview Has been involved in traditional ceremonies at Mokuhunia since 1974. She feels a strong connection to the Goddess Kihawahine and wants it to be known that the goddess is still present, is still being honored and worshipped, and should not be thought of as an ancient Hawaiian goddess, but as an active, present deity. She does not want to see any structures built on the project area. (For further detail see Section 5.2.2 and Appendix B)
Mr. Levan Keola Sequiera	Lāhainā *kama‘āina*	Y	Y	For further detail see Section 5.2.10
Mr. Kenneth Sharpe	Lāhainā *kama‘āina*	Y	Y	His family owned property along the beach in front of Moku‘ula. His Auntie raised ama‘ama in a fishpond where the 505 is now. Recalls that the original pond walls and some artifacts were encountered during construction activities at the 505 in the early 70s. (For further detail see Section 5.2.6)

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Ms. Janet Six, Ph.D	Archaeologist at Maui College. Led field school at Moku‘ula site for two years.	Y	Y	Made the following comments at CRC Meeting: She supports USACE pond restoration. In 1945 the park fill sank and additional fill was brought in. In the Fall of 2011, there were problems between Janet and FOM. Not in support of FOM “facilities” planned for site Would like to share video and archaeological report for CIA. (For further detail see Section 5.3.4)
Mr. Stanley Solamillo	Maui County Planning Department	Y	S	Provided comment at the January 3, 2013 Maui County Cultural Resource Committee meeting (For further detail see Section 5.3.4)
Mr. Keoki Sousa	Friends of Moku‘ula Maui Nei	Y	Y	One of the last remaining original members of Friends of Moku‘ula. He is interested in reintroducing the native plants that once grew in the area, especially ones that have healing properties. He feels a very strong connection to the Goddess Kihawahine. (For further detail see Section 5.2.14)

Table 5 (continued). Summary of Community Consultation

Name	Affiliation	Contacted[3]	Personal Knowledge (Y/N/S)	Comments
Mrs. Lillian Suter	Lāhainā *kama‘āina* (Kailihou ‘*ohana*)	Y	Y	Noted that her grandfather was the caretaker of Waiola Church and her great-grandfather was the minister. She recalls her auntie Kai (Alice Shaw) having a house where 505 currently stands and remembers the area consisting of a lot of wetlands. (For further detail see Section 5.2.7)
Mrs. Haunani Teruya	Waiola Church and Waine‘e Cemetery Committee	Y	Y	Interview pending
Mr. Charles Wahineho`okai	Lāhainā *kama‘āina*	A	--	--
Mr. Kekoa Yap	Lāhainā Community Member	A	--	--

Section 5 Summaries of Community Consultation and Kama‘āina Interviews

The summaries presented in the section below consists of information that was shared during informal and formal interviews, as well as small group meetings, as related to past and present land uses, traditional Hawaiian cultural resources, and traditional cultural practices and beliefs of the study area. *Mana‘o* shared during public meetings, community briefings and small-group meetings conducted in support of the overall scoping and consultation process for the project are also included below.

5.1 Formal Interviews

5.1.1 Ms. Roselle Bailey

Ms. Roselle Bailey was born and raised in Lāhainā, near what was once Mokuhinia Pond. Her grandfather, Charles Robert Lindsay, and her father, Edwin Robert Nalelehua Lindsay were both part of the Lahaina Police Department. She remembers her childhood neighborhood as being inhabited by close-knit families whose genealogies were all intertwined.

Ms. Bailey recalls the fishpond, Loko o Nalehu, that once belonged to Auntie Ka‘ae (Mrs. Alice Shaw) as being in the location of what is now the garage for 505 Front Street. The pond was a *pu‘uone* fishpond, a sand banked fishpond, and she spoke of a song that was written for it called *Kananaka*. She recalls that she had also observed Hawaiian Rails visiting the pond, a bird that is now believed to be extinct.

When Ms. Bailey was a child, the ballpark was often referred to as Mokuhinia Pond even though it was already filled in, and Canal Street was still known to be where the pond exited into the ocean. Ms. Bailey would like to see the pond restored to its original state with Canal Street returned to its original purpose. She feels that the whole wetland area, connected by streams, ponds, and springs, must be rejuvenated, and is concerned that the planned two foot deep pond would be too shallow to support a double hull canoe. She wants the pond to be revived as a historical place to educate people on Hawaiian culture, and does not agree with the idea of putting *kapu* on the area since there is nobody left alive that can say what *kapu* were in place before.

5.1.2 Mr. George Warren Freeland (Keoki Freeland)

Mr. George Warren Freeland (Keoki Freeland) was born in Lāhainā in 1939. He was raised in a house where the Wharf Shopping Center is now, on the *mauka* side of Front Street, across from Banyan Tree Park. His grandfather, George Freeland, immigrated to Hawai‘i from Coburn, England and built the Pioneer Inn, in 1901. His grandmother, from the Kahu‘u family, was a full-blooded Hawaiian woman from Lāna‘i. Keoki’s parents owned and operated seven movie theatres throughout the Lāhainā district. Having grown up during the plantation era, Keoki feels it was not unusual that his parents withheld information from him about his Hawaiian heritage, and it was not until he began to work with the Lahaina Restoration Foundation in 1995 that he learned about the history of Moku‘ula. Up until this time, Mr. Freeland recalls the area to be a

ballpark with the exception of the Salvation Army side, which was the garbage dump during his childhood. He remembers that there was rubbish burning there at all times until it was moved to a new location.

When Mr. Freeland was a child, the Shaw residence was located where the 505 is today. He recalls there being ponds on either side of the residence which were fed from underground springs that are still present (today, these springs cause the 505 parking garage to be constantly pumped to avoid flooding). Mr. Freeland does not remember there being many fish in these ponds. They were already quite overgrown. He explains that the area was not largely populated during his childhood, but rather dominated by fish ponds and *kiawe* trees. There are remnants of these fishponds where the Prison Street parking lot is now. Mr. Freeland believes this land should eventually be given to Friends of Moku‘ula.

Mr. Freeland’s grandfather is credited for being involved in the decision to fill the pond in, in 1919. At the time, Lāhainā was a growing plantation community and Moku‘ula had been abandoned and in disrepair, with a large mosquito problem. It was with good intentions that the plantation manager, Harry Weinzeimer, a personal friend of Mr. Freeland’s grandfather, suggested the pond be filled in to create a ballpark. Dirt was railed in from Honokowai, and the pond was filled in and leveled. Mr. Freeland maintains that the original archaeological study shows that the way the pond was filled in has managed to preserve the pond walls and Kamehameha’s pier, making it more likely that restoration is possible.

Mr. Freeland made references to several occurrences that point to Hawai‘i and specifically Moku‘ula being significantly older than what is generally believed. The first occurrence is the carbon dating of *‘ulu* pollen (breadfruit; *Artocarpus altilis*) samples that were collected during the original archaeological survey conducted by the Bishop Museum in 1995. These samples were carbon dated to roughly 265 BC. The *‘ulu* plant is not native to Hawai‘i, so if the results were accurate it would demonstrate that there was human presence, specifically in the project area, hundreds of years before what is generally believed.

Mr. Freeland also made reference to an ancient chant from Rapa Nui which describes their ancestors having originated from a place called Moku‘ula. The chant describes the valleys and mountain peaks beyond Moku‘ula accurately and indicates that the people who settled upon Rapa Nui may have stopped and lived in the project area before continuing to their final destination.

5.1.3 Mr. Hailama Farden

Mr. Hailama Farden was born in 1971 and though raised in Waianae, Oahu, he spent a large part of his childhood with his family in Lāhainā. He is the grandson of Rudolph Haleakala Farden and Harriet K. Sylva Farden of Lāhainā; however, he spent most of his Maui visits with his grandmother’s brother, Frank Sylva and his wife, Adelaide. Their home was located Luakini Street, directly behind what is now the Wharf Center.

Uncle Frank Sylva was a good fisherman and he used to take Hailama fishing around Lāhainā where they would catch *weke‘ula* and nabeta, a deep sea fish caught only by hand line that Mr. Farden claims is so delicious you will never see it in a store because the fishermen always keep it for themselves. He also recalls picking *limu* at Launiupoko with his aunt and uncle. According to

Mr. Farden, his Uncle Frank would be able to tell if there was a shark in the in the water by standing on shore and putting his ear to a rock and listening for it. He also has vague memories of his family hunting sharks, which he believes was an acceptable practice since his family's *aumakua* is not a shark. Mr. Farden remembers hearing stories of families whose *aumakua* was the shark and how they would go out and feed them. The sharks would behave like dogs in that they would always come back to the same spot to be fed. If a shark were to ever get caught up in a fishing net, the fishermen would have to let the fish out. Then they have to put the net on the ground and sit in a circle on the net and *ho‘oponopono* until they figured out what the problem was. Then they could continue to fish. Mr. Farden also recalls being told that often times, families had their own fishing *koa*, or fishing grounds, that were not to be trespassed upon by people without permission.

Mr. Farden grew up hearing stories about Auntie Ka‘ae (Alice Shaw) who lived where 505 Front Street is today. His aunts and uncles told him how they were afraid of her. She always wore black and they accused her of "doing *kahuna* stuff." His grandfather used to steal mullet out of her pond, which would cause Auntie Ka‘ae to come over and yell at his great-grandfather. Mr. Farden knows that they were somehow related to Auntie Ka‘ae but he is unsure of exactly how.

Mr. Farden has spent many hours studying the hand notes of the Hawaiian scholar, Mary Kawena Pukui. According to him, in these notes, Pukui describes the original three *‘ulu* trees brought to Hawai‘i. From these parent trees, all other *‘ulu* trees grew. Although Mr. Farden could not recall the names of the three trees, he remembers that two of them were planted near the project area. One was at the prison, and was referred to as hanging tree because prisoners were sometimes hung from it. The other tree, believed to be an original, was located at the Baldwin House.

Mr. Farden recalls stories that were repeatedly told to him about the Kaua‘ula winds that would blow so hard through Cut Mountain into Lāhainā that the people would have to hold down the roofs of their houses. The wind destroyed the Waine‘e Church that was replaced by the Waiola Church which stands today. The people would first know the Kaua‘ula wind was coming by a whistling noise coming from the mountain. This would be followed by a wall of dust with some cane tassels that were pulled up, coming into town. His Uncle Frank also shared a story with him about how he encountered the mythical white dog while driving home. As he got closer to the dog it became larger and larger until it was as large as a cow. According to legend, this sighting is a sign to turn around, which he did, only to find out that there had been an accident up ahead.

5.1.4 Mr. Sammy Kadotani

Mr. Sammy Kadotani was born in 1923 and raised in Lāhainā, near the project area, close to the home he continues to reside in today. He is a known community organizer and a proud Silver Beaver, the highest award given to an adult member of Boy Scouts of America. Mr. Kadotani attended King Kamehameha III School and the Japanese School at the Lahaina Hongwanji Mission. His family owned a fish market called Kadotani Fish Market on Front Street (across from the current location of Moose Mcgillycuddy's Restaurant) which he helped operate until he was an adult and later moved on to administer the Pioneer Mill Hospital. Mr. Kadotani is very

knowledgeable of the plantation camps that once existed around Lāhainā, which he attributes to his many years of delivering fish to the families living there.

Mr. Kadotani remembers Malu ‘ulu o lele Park as a place to hold community events, and referred to the park as a “Mecca” for their sports. He has fond memories of playing baseball, basketball and holding track events here. He did not learn of Moku‘ula and Mokuhinia until he was an adult. According to Mr. Kadotani, there was once a large pond where the Lahaina Shores parking lot is today where, as a child, he used to fish for *o‘opu* and *aholehole*. Below the pond was a grove of kiawe trees where “Old Lady Shaw” lived. Mr. Kadotani recalls Mrs. Alice Shaw reprimanding him on numerous occasions for fishing in the pond. Across from the pond, an area including where the Salvation Army is today, was a large swampy area that Mr. Kadotani remembers having to cross in order to get to Japanese School. He and other children would play and catch dragonflies in the swamp.

Mr. Kadotani recalls the Mokuhunia area as being somewhat sparsely populated with numerous kiawe trees and cane fields just *mauka* of the park. The houses in the neighborhood had large yards, large enough to graze a horse, that extended to the ocean. Along the ocean, people would gather *limu* (*waiwai‘ole*, and ogo) and were able to bring home fish of any size, a practice that Mr. Kadotani laments is not possible any longer thanks to DLNR regulations. Some of the fish that they would catch include: *moi*, *papio*, and mullet. According to Mr. Kadotani, there was a culvert next to the fish market that brought waste water from Pioneer Mill to be released into the ocean. He believes there was something in the waste water that attracted *moi* and mullet because they were numerous near the mouth of the culvert. Another favorite fishing spot was a pond situated where Bubba Gump restaurant is located today. Mr. Kadotani recalls using a torch to spear fish at night all alongside the bank of the pond.

Mr. Kadotani is not opposed to the restoration but is concerned about the potential effect to the existing businesses in the area. For example, the parking lot of Lahaina Shores was once a pond that was associated with Mokuhinia. He questions whether there is plan to restore these smaller ponds as well, in which case the Hotel would lose their parking lot.

5.1.5 Mr. Sam Ahia

Mr. Sam Ahia was born in 1939, in Honolulu, Hawa i‘i. He grew up in Honolulu then went on to pursue his music career in California for a number of years before returning to Hawa i‘i in 1973. He has played guitar with numerous legendary musicians such as Don Ho, Jimmy Borges, and Gabe Baltazar. He and his wife have been living in Lāhainā since the 1980’s where Mr. Ahia continues to play music on a regular basis.

Though Mr. Ahia feels at home in Lāhainā, most of his knowledge of the project area is limited to what he has been told in stories by friends who grew up in Lāhainā. He says most of his knowledge of Lāhainā has come “just by living here.” He and his wife used to go and listen to historian and Hawaiian activist, Dr. George Kanahele, speak about ancient Hawai‘i and through him they gained some insight into the drastic changes that have taken place since the time of Moku‘ula and Mokuhinia.

Mr. Ahia’s father was one of the earliest builders of Hawaii. He served in the old territorial government. He served in many different positions, but his last one was Senator, and was also

part of the Wilcox Rebels that tried to restore the queen back to power again. Even though they were defeated, more than once, his father was always ready to support or defend.

Mr. Ahia recalls that when he was a child, if you were paddling a canoe, you could not be on the reef side. One would have to be in the outer darker blue parts of the water to paddle the canoe across the whole area of what we call Front Street, Lāhainā today. These were the rules when the royal family was in town for the summer. He also recalls a river near Waiola church that use to have *lo‘i* all along the whole hillside of Lāhainā. There use to be rich soil that had taro, *‘ulu*, and bananas growing along the banks. He said that now the river has been changed, and the water is deterred out to Puamana. He expressed how the area was so beautiful and lush, and the water would incase the whole hillside before.

Mr. Ahia’s family genealogy has High Chiefess Ahia as a sister to his line. They say that similar to Samoan tradition, if the woman’s family has the title to the land, the guy who married her, he would take her family surname. So that is how his lineage is so interconnected. Captain George Beckley had married the High Chiefess Ahia and then they started a family line together. Captain Ahia was the superintendent of canoes. His name was Kaha, and his daughter, Milaina became a high chiefess and was adopted by Queen Kaa‘humanu. They all trail the same genealogy

5.2 Community Consultation and Informal Interviews

5.2.1 Ms. Hokulani Holt-Padilla

An informal telephone interview with *Kumu Hula* Hokulani Holt-Padilla was conducted by Colleen Medeiros on December 20,2012 with regard to the current study and proposed project. Ms. Holt-Padilla noted that there were no known cultural practices specific Mokuhinia and Moku‘ula per-say after the pond was filled in 1918. The area was utilized as a ball park and that is the memory she has of the area. Hawaiian cultural practices have taken place only since the Friends of Moku‘ula have brought attention to the cultural significance and the history of Moku‘ula, maybe over the last ten years or so.

Ms. Holt-Padilla believes that Mokuhunia and Moku‘ula should be restored and recognized nationally for its significance in Hawaiian History. History, culture and the Hawaiian Nation are attached here and restoring the pond would bring back these aspects of its significance. She also feels a personal and emotional connection to the restoration effort and notes that it will bring back national pride to all Hawaiians, much like Kailua-Kona, an area recognized in cultural practices. Ms. Holt-Padilla also asserts that restoring the pond is more important than what might be impacted by restoration as we can learn from excavating the pond.

During the informal interview, Ms. Holt-Padilla recalled that a chant about the Moku‘ula entitled “e hoi Kanani, e hoi Kanani Moku‘ula” was published in the Hawaiian language newspapers. She goes on to highlight the political, religious, and cultural significance of the *loko* as the home of Kihawahine and the Pi‘ilani royal family. Kihawahine is a symbol of Maui’s political, religious and cultural strength the worship of whom continues today and symbolized by the color yellow, the noted color of the female deity. It is important that the Pi‘ilani royal line must be remembered.

5.2.2 Ms. Owana Ka‘ōhelani Salazar

On March 28, 2013, Anna Cordova met with Ms. Owana Salazar near the projects site to garner her *mana‘o* regarding the proposed project and the project area (see also Appendix B). Detailed notes were taken during this interview and email were exchanged afterwards. These notes, along Ms. Salazar's additions to the notes, can be found in the Appendix of this report. During this informal interview, Ms. Salazar made it known that she is a descendant of the Royal Pi‘ilani line on her mother's side. She was raised on Oahu, but began coming to the project area in 1974 for an annual ceremony at Waiola church in which the restoration of the Royal Tomb was celebrated. While there, her mother taught her more about her ancestors and their connection to the area.

Ms. Salazar then relayed some of the dreams and visions of Kihawahine and the *mo‘o* that she began having when she began regular stays in Lahaina in the late 1990s. (For more detailed information about these dreams and visions, please refer the to Appendix of this report.) The vision and dreams served to assure Ms. Salazar that Kihawahine and the ‘*aumakua* are indeed real and present deities. She wants to emphasize that these beings are not only ancient Hawaiian deities, but that they are very much present and being revered by some of today's modern Native Hawaiian people (including Ms. Salazar).

As for the project specifically, Ms. Salazar is concerned with and against the building of any structures being built on land where Mokuhinia and Moku‘ula once were. She is especially concerned with any bathroom facilities being built in the area due to the fact that human waste in the area would be extremely irreverent to Kihawahine and the *mo‘o*. On this note, Ms. Salazar would like for the pump station currently located in the parking lot just east of Malu ‘Ulu o Lele Park to be removed. Another concern for her is that any disturbance of earth near the Waiola Chruch cemetery will disinter *iwi* buried in the area. Overall, Ms. Salazar wants to emphasize the sacredness of this area as the home of Kihawahine and the *mo‘o* ‘*aumakua*. Any actions taken to carry out this project should be done with that in mind.

5.2.3 Mr. Leslie Kuloloi‘a

In a letter to Pua Aiu, Administrator of the State Historic Preservation Division, dated March 11, 2013 which outlined the connectivity of the Kuloloia Ohana to Oahu and Maui and lineal descendant rights, Mr. Manuel Kuloloia, son of Mr. Leslie Kuloloi‘a share the following *mana‘o* as it relates to Waine‘e, Moku‘ula, and Loko o Mokuhinia (see also Appendix B):

> The Kuloloia lineage predates the conquest of Kamehameha and escaped the attempts of the victor to eviscerate ancient memory. Namahana died at Kuloloia, O'ahu. In Ruling Chiefs of Hawaii, Samuel Manaiakalani Kamakau, who helped form the first Hawaiian Historical Association and also appointed to the Land Commission, mentions that Kaheiheimalie was taken to the stone house of Kuloloia at Waine'e, Maui upon her death in Jan. 1842. Kamakau tells of Ulumaheihei traveling to O'ahu, passing makai of Kuloloia. Kamamalu and the older boys and girls of the Royal School were comfortably situated at Kuloloia house, Waihe'e, Maui while attending a government conference in 1841.

Mr. Leslie Kuloloi‘a has shared that a contributing stream to Loko o Mokuhinia, and a place identified adjacent and *mauka* of the *loko* bear the name of Kuloloia (see also place name

discussion in Section 3.1 Traditional and Historical Background, Table 1 in Section 3.1.3Mid-1800s and the Great Māhele, and Section 6.8.1 The Original Extent of Loko o Mokuhinia). His concern is that the *mana‘o* of the community and the stories be brought together and considred on a broad level. For Mr. Kuloloi‘a, Moku‘ula is about the shoreline, *mo‘olelo* (traditions), *wao* (land regions), *akua* (gods), and streams. These things intertwine and threads together – a spiritual connection from the ocean to the sea to our *kupuna*. It is the community who should direct and tell the project proponents “who, what, when, why, and how.” Moku‘ula is important because it is about every time period from the beginning of time. Moku‘ula is about a sense of place. Mr. Kuloloi‘a wants to be appraised of anything that might pose injury to his traditional religion and wants to be sure that with regard to any restoration effort that the best studies and available technology be used for the project.

At a community meeting conducted on May 15, 2012 (see also Section 5.3.2 below), Mr. Kuloloi‘a stated that he felt that more research and clarification was needed. He asked about the cultural significance of the site, noting that it is a “high sacred place”. He emphasized that the historic maps reflected white man’s perspective, as they do not document the sacredness of the site and stressed that he is initially against the project under the direction of the USACE, furthing noting that the two families that must be consulted are the Kaina and Kuloloia families, as these two families were present before Kamehameha III. Mr. Kuloloia further felt that the hydrogeologic testing was flawed, as the test wells were not deep enough to assess tidal flow and stated that a definition and restoration of the this *loko* as wetland is a white man’s concept and that the site should be a fishpond.

Mr. Kuloloi‘a further testified at the Public Scoping meeting for the Environmental Assessment (see also Section 5.3.3) that he is listed on the historic register documents and formally indicated his interest in the site. He compared Moku‘ula to Pākaka (in Honolulu), referencing the destruction of the reef to build Kawaihao Church and emphasized the need to add to the documentation the site’s history, as it has been fragmented. Mr. Kuloloi‘a further requested a copy of the Executive Order establishing Malu-Ulu-o-Lele Park, and expressed the need to understand the County’s interest in the site stating that the County should not pressure the community, but rather follow the community’s lead. He stated that while he is against the project, he will not seek to stop it, that he wants the history to be properly documented, and wants to be part of the partnership. He emphasized the need for the site to be treated as sacred ground, noting that more protection is afforded to the whale sanctuary and critical habitat for monk seals.

5.2.4 Mr. Foster Ampong

On April 15th, 2013, Mr. Foster Ampong had submitted a formal letter expressing his thoughts on Loko o Mokuhinia (see also Appendix B). He noted how taking responsibility and fulfilling one’s Kuleana in large part is to recognize, acknowledge, respect and honor someone else’s Kuleana. Foster states that Loko o Mokuhinia is located in the ahupua’a of Waiokama and Wainee and is wahi pana of his family. He mentions that the waters from the wao akua of Mauna Kahalawai and Pu’u Kukui, mauka of Kaua’ula Valley and pu‘u Pa‘u Pa‘u has flowed freely to Mokuhinia, Moku’ula, the aina, muliwai and kahakai of Waiokama; nurturing and providing sustenance to the mind, body and soul of his family for generations. He displays how they have a

symbiotic relationship which remains un-severed and un-extinguished from the time of Ku-muli-po.

Mr. Ampong is a lineal descendant of Waiokama-Waikane whose ancestors were born, thrived, died and buried at Waiokama. Foster mentions how it is a more transparent and balanced historical account of this wahi pana. He expresses how it is necessary to remedy the false/injurious historical context that is presently perpetrated from the maligning and racist narratives propagandized by the early Christian and plantation foreigners. He senses that these devastating effects continue to inflict great injury on the minds, hearts and souls of today's Kanaka o‘iwi Ohana.

Mr. Ampong points out that Mokuhinia and its elements-relatives, for example, Kanaka Moali a me na (symbiotic context) and Kanaka o‘iwi is Hawaii's inherent people and history (pre-1776 A.D.) were here before the foreigner, Captain James Cook and his lost-at-sea companions who simply stumbled upon the shore and/or their subsequent followings. He states that this is facts often shrouded and/or marginalized in today's Plantation/Tourist narratives marketed throughout Lahaina.

He closes with the statement of "The waters of kama (Mokuhinia) still flows to the Kahakai at Waiokama…" and he states that it is our (kanaka o ‘iwi) history that must be told and respected before the foreigners.

5.2.5 Mr. Charlie Lindsey

An informal telephone interview with Mr. Charlie Lindsey was conducted by Colleen Medeiros on December 20, 2012 with regard to the current study and proposed project. Mr. Lindsey questions how the County would maintain a pond and asserts that since we do not know exactly how the pond was originally, it would be impossible to restore it to its "original" design. He shared that down Front St. to Canal St., there was once a channel where fresh water exited into the ocean by Kamehameha III Elementary School resulting in a complete circulation of water. When the circulation was cut off, the area turned swampy likely resulting in the presence of lots of toads and mosquitoes which the vector truck used to come through to spray.

Mr. Lindsey notes that Kamehameha III (Kauikeaouli) converted to Christianity, and therefore asserts that if Kauikeaouli was not interested in the restoration of Moku‘ula, an area with a great deal of traditional Hawaiian cultural beliefs and practices associated with it, then why should the present generations do so and overrule the Royal family's decision to let it go and move to Christianity. He believes we should respect the decisions that were made at that time. Currently, the ditch along the ball park empties into the ocean between Holy Innocents Church and King Kamehameha III Elementary School.

With regard to the cultural and historical features in the vicinity of the proposed project area, Mr. Lindsey recalls the surf spot called ‘Uo, that fronted the current-day Lāhainā Harbor. This particular spot was a favorite of the *ali‘i* in traditional times and he also used to surf here with a plywood board. Mr. Lindsey also pointed out that there is a birthing stone located in the waters that fronts the current Lāhainā Public Library.

When Mr. Lindsey was a child, the proposed project area was a park which included a football field, track field, and baseball field. He further notes that the dredge from construction at

Lāhainā Harbor was used as fill for the ball park. This fill consisted of crushed coral and may have also included boulders from the cane fields. During his childhood, the Lāhainā town dump was also located at the project area (at the current location of the Salvation Army).

With regard to the restoration effort, Mr. Lindsey points out that the lower parking lot at 505 Front Street is continually pumped because of the high ground water and questions the potential effect that the restoration of Mokuhinia will have on other areas? Instead of spending funds on a restoration project, he suggested that a display should be created to show what the area used to be like, like at Honaunau.

5.2.6 Mr. Kenneth Sharpe

On February 13, 2012, Anna Cordova conducted an informal telephone interview with Mr. Kenneth Sharpe. During the interview, Mr. Sharpe shared that he attended Kamehameha III School when he was a boy and used Malu ‘Ulu o Lele Park as a playground. Kepa Maly also gave him some papers that showed that his great-grand aunt had property where the baseball fields next to the current aquatic center are now. With regard to the area of Lāhainā Town adjacent to the proposed project area, Mr. Sharpe shared that his relatives, the Kekua family, had property along the beach in front of Moku‘ula and his Aunty Ka‘ae (Alice Shaw) and Uncle Pat had a house on the *makai* side of Front Street where 505 is now. He further notes that his Auntie Ka‘ae raised *‘ama‘ama* in the pond on the *mauka* side of her house. With regard to others in the area, further notes that there were two residential houses where Lahaina Shores is now.

Mr. Sharpe shared that he was present in the early 70’s when construction workers were putting in a waterline for 505 and he recalls that the construction crew came upon stone that was part of the original canal for the wetland area of Mokuhinia in several places along Dickenson St., between Front St. and Luakini St., by the Catholic Church on Waine‘e and Dickenson, and the area where Dickenson Square is now. Along with parts of the canal walls, they also came across indigenous artifacts which included *‘ulu maika* and small pounders. He goes on to note that the construction crew left everything as they found it. With regard to the fills of Mokuhinia, Mr. Sharpe recalled that the fill dirt used to fill in Mokuhinia came from Honokowai.

5.2.7 Ms. Lilian Suter

On February 19, 2013, Anna Cordova conducted an informal telephone interview with Ms. Lilian Suter of Lāhainā regarding “Auntie Kai”; as well as the proposed restoration project. Ms. Suter noted that Auntie Kai’s English name was Alice Shaw, but she and her brother called Mrs. Shaw “Auntie Kai”. Ms. Suter recalled being frightened of her when she was a child and remembered that she was always sitting on her front porch on the beach side of her house and was always dressed in black. Mrs. Shaw would speak to the children in Hawaiian and when they did not understand or did not reply in Hawaiian, she would scold them. Ms. Suter said that she remembers going to Alice Shaw’s house with her father when she was a young child, clinging to her father’s hand, and hiding behind him while he spoke with Alice. When asked what she remembered about the house, Ms. Suter said it was a nice house for the time. It was a Western-style home in the area where 505 currently stands. There was also a swamp between the house and Front Street. Inside the house, there were sticks (they looked like canes or walking sticks) on all the walls, which Ms. Suter later learned were collected by some Hawaiians for the power they

had. Ms. Suter was not sure if Alice Shaw was a blood relative or not. Lilian's father, Dallas Kalepa, is related to the Richardson family, and the Richardson family is related to the Ka‘ae family. She knows that Alice was part of the Ka‘ae family so thinks they were probably related in some way. Her other recollections about Alice Shaw were that she claimed to be a lady in waiting for Queen Lilioukalani. She always dressed in very long, black dresses and was a good looking Hawaiian woman. She remembers her husband, Patrick, as being a heavy man who had health problems with his legs and could not walk much. She recalls that he was much younger than Alice. She remembers that William Ka‘ae was her son, and he was the captain of the tug boat for Young Brothers. He would always honk the tug boat's horn when he passed by Alice Shaw's residence. Lastly, Ms. Suter believes that her classmate, Isaac Ka`ae, was Alice's grandson.

5.2.8 Visit to Moku‘ula with Ms. Victoria Kaluna Palofax

In an informal meeting with Ms. Victoria Kaluna Palofax (Aunty Vicky) at Moku‘ula, Anna Cordova of CSH was invited to hear Kumu Kapono‘ai Molitau speak with his *oli* (chant) class about the important streams and waterways that once fed Mokuhinia. During the gathering, Kumu Kapono‘ai noted certain places that were important to the area. The first was Pu‘u Kukui in the West Maui Mountains, followed by Kanaka, Kanaha, Panaewa, Pa‘u Pa‘u, and Kaiolahaina (which is now commonly called Kamehameha‘iki). He then listed the following waterways as also being important to Mokuhinia:

- Waine‘e (*mauka* of Mokuhinia)
- Polanui
- Halaka‘a (near Shaw St.)
- Pulehunui
- Kaiomakili (commonly referred to as Puamana)

Kumu Kapono‘ai then took the class to the house where his father (John Keola Lake) grew up which remains on Front Street very close to Mokuhinia. He relayed a story that his father told him about the Kauaula Winds where his father remembered the winds coming up and causing a lot of property damage in the area. His father's tutu, whom also taught him the hula traditions that he then taught his childrent, predicted that the winds would come shortly before they did.

Aunty Vicky wanted to make it clear that she feels that current cultural practitioners should be brought in to restore the pond so that nothing is damaged. She further feels that no modern structures should be built in the area so as to preserve the original state of the pond and island.

5.2.9 Mr. Ke‘eaumoku Kapu

Mr. Ke‘eaumoku Kapu provided input and comment on the significance of Moku‘ula and Loko o Mokuhinia and concerns regarding the proposed project through both email correspondence and meeting with the Aha Moku o Maui in March of 2013. Mr. Kapu's main concern is that this site not necessarily be opened up for tourism once the *loko* is restored. He stated more than once that he does not want tourism in the area, and does not want any structures in the area that were not originally there at the time of Kamehameha III. He is concerned that since the land is currently under the jurisdiction of Maui County, this will open it up to the

public. He is concerned about this possibility because he wants to preserve the sacredness of Mokuhinia and Moku‘ula. To counter this, Mr. Kapu suggests giving stewardship over to FOM to manage and ensure restriction to the island and sacred lands. He emphasized that the intent is to bring the glory back to the area, and let people see how it was, not necessarily open it for general public use.

As for the logistics of carrying out the restoration, Mr. Kapu wants to know the impact from the sewage pipe and cane fields. He states that we cannot just look at the surface, and suggests going deeper to allow us to find out how healthy the water is. What are the adverse impacts to the ground water from above? Will that affect the waters of Mokuhinia? Mr. Kapu emphasized that this is particularly important because the land and water are all connected from *mauka* to *makai*. He also specifically suggests that the outlet for the pond be up by the Hongwanji to allow the *auwai* to be flushed out. He notes that this would also help with mosquito control. With regard to specifics of the conceptual design proposed for the project, Mr. Kapu recommended that the outlet from the *loko* to the irrigation ditch that forms the boundary of TMK (2) 4-6-007:002 be moved closer to culvert off of Luakini Road and the Hongwanji Mission.

In an email on March 18, 2013, Mr. Kapu emphasized the historical importance of the area and his connection to it. He says, “Kamehameha III wrote the first constitution naming it the constitution of Kalua‘ehu which is the name of the fishpond fronting the island where the *ho‘okupu* was offered to the Mo‘o goddess Kiha Wahine. Kamehameha believed that the constitution should reflect the *kiole* (schools of little fish) to protect the little fish from being eaten by the big fish within the loko of Kalua‘ehu. Everything is related from the Wau‘akua (place of the gods) to the Waukele (productive area) to the Waukanaka, (civilization), and this is the place I am from, Kaua‘ula! which is the place that fed the wetlands of this *loko i‘a* known as Moku‘ula/Mokuhinia.”

Overall, Mr. Kapu is concerned with the sacredness of the site being preserved. He wants to ensure that Native Hawaiians are allowed their rights to come to the area and practice their traditional religion once the proposed project is completed.

5.2.10 Mr. Levan Keola Sequeira

On Thursday, April 11th, 2013, Anna Cordova conducted a follow up consultation phone call to Mr. Levan Keola Sequeira. The purpose of this phone call was to summarize an interview conducted with him by Friends of Moku‘ula and to gather any additional information that he wanted to give. Mr. Sequeira grew up in Lahaina near the Moku‘ula area. He was born in Honolulu, but spent the majority of his childhood and adulthood in Pakala. The land that he currently lives on (very near Mokuhinia) is where he grew up. This land has been in his family since about the 1860s. Mr. Sequeira is a traditional Hawaiian wood carver. He began practicing this trade as a teenager and continues to do so to this day. Mr. Sequeira has made a carving of Kihawahine, based on an original carving of her found in Hawaii. Before and during the carving of the image, Mr. Sequeira prayed that his body and skills would be used to make an accurate carving. After the carving, he watched a video of himself doing it, and had little recollection of doing it that way. He claims this is because the ancestors were able to use his body and talent to make the image.

Mr. Sequeira's grandmother taught him about the area's history and about all the traditional Hawaiian medicinal plants located there. His grandmother had knowledge of the location of the *mo‘o* den at Mokuhinia and once pointed it out to him. She was also born and raised in the area and told Mr. Sequeira that when she was a child, she and her father used to hear music emanating from the Mokuhinia area. They were not sure of the source, but thought that it may have come from *menehunes* or something similar.

Mr. Sequeira recalls plant gathering in the area of Mokuhinia both on land and in the water. He used to gather plants for food and medicinal purposes with his grandmother when he was a boy. He also recalls other traditional gathering practices, such as fishing and harvesting *opi'i*.

The land that Mr. Sequeira currently lives on was originally Kuleana land. It belonged to Chief Hoapili who gave it to a blacksmith. This blacksmith then sold the land to Mr. Sequeira's grandfather – Russell Newton, Sr. This grandfather was a counselor for the last queen, Lilioukalani. Queen Lilioukalani stayed in Newton's house on the property when she visited Maui, and she was often serenaded there. Mr. Sequeira also has personal recollections of Ms. Alice Shaw who was a Lady in Waiting to Lilioukalani. She lived makai of the Mokuula area where 505 is currently located. Mr. Sequeira's grandmother and Ms. Shaw were friends and he recalls visiting her house when he was a child. She was a dignified-looking Hawaiian woman, and she had a fishpond on her property.

At the end of the phone call, Mr. Sequeira recalled the project area's connection to traditional Hawaiian deities. He went on to tell of the traditional cultural knowledge of the area and its connection to Native Hawaiian spiritual elements. He emphasized that Loko Mokuhinia is the main home of Kihawahine. The *mo‘o* that lived in the *loko*, is the giver of life (represented by the fresh water in the spring). According to Mr. Sequeira, the springs possibly come from lava tubes that run underground in that area; the source of these waters being Ka‘ua‘ula Stream. In keeping with traditional Native Hawaiian thinking, the West Maui Mountains are related to Mokuhinia because there are three features which represent the two breasts and the vagina of a woman. Between the two mountains that represent the breasts of a woman and the vagina is a feature that resembles a *mo‘o*. The *mo‘o's* location would then be in the womb of the woman. Ka‘ua‘ula Stream (which means red rain) originates from this area and, has little red rocks in it which represent the woman's menstrual period. Mr. Sequeira says that if you go to that valley near the stream, and listen, you will hear the rushing of fluids and a thumping which he interprets to be what a baby would

5.2.11 Ms. Deann Kaina and Ms. Silla Kaina

On February 18, 2013, Anna Cordova conducted an informal phone interview with the Kaina ‘Ohana which included Ms. Orpha Kaina and her two daughters Deann and Silla. Silla talked about playing baseball in Malu ‘Ulu o Lele Park as a child. She remembers unexplainable things occurring there. For example, she noted that in the area between home plate and 3rd base, there were at least two freak accidents that occurred to some of the children while playing baseball. In one incident, a player's eye came out of the socket, and in another, there was a knee dislocated. She mentioned that as children, she and her playmates did not know that this area was once a sacred site, but, looking back on it now, she says it makes more sense. As an adult, she came to find out that the area between home plate and 3rd base is where the actual island of Moku‘ula

once was. She noted that these accidents were strange occurrences, and thinks they had something to do with the area being *kapu*. Another example of unusual occurrences in the area that she gave regarded the Aloha Week Court festivities. During this celebration, an honorary royal family was chosen from the community on each island, and they would reenact the presentation of past royal family introductions when they arrived on an island. People were chosen to represent the king, queen, ladies in waiting, princes, princesses, conch blowers, a *pulo‘ulo‘u* carrier, two *kahili* bearers carrying red and gold, and spearsmen. Silla remembers that during one of these festivals when she was a child, an unusual small mist of rain came at the moment they were announcing the honorary king and queen and the conch shell was being blown. She emphasized that rain like that is very rare for that part of the island which is normally hot and dusty. This was significant because the stage for this ceremony was in Malu Ulu o Lele Park on the baseball field between home plate and 3rd base. The last thing that she mentioned about the Aloha Week Court festivities, was that she recalls several owls being seen during the ceremony. She says that owls are ‘*aumakua* (spiritual guardians) in Hawaiian culture. She also recalls that she and her playmates sometimes heard whistling and voices in the area, and they could not tell where they came from. The area (particularly Kuloloi‘a Stream near the Jodo Mission) was often flooded after it rained. She remembers that, as a child, she often wondered why the area had so much water, and did not find out that it had been a pond until adulthood. She says that in present times, she has noticed that certain plants have begun to grow in the area, such as *noni* and *lo‘ulu*, which are traditionally associated with Hawaiian royalty. Orpha made a referral to Rubelite Johnosn, who wrote out the *Kumulipo*. She says she is very familiar with the *ali‘i* and can tell us why they came to Maui, when, etc. Deann made a referral to Ke‘eaumoku Kapu about the project.

5.2.12 Pincess maori puananio tahiti Badoyen-Robinson

On March 19th, 2013, Princess maori puananio tahiti Badoyen-Robinson submitted an email outlining her *mana‘o* on the restoration of Loko Mokuhinia ecosystem. Princess Badoyen expresses her reverence to her ancient gods and goddesses and wants to make sure that they are not put on display and served as an amusement to visitors for a price. She emphasized on how the area needs to be restricted to the purposes of education, so that children from local schools can come and see how their ancestors lived. She suggests that the teachers and children be educated on the Loko Mokuhinia, before any visitors should be.

Princess Badoyen stated that Loko Mokuhinia is a sacred ground and the only people that ever lived there were priests and *ali‘i* and that once it is restored, the tradition be continued.

Princess Badoyen advises that during the Archaeological excavations, workers need to follow the Hawaiian protocol, specifically related to Kihawahine. She mentions that Akoni Akana, the former Executive Director of FOM (deceased), had at one time written a column in the Lahaina News, explaining the proper Hawaiian protocols for on-site workers. She expresses the importance of these protocols and said that if people are serious about excavating and restoring the pond, they need to observe and practice these protocols in respect to our ancestors. She says that our physical acts have unknown consequences when on sacred land. The protocols she would like to see enforced that were once mentioned by Mr. Akana include being very careful on what you touch, even on your own body. One must avoid scratching any itches, or expelling any personal waste from the body including urinating, defecating, blowing the nose, menstruating or

spitting. She expresses the importance of leaving the site to take care of these actions and to make sure one will wash their hands before returning to the site. Princess Badoyen states how that in modern times, it may be hard for people to understand the importance of these protocols, but they need to be followed. She states that even today, there are many accounts of unexplained occurrences and tragedies that have happen at construction sites all around Hawaii probably due to the fact that they were not following proper Hawaiian protocol.

Princess Badoyen goes on to mention that only certain royal medical practitioners, *la‘au lapa‘au*, were allowed near the pond to collect medicinal plants. She said the plants were located on the Makai side of the pond. There were many ‘ulu Breadfruit trees that had been planted in the Makai area to symbolize the prosperity of the royal family. She remembers them there as a child, but said they were all destroyed later on.

Princess Badoyen states that in Hawaii, when invasive or non-native plants are removed from an area where they had been long-established, the forgotten native plants would return. She conveys how we can expect the same thing to happen with Ma‘ulu o lele Park, where Mo‘oku‘ulu and Mo‘oku hinia lie. She says that her spelling of these areas reflect the former pronunciation of these places, because they are related to the *mo‘o*. She mentions that if you have heard of people collecting plants from that area since it was covered, to ignore them, because the traditions of the place are contrary to such gatherings.

5.2.13 Polanui Hiu – Ekolu Lindsey and Scott Fisher

Colleen Medeiros met with Mr. Scott Fisher and Mr. Ekolu Lindsey of the Polanui Hiu on January 8, 2013 to discuss traditional practices and look around at fresh water outlets in this area. Mr. Lindsey shared many comments and concerns about the project and voiced the following questions:

- Who will be financially responsible for the maintenance and upkeep of the pond?
- How will the pond water circulate with the ocean?
- How will mosquitos be controlled?
- Who will have access/use of the pond and island?

He noted that his family owned the block near Canal St. and Kamehameha IIII School in Waianae and Puako. This parcel of his family’s land was known as Lindsey Kalua Ka Mano or Kalua o ka Mano. This family knew a chant that they used to call in the sharks and feed them. As a young boy, Mr. Lindsey recalls seeing and talking to the man who did this and mentions a story of this man taking his canoe out and feeding the sharks. He also said that once this man was to meet some people at Olowalu and went by canoe instead of by foot and beat everybody there. It was said that he harnessed a shark who helped him arrive faster. Mr. Lindsey also mentioned a channel through the reef called Uha Ilio. This was a break in the reef that was maintained by his family members. It served as a channel for canoes and boats, but, he explains it was also designed to slow down fresh water entering the ocean here in order to slow down the water velocity and alleviate sedimentation and help more evenly dissipate the nutrients contained in the fresh water. This channel is marked by two poles. There are other channels like this at intervals both north and south, including one fronting the Lahaina Shores Hotel. Mr. Lindsey notes that

there is currently a lack of coral fronting Lahaina Shores, likely due to the constant flow of fresh water pumped into the ocean here, now and historically. He recollects that Waine‘e translates to ‘Seeping Waters’ and there used to be a bridge over front street.

At this point in the discussion the three participants then went to the ball park and followed the ditch along Mokuhinia Way to its outlet between King Kamehameha III School and Holy Innocents Church. They then went onto the beach to see where it entered the ocean. They observed *talapia* and *aholehole* in the ditch/drainage water. The water this day was unusually clean looking. They then walked back down to Polanui along the beach and identified the rivulet of fresh water being pumped by Lahaina Shores, entering the ocean. Mr. Lindsey pointed out another drainage exit further south nearer to his home.

Mr. Lindsey is potentially in favor of a hybridized restoration (not a full restoration of pond but something else). He would like there to be something that explains the history of the area such as a museum or something similar.

5.2.14 Mr. Keoki Sousa

The following is a summary of comments and concerns voiced by Mr. Keoki Sousa during a phone interview with Ana Cordova on February 25, 2013.

Mr. Keoki Sousa says he is a kumu and one of the last remaining original members of Friends of Moku`ula. Through recent genealogical research, he says that he believes he is a lineal descendant of the Pi`ilani line. Mr. Sousa grew up on Oahu and the mainland, but says he feels a very strong connection to Kihawahine. He has had dreams and other things that lead him to believe the mo`o and Kihawahine is his `aumakua. Of all the kupunas that Mr. Sousa has spoken with about growing up in the area, they have almost all talked about their elders (particularly Christianized Hawaiians) telling them to avoid the area of Moku`ula and Mokuhinia. He says they talk about it as being kapu. Mr. Sousa also mentioned that in his movie *Waves of Change*, Eddie Kamae (who partially grew up in Lahaina) talked about playing baseball in Malu Ulu o Lele Park. Near 3rd base, he was tripped up by an unseen entity and believes it to be Kihawahine. Mr. Sousa wanted it to be known that he was not necessarily speaking on behalf of any organization. He wants it to be known that his personal allegiance is only to the mo`o goddess Kihawahine as his `aumakua. He wants her glory to be restored and respected for future generations. He went on to talk about the fact that he was hanai-ed by several kupuna in the Lahaina area, and was once made president of Kahuna La‘au Lapa‘au O Maui. He then went on to talk about the la`au lapa`au (traditional Hawaiian remedies) that we found on every Hawaiian island in ancient times. This is what he studied most with the kupuna. He then went on to provide a list of these native healing plants and herbs that were found in the area in and around Mokuhinia.

- Kōlī: The castor bean (also known as the Palma Christi or Palm of Christ) is extremely toxic. But, ancient Hawaiians used the leaves as a poultice for injuries such as a sprained ankle.
- Makaloa: This was a very soft marshland grass that was used to make fine, soft mats.
- Milo: This tree’s leaves were used for medicinal purposes, but the nut was also very important to Hawaiian people. When the nut is green, the surface can be scratched off

and a bright yellow liquid oozes from it. This was used for dye, particularly for things related to the ali`i since yellow is a royal color.

- Hau: Part of this tree was used to make cordage. The sap was sometimes used to lubricate the vagina during childbirth.
- ‘Akia: When fisherman did not have a net, they sometimes used the branches of the akia to catch fish. When placed in the water, the branches of this shrub release some sort of chemical that stuns the fish. In their stunned state, the fish can more easily be collected by the fishermen.
- Noni: The fresh pulp of the fruit of this plant was used for all kinds of ailments.
- Naupaka: The juice from this white berry will heal a bee sting within 5 minutes of application.
- *Pa‘u o hi‘iaka, ilima papa*, and another type of beach morning glory also grew in the area of Mokuhinia. Mr. Sousa could not think of the name of the beach morning glory, but knew that it was often used to help heal broken bones and sprains.

Mr. Sousa shared that one of his big interests with the restoration of Mokuhinia is to reintroduce the native plants that once grew in the area.

5.2.15 Mr. Carl “Kale” Eldridge

On February 13, 2013, Anna Cordova conducted an informal interview with Mr. Carl “Kale” Eldridge via a phone conversation. Mr. Eldridge is not originally from Lāhainā, but says that his great-great grandmother, Kalula Memehu, used to entertain Kamehameha III on Moku‘ula by singing and dancing. Her uncle helped to build the original building for Waine‘e (Waiola) Church. She lived in the area with her uncle, and that is why she was present to entertain the royal family. He is now retired, but he worked across the street from the project area at Kamehameha ‘Iki Park for many years, beginning in 1994. Mr. Eldridge recalls that he worked with Akoni Akana when Friends of Moku‘ula was first being formed. He has knowledge of a building called Hale Puila, on the *makai* side of Front Street across from Malu ‘Ulu o Lele Park that was removed before his lifetime. He remembers being told that it was a two-story Western-style building that served as a residence for some of the royal family. He believed that the area on the corner of Shaw and Front Streets were wetlands and an area where taro was grown. Mr. Eldridge is concerned about where the restored Mokuhinia wetlands would drain into the ocean so that the water does not become stagnant. The area at the corner of Shaw and Front Street is where he believes the original pond flowed out to the ocean. He feels it would be best if the original footprint of the pond was followed as closely as possible and is concerned about disturbing the original walls and pier. Mr. Eldridge mentioned his recollections of a burial being found across the street in Kamehameha ‘Iki park around 1999 and would caution anyone working on this project to be mindful that there may be burials in the area. Lastly, he made referral to a Mr. Charlie Makekau who lived just *mauka* of Mokuhinia between Waiola Church and the Hongwanji Mission for many years.

5.2.16 Ms. Lucienne DeNaie

On December 19, 2012, Colleen Medeiros conducted a phone interview with Ms. Lucienne DeNaie. Ms. DeNaie voiced some of her concerns about the project. In general, she would like to see Mokuhinia and Moku‘ula spiritually reclaimed. She says that the connectivity to waters of Waine‘e Stream is critical to the overall restoration. Ms. DeNaie recalls that there was a *mo‘o* head-shaped artifact excavated from an area adjacent to the project area. She wants it known that this area is still culturally significant to modern Hawaiians. To emphasize this fact, she noted that the Ka‘apuni (a torch march organized by Ke‘eamoku Kapu) began and ended at Moku‘ula for reasons of cultural significance.

5.3 Hawaiian and Local Community Organizations

5.3.1 Nā Kia‘i o Waine‘e – The Waiola Church Cemetery Committee Meeting of April 24, 2012.

A meeting with Nā Kia‘i o Waine‘e was held at Waiola Church and attended by Ms. Dawn Chang of Ku‘iwalu and Tanya L. Lee-Greig of CSH. Mr. Earl Kukahiko is a long time resident of Lahaina, and served as the *Kahu* for Waiola Church for over 20 years. He remembers that the park was used for all manner of things, from a practice field for Lahainaluna High School athletic programs to a camp ground for the Boy Scouts. He noted the patches of salt on the grounds of the park and the small toads that would cover the park in the morning. These things are reminiscent of when the area used to be a pond. When camping at the park, he always felt like there was something there. Kahu Kukahiko recalls that the path of the *mo‘o* to the pond from *mauka* was on the north end of the grounds in the former location of the *Kahu*'s house and at the breadfruit tree. The *Kahu*'s house was built on stilts to allow for passage of the *mo‘o*.

Ms. Janet Bostik, an archaeologist with Maui Community College, was also in attendance at the meeting and noted the presence of large pumps in the underground parking lot of Lahaina Shores. This indicates the fact that there is a lot of fresh water running underground in and around the project area.

The Waiola Church Moderator, mentioned that the water table was high below the church grounds. He recalled that when digging graves in the corner of the cemetery, they would hit ground water at around 5 feet and is concerned about the maintenance of the cemetery easement that is approximately 16 feet *makai* of the stone wall at Shaw Street.

Finally, Mr. Tama Kaleleiki, who is a member of the committee and lineal descendant of the area, commented that at the current location of the Lahaina Shores hotel there was once a big *muliwai* that he would have to cross in order to get to school. The opening was deep and sandy. He also noted that the water was very strong during certain months of the year. *Ma‘o* would grow there in abundance and *limu ‘ele‘ele* could be found on the beaches indicating a freshwater source. He can recall putting a coke bottle in the sand that would fill up with fresh water. They would have competitions as *keiki* to see whose bottle would fill up first. Mr. Kaleleiki recalls that the breadfruit tree that stood at the path of the *mo‘o* was a *kapo‘ula* type of breadfruit - red *‘ulu* where both the sap and the meat of the *‘ulu* was red. He noted further that this particular tree was

said to have been planted by Kapo herself who is connected to Pi‘ilani. He then reiterated that the *loko* is the home of the Kihawahine, his *‘aumakua*, and mentioned the burial practices of those who were closest to the lineage of Kihawahine and those that revered her as their *‘aumakua*. These practices involved burying their dead in the banks of the *loko* as well as dropping them into the water. He expressed concern over the 4 remaining coconut trees out of an original large grove of coconut trees and the presences of burials beneath the trees. Mr. Kaleleiki wanted to make sure that the restoration was not one to exploit Hawaiians but to make sure that it is useful. He mentioned that he wanted to bring back the mullet and establish swimming areas of the pond.

5.3.2 Nā Aikane o Maui – May 15, 2012

On May 15, 2012, a meeting was held at the Na Aikane o Maui facility to discuss the proposed project and receive input from the Native Hawaiian community. Many of the discussion participants stated that it is important that only Native Hawaiian plants be brought back into the area for this restoration. Several times, community members mentioned that the area should be restored as a fishpond and not a general wetland area. They mentioned that the restoration should be conducted from a Native Hawaiian view, and a fishpond is more in line with traditional ways of thinking. On this note, the community members made it clear that the Aha Moku Council should be utilized by USACE in planning and carrying out this project. Most importantly, the participants made it known that the project area is extremely sacred to Native Hawaiians and it should be treated as such through all phases of this project.

5.3.3 Public Scoping Meeting May 30, 2012

A public scoping meeting for the overall USACE Environmental Assessment process was held at the Lahaina Civic Center on May 30th, 2012. Over 70 community members attended the meeting to seek information about the proposed project, share concerns, and offer their *mana‘o*. Many of the participants stated similar concerns and advice about how the project should be carried out. A few on the community members made it known that they are against the project because of the sacredness of the area and concerns about the heavy responsibility of maintaining the pond once it is restored. The majority of the meeting’s participants seemed to be for the general idea of restoring the pond, but did have many concerns. A common theme that many people brought up is the idea that this area is so close to many of the Native Hawaiian people of the community, that it is literally a part of their identity. Many of them noted their mistrust of government agencies, including the USACE and the County of Maui, and are particularly concerned because of the sacredness of this site. Some of the attendees mentioned that the history of the site, and the way in which it is communicated to the public is important. They feel that it should be told from a Native Hawaiian perspective, and want *kupuna* to be involved when it comes time to relay the extensive history of the site. Furthermore, many people want the Native Hawaiian community to be consulted throughout each phase of the project in order to ensure that things are done in accordance with their particular stipulations. The importance of how very sacred this site is was mentioned repeatedly. In particular, two of the community members shared that their *kupuna* were buried in and around the shores of Mokuhinia and are very concerned that any excavation in the area may disinter them. They also feel that only

Native plants and fish should be reintroduced to the area. It was stated that the project should be carried out from the mindset that the land is to be respected and taken care of.

5.3.4 Maui County Cultural Resource Commission Meeting of January 3, 2013

The MCCRC was consulted on the proposed project for the current study at their monthly meeting on January 3rd, 2013. The following concerns and recommendations regarding the cultural resources of Lāhainā and Mokuhinia were shared.

Janet Six, an Archaeologist for UH Maui College, as well as the former leader of the Moku’ula site field school for two years, mentioned that there should be no parking lot on site. She suggested that they build a parking lot elsewhere and provide transportation to view the site. She pointed out that in 1945, the park fill had sunk further down, and additional fill had to be imported to fill any sink hills. Ms. Six stated that she is not in support of the Friends of Moku’ula plans on building facilities for the site; however, she does support the USACE pond restoration plan. She mentioned that Moku’ula has been inhabited for 1300 years and the pond was fed by several sources. According to her personal opinion, Ms. Six believes that princess Kihawahine was last seen where the parking lot now stands. Ms. Six stated that Mary Kawena Pukui’s book on kinship of Ka‘u…does mention numerous burials in the pond.

Ms. Elle Cochran is the Maui County Council – West Maui Representative and also on the board of directors for Waiola Church says she supports this project. Ms. Cochran mentioned that she would like to see remnants of the pier preserved as well as the channel for the canoe intact. Ms. Cochran who kept close involvement on the vision committee, which worked closely with the Army Corps during their consultation efforts, says that this project can only proceed with the involvement of the Army Corps because the Wetland restoration is there “*kuleana*”. She expressed her concerns on how this project requires a great partnership with all parties involved working harmoniously.

Ms. Owana Salazar, a lineal descendent of Ke Ali‘i Keōpuolani, was also involved in the vision committee for Moku‘ula. She says there was a crown land survey performed of Moku’ula showing the islands size. She had shared the survey with USACE and expressed the importance on using the information she provided.

Ms. Clair Apana, the Great Granddaughter of the very last Kahuna at Moku‘ula, Victoria Kaluna expressed how we need to review the original restoration plan that Chris Hart had helped design which displayed the whole area restored. Ms. Apana did express her concerns about the location of the FOM parking lot and is urging CRC to recommend specifics to this project. Ms. Apana also mentioned how the Loko I‘a was connected to another fish pond near Kahoma river mouth. She conveyed how the pond/ocean connection of a river mouth is critical to the health of both ecosystems, and how FOM should consult people that work closely with fishponds.

Ms. Rhiannon Chandler mentioned how she wants to write a letter encouraging the Army Corps to continue with this project. She expressed how she "can't think of a more culturally significant project" and would like to see it completed within her lifetime.

Mr. Stanley Solamillo mentioned the magnitude of this project and how it may actually encourage the presence of more Hawaiians in Lāhainā.

Section 6 Traditional Cultural Practices

6.1 Traditional Hawaiian Habitation and Agriculture

Around 1796 Kamehameha I established his government at Lāhainā and from this time Lāhainā grew as the capitol of the Hawaiian Kingdom. LCAs as well as historical documentation for the study area illustrates the area as being a political and chiefly center during the time of the Great Mahele. According to Klieger (1998:69), Moku‘ula was the central point with the royal residence located there. Surrounding the island you had the loko of Mokuhinia and the area extending out from here was known as Kalua o Kiha where government officials and those of the kings court lived. Beyond Kalua o Kiha was Kalua‘ehu for the *ali‘i* and extended family. Beyond that was Lāhainā for the traders and Lāhainā *maka‘ainana* (P. C. Klieger 1998:70, Figure 19). Because this was the capitol of the Hawaiian Kingdom, Lāhainā was unique with regards to the traditional land tenure *ahupua’a* system. Here you had the political divisions described above overlapping with the more familiar *ahupua’a* system with the result being smaller and discontinuous *lele* type *ahupua‘a*. Klieger suggests that in ancient times Kalua‘ehu might have been itself a larger ahupua‘a, but that between 1780 and 1850 the area became fragmented into smaller land divisions to accommodate the various levels of chiefs moving into the area (P. C. Klieger 1998:69).

Mr. Keola Sequeira and his wife Dr. Apela Colorado live at Pākalā and explained that the area was where the *kaukau* chiefs or lower ranking chiefs, lived in the time of Kamehameha III. Mr. Sequeira said that the property has been in his family for several generations and was attained by his grandfather Russell Newton, possibly purchased from Catalena (L.C.A. 00206, see also Table 1) after the time of the Great Māhele.

Appropriate climate, soils and fresh water sources provided the people of Lāhainā with the necessary conditions for successful agricultural endeavors. It was stated by Handy and Handy (1991:492) that the areas main taro *lo‘i* were located in the lower reaches of Kahoma and Kanahā Valleys. The following description of Lāhainā speaks of these attributes:

> Lāhainā District was a favorable place for the High chiefs of Maui and their entourage for a number of reasons: the abundance of food from both the land and sea; its equable climate and its attractiveness as a place of residence; it had probably the largest concentration of population, with its adjoining areas of habitation; easy communication with the other heavily populated area of eastern and northeastern West Maui, “The Four Streams,” and with the people living on the western, southwestern and southern slope of Haleakala; and its propinquity to Lanai and Molokai (Handy et al. 1991:492).

During a botanizing trip into the mountains behind Lāhainā, Menzies described the *lo‘i* system in what is thought to be either Kahoma or Kanahā Valley:

> Here our conductors importuned us to dine, and a pig being killed and got ready, together with yams and sweet potatoes, we partook of a hearty meal, after which we continued our journey, and soon entered the verge of the woods where we observed the rugged banks of a large rivulet that came out of the chasm cultivated and watered with great neatness and industry. Even the shelving cliffs

> of rocks were planted with esculent roots. Banked in and watered by aqueducts from the rivulet with as much art as if their level had been taken by the most ingenious engineer. We could not indeed but admire the laudable ingenuity of these people cultivating their soil with so much economy. The indefatigable labor in making these little fields in so rugged a situation, the care and industry with which they were transplanted, watered and kept in order, surpassed anything of the kind we had ever seen before. It showed in a conspicuous manner the ingenuity of the inhabitants in modifying their husbandry to different situations of soil and exposure, and it was with no small degree of pleasure we here beheld their labor rewarded with productive crops. (Menzies 1920:105)

Another detailed description of the state of cultivation in Lāhainā was given by Menzies (1920) in his account during a trip aboard the Discovery, with Captain George Vancouver in 1793:

> March 17. On the forenoon of the 17th, I accompanied Captain Vancouver and a party of the officers, with the two Niihau women, to see the village of Lāhainā, which we found scattered along shore on a low track of land that was neatly divided into little fields and laid out in the highest state of cultivation and improvement by being planted in the most regular manner with the different esculent roots and useful vegetables of the country, and watered at pleasure by aqueducts that ran here and there along the banks intersecting the fields, and in this manner branching through the greatest part of the plantation.
>
> These little fields were transplanted in a variety of forms, some it rows, in squares, in clumps and others at random; some according to their nature were kept covered with water, while others were with equal care kept dry by gathering the earth around them in little hills. In short, the whole plantation was cultivated with such studious care and artful industry as to occupy our minds attention with a constant gaze of admiration during a long walk through it, in which we were accompanied by a numerous group of natives that continued very orderly and peaceable the whole time. (Menzies 1920:112)

At the time of Menzies visit it is unknown if the two extensive *‘auwai*, ‘Auwaiawao and the other called ‘Auwai o Pi‘ilani, were still in use. These *‘auwai* were said to have spanned from Kaua‘ula to Kahoma and are roughly datable due to their association with Kaululā‘au and Pi‘ilani. ‘Auwai o Pi‘ilani has its headwaters in the Kaua‘ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna (Maly and Maly 2007b:4).

Archaeological studies of Lāhainā provides additional evidence of the extent to which Lāhainā was settled and for how long. Archaeological sites located within the current study area include pre and post-contact sites ranging from agricultural sites, to habitation sites (several belonging to Maui’s chiefly residents), ceremonial sites and burial/cemetery sites. Mr. Kenneth Sharpe recalls uncovering several Hawaiian artifacts including an *ulu maika* stone and a basalt pestle as well as a historic wall and stone-lined canal, while serving as a traffic director during the installation of the water main for the 505 Front Street development (Medeiros et al. 2012)

The number of LCAs located within the project area is also a testament to the population and agricultural crops planted in the study area around 1848, during the Great Māhele. Based on Klieger’s (1998:66-68) LCA research, the LCA reflect 57 LCA in the areas of Pākalā, Waine‘e

and Waiokama. Of these 27 were house sites. Claims in the area contain *kalo*, *lo‘i*, *kula*, and *gourd* plantings plots. Klieger explains that *lo‘i kalo* was said to have extended from Waine‘e Nui into Kaua‘ula Valley. In addition to the evidence above which provides information regarding the population of the study area and traditional and historic agricultural practices, individuals interviewed for this study and others also described *lo‘i* cultivation which once took place within the current study area and continues to take place in the upland reaches of Kahoma and Kaua‘ula Valleys. The royal *lo‘i*, the name of which was Apuakehau, was once located where the modern day Lāhainā library and Pioneer Inn currently stands (Figure 19); as well as, the former location of Kamehameha I's Brick Palace was located.

Klieger (1998) includes Lahela Shaw's testimony in a land dispute. In this testimony from 1879 describing the boundary of Waiokama, Lahela Shaw describes a stone wall and *lo‘i* bank extending from a cluster of *hau* located at the seaward corner of Waine‘e church and extended to Moku‘ula. Pollen samples analyzed as a part of the archaeological survey conducted by the Bishop Museum showed quantities of *Cyperaceae* or Sedges, indicative of a wetland environment, *Pritchardia* pollen, *Cocos nucifera* (coconut) pollen, *Colocasia* (taro) pollen, inadvertently left when area was abandoned and *kalo* went to flower and created pollen, which was not usually the case. Mr. Carl Eldridge noted that the corner of Shaw St and Front St. were wetlands and *kalo* was grown here (see also Section 5.2.15).

6.2 Gathering for Terrestrial and Marine Plant Resources

The place names of Kalua‘ehu either incorporate or allude to the traditional plant resources of the area in such *ahupua‘a* names as Halaka‘a, Kamani, Polapola, Puamana, and possibly Polanui (see also Section 3.1 Traditional and Historical Background). According to those interviewed and consulted for this study, plant gathering continued into the late historic and modern era also occurred within the overall study area and lands immediately surrounding the proposed project area.

Lau hala, or the leaves of the *hala* tree (*Pandanus tectorius)*, were used traditionally for the weaving of baskets and mats. During community consultation for the current study, the presence of *hala* was noted within the vicinity of the current project and gathering of the leaves for weaving occurred into the late historic time period. Mr. Tama Kaleleiki also notes the presence of *ma‘o* or Hawaiian cotton (*Gossypium tomentosum*) would also grow around the proposed project area in abundance. Gathering of medicinal plants from park area such as *‘Uhaloa* or *hialoa* (*Waltheria indica*), *pōpolo* berry (glossy nightshade, *Solanum americanum*), and *noni* (*Morinda citrifolia*) also occurred into the modern era. *‘Uhaloa* or *hialoa* is weed common to dry zones such as Lāhainā with grayish leaves and heads of yellow and red flowers. With regard to medicinal used, the stems, leaves, and bark of the roots were pounded, strained, and used as a gargle for sore throat (Abbott 1992:101).

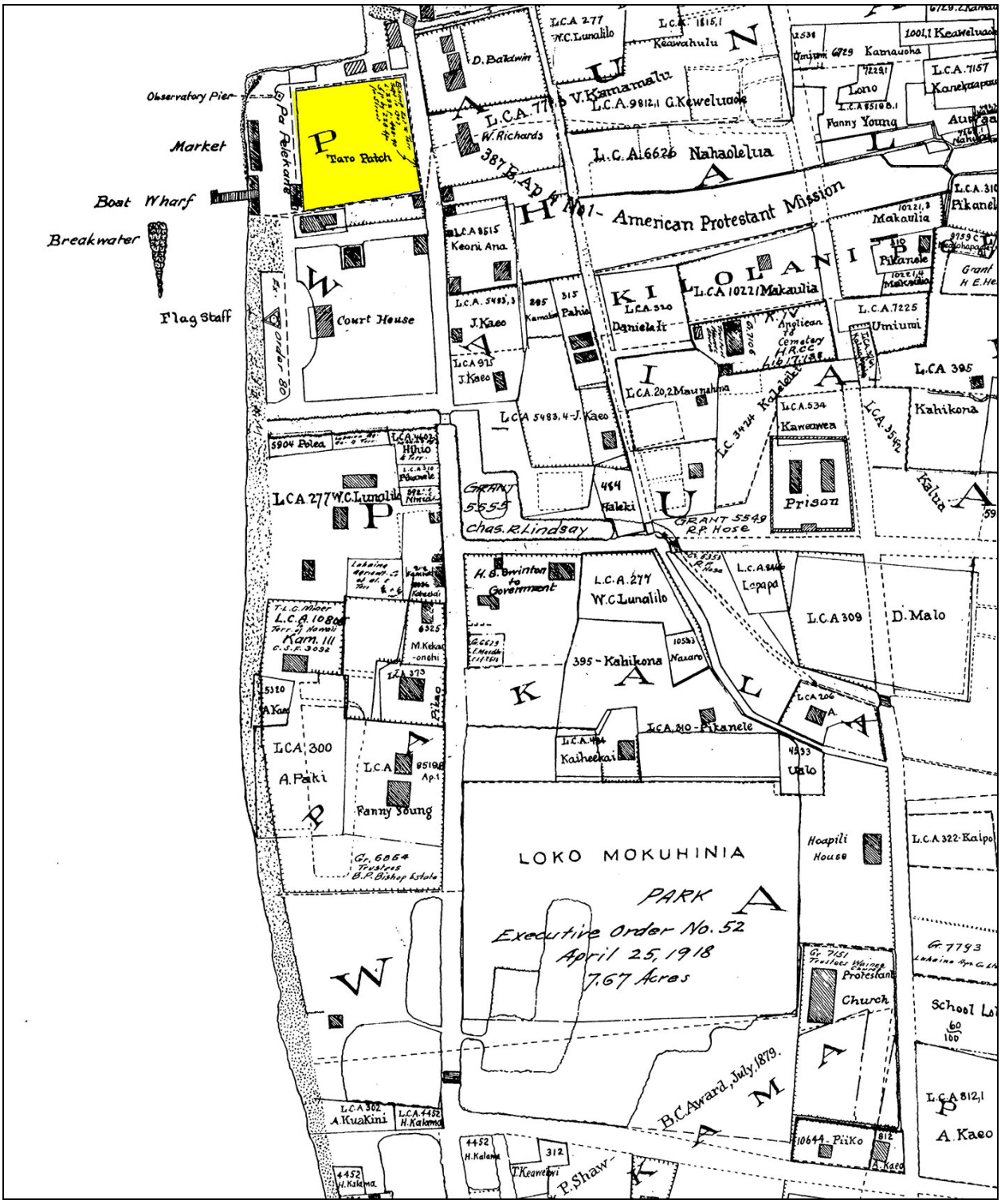


Figure 19. A portion of the 1884 S.E. Bishop map showing the location of the *lo‘i kalo* believed to be the royal *lo‘i* near the Lāhainā Courthouse (highlighted in yellow) in relation to the location of Loko o Mokuhinia.

Pōpolo berry may grow to be as tall as three feet with long, dark-green leaves that have a dull finish and clusters of white flowers which produce shiny black, sweet berries that have the texture of grapes. According to Isabella Abbott, in her compendium *La‘au Hawai‘i: Traditional Hawaiian Uses of Plants*, Handy and his fellow researchers considered the *pōpolo* plant as the most important of all medicinal plants as it was considered a *kinolau* form of the god Kāne and in obtaining it, the following *oli* (chant) is offered (Abbott 1992:99):

> I come to you, Kāne Pōpolo for a leaf of your body, as medicine for …

Abbott (1992:99) notes that the raw juice of leaves and ripe berries are used alone and in compounds for all ailments related to the respiratory tract and skin problems. When salt was added to *pōpolo* mixtures, this compound was used as a healing agent for cuts and wounds. Finally, the *keiki* leaves growing at the tips of branches could be steeped with a little salt and used to tone up the digestive tract.

Noni, a member of the coffee family is easily cultivated in gardens in both moist and dry areas from sea level to approximately 1300 feet in elevation (Abbott 1992:99). Identified by its large, glossy leaves and “grenade-like” yellow fruit, this plant was processed for *kapa* dyes as well as medicinal purposes for which all parts of the tree and fruit were used. Traditionally, the leaves of the *noni* tree would be crushed or singed and applied to bruises, boils, sores, and wounds. The bark of the stem was considered good for cuts and the juices extracted from roots were recommended for skin eruptions. Immature fruit was mashed and mixed with salt and applied as a counterirritant over bone breaks while the mashed meat of the green fruit was applied to the head if one suffered from a concussion (Abbott 1992:100). Finally, the half-ripe fruit would be cut in half and applied to a boil which would assist in bringing the boil to a head. More recently, it has been determined that the effective alkaloid element of the *noni* plant is useful in relieving menstrual cramps, arthritis, gastric ulcers, sprains, pjoor digestions, and problems associated with high blood pressure (Abbott 1992:100).

Mr. Keoki Sousa also provided the following list of traditional plants surrounding Loko o Mokuhinia and their uses, as known to him, in *la‘au lapa‘au* (traditional medicine):

> Kōlī: The castor bean (also known as the Palma Christi or Palm of Christ) is extremely toxic. But, ancient Hawaiians used the leaves as a poultice for injuries such as a sprained ankle.
>
> Makaloa: This was a very soft marshland grass that was used to make fine, soft mats.
>
> Milo: This tree’s leaves were used for medicinal purposes, but the nut was also very important to Hawaiian people. When the nut is green, the surface can be scratched off and a bright yellow liquid oozes from it. This was used for dye, particularly for things related to the ali`i since yellow is a royal color.
>
> Hau: Part of this tree was used to make cordage. The sap was sometimes used to lubricate the vagina during childbirth.
>
> ‘Akia: When fisherman did not have a net, they sometimes used the branches of the akia to catch fish. When placed in the water, the branches of this shrub release some sort of chemical that stuns the fish. In their stunned state, the fish can more easily be collected by the fishermen.

> Noni: The fresh pulp of the fruit of this plant was used for all kinds of ailments.
>
> Naupaka: The juice from this white berry will heal a bee sting within 5 minutes of application.
>
> *Pa‘u o hi‘iaka, ilima papa*, and another type of beach morning glory also grew in the area of Mokuhinia. Mr. Sousa could not think of the name of the beach morning glory, but knew that it was often used to help heal broken bones and sprains.

Because of the abundant ground water and fresh water springs of Lāhainā, as evidence by the presence of several *loko* or ponds surrounding Loko o Mokuhinia (see place names in Section 3.1, as well as Table 1 in Section 3.1.3), and their outlets along the coastline, the shores of the *kalana* of Lāhainā were notable for the plentiful varieties of *limu* or seaweed. Plant gathering along the coast was primarily for the different *limu* species such as *limu līpoa* (*Dictyopteris plagiogramma and D. australis*), *wāwae‘iole* (*Lycopodium cernuum*), *limu kohu* (*Asparagopsis taxiformi*), ogo or *manauea* (*Gracilaria coronopifolia or G. bursa-pastoris*), *limu ‘ele‘ele* (*Enteromorpha prolifera*), and *līpe‘epe‘e* (*Laurencia parvipapaillata, and L. dotyi, L. succisa*) (Dagan et al. 2009:125) all of which were commonly harvested from the ocean fronting the proposed project area.

Mr. Tama Kaleileiki recalled that the location in which the Lahaina Shores hotel currently stands, there was once a big *muliwai* (river mouth or pool near the mouth of a stream) that he would have to cross in order to get to school where the opening was deep and sandy. He also noted that the water was very strong during certain months of the year and that *limu‘ele‘ele* could be found on the beaches indicating a freshwater source. Mr. Sam Kadotani (see Section 5.1.4) also notes that he used to gather *wāwae‘iole* and ogo along the shoreline of Lāhainā, while others have noted that the scent of *limu lipoa* was pungent near Puamana.

According to informant testimony, *limu* gathering for subsistence purposes still occurs at select locations along the Lāhainā coastline. Some gathered ogo from Launiupoko area and *limu kohu* and *wāwae‘iole* from Wahikuli. Also collected *limu* referred to as “chop chop”. It was dark purple or black and smooth. This type of *limu* was also referred to as the pubic hair of a woman, in Hawaiian [huluhulu?].

6.3 Aquatic Resources

Freshwater resources, in addition to marine resources, supplied the Hawaiian diet with a rich source of protein. The coastal area fronting the proposed project area is rich with marine resources and is distinguished as the traditional fishing grounds for the people of the Lāhainā District. These fishing grounds are included in the areas designation as Lāhainā Historic District (#66000302), a Federal Historic Landmark also listed on the Hawaii State and National Historic Registers and within Maui County Historic District #1.

6.3.1 Geologic Overview

Fresh water seeps, springs and stream runoff free of chemical pollutants, creates vital habitat for near shore ocean resources by providing essential nutrients to reef and ocean. Fresh water infusions are a natural and integral part of *mauka* to *makai* ecosystem as it provided an important

resource for the successful cultivation of *lo‘i kalo*, the maintenance of the coastal fresh and brackish water *loko* systems, the resources needed to promote *limu* growth, and an important part of the overall health of the fringing reefs of Lāhaina. Ms. Janet Bosti,k (see Section 5.3.1) and Mr. Ekolu Lindsey (Section 5.2.13) noted that fresh water is continually pumped from the basement of the Lāhainā Shores hotel across the beach and into the ocean. Examining the Town of Lahaina map of 1884 and according to testimony provided by Mr. Sam Kadotani (see Section 5.1.4), Mr. Kenneth Sharpe (see Section 5.2.6), it appears that the Lāhainā Shores hotel was built over the pond called Loko o Nalehu (also referred to as Loko o Kolea [see also Section 3.1.3]). Ms. Lilian Suter (Section 5.2.7) who is related to the Ka‘ae family also recalled that the front yard of her Aunty Ka‘ae’s (Alice Shaw) property, where 505 Front Street is located and in the vicinity of present day Lāhainā Shores, was swampy. At the Maui County Cultural Resources Commission Meeting on January 3rd, 2013 (Section 5.3.4), Dr. Janet Six indicated that Loko o Mokuhinia was fed by several sources; spring/ground water, surface water, ocean water. Testimony provided at the same meeting by Ms. Clair Apana further noted the existence of an *auwai* system throughout Lāhainā that connected all of the ponds (CRC, Clair Apana).

The understanding of Mr. Kenneth Sharpe is that the water in Mokuhinia was always moving and circulating throughout Lāhainā in ancient times through the various *lo‘i* kalo, then exiting out to sea, one exit point of which was at the sluice gate of Mokuhinia near the Lāhainā Shores hotel. The abundance of ground water at Lāhainā was also noted by the Rev. Earl Kukahiko when water running under Waiola Cemetery was encountered when digging graves for interment at the cemetery.

6.3.2 Marine Resources

The areas “keystone” species include *manini* (Convict Tang, *Acanthurus triostegus*), *kole* (Surgeonfish*, Ctenochaetus strigosus*), *moi* (Six-fingered threadfin, *Polydactylus sexfilis*), *weke* (Goatfish, *Mullidae sp*.), *uhu* (Parrot fish, *Scaridae sp*.) and *hinalea* (Psychedelic Wrasse, *Anampses chrysocephalus*). These species were determined to be the main contributors to sand and reef composition and a healthy reef ecosystem. *Opelu* (*Decapterus macarellus*) could be found around the Mala Warf area (Medeiros et al. 2012:55) (see also Section 5.1.4). Other fish species mentioned include *kala*, *kalani,*and *aholehole. Pipipi, moi, papio*, *wana*, *oama*, all harvested from ocean within study area. Also went torch fishing near where the Bubba Gumps is today and according to Mr. Sam Kadotani, there used to be a little point where fish would gather. Sharks came in as well.

Individuals interviewed recall *opelu* canoes along the beach from the present day Lāhainā harbor to Kamehameha III school. *Opelu* and *akule* fishing. Individuals interviewed describe performing *hukilau* at sunset directly in front of what is now 505 Front Street, the area historically known as Mākila and ‘Uo Beaches and Pākalā and Waine‘e Ahupua‘a (P. C. Klieger 1998:66-67). The fishing families of those days (and today) are the Smiths, Sedangs, Nahina’s and the Lindsey’s. Any and all families were invited to participate in bringing in the catch and everyone would receive fish. For families who could not participate and to alleviate waste, after the catch was brought in, fish was taken door to door and given to anyone who wanted.

Fishing families of the area maintained channels through the reef. The channel, which fronts the Lindsey property, is called ‘Ūhā ‘Ilio meaning, thigh of a dog and refers to the curve of the

channel. The purpose of this channel was twofold: 1. To provide access to canoes and boats for fishing around and beyond the reef, and 2. To slow the velocity of the fresh water as it entered the ocean at these locations to alleviate sedimentation and help more evenly distribute the nutrients contained in the fresh water, as well as, slowing the incoming swell surges and waves. There are two poles which mark this channel. The Lindsey family, as well as others, used to keep this channel, and others like it in the area, clear by breaking back coral that would grow and start to close the channel. Other similar channels through the reef exist along the coast, another one is located in front of the Lāhainā Shores hotel.

‘Ūhā ‘Ilio is mentioned in a land dispute boundary description of Waiokama in testimony given by Lahela Shaw in 1879:

> Lāhainā is where I live. I am familiar with the boundaries of the ahupua’a of Waiokama. Kānema‘aikoa owned it before, then to Maele, then to Nalehu for Kamehameha [V], and from Kamehameha to [Ruth] Ke‘elikolani I bought it. I have lived here since my childhood. I am familiar with the boundaries at the time of my father Nalehu. Halemano surveyed under the directions of the residents and myself. Halemano showed me the picture-this is what was left, this is right and correct. Start at the hau tree pit that is left at the corner on the ocean side of Wainee Church. Go along the stone wall and lo‘i bank, and between, go until you arrive at Mokuula. Go seaward and at the back of Napaepae’s house go until you reach the sea. Napaepae’s house is in Waiokama. Go to the sea to ‘Ūhā ‘Ilio, alongside the pa of Kamoemaile, go inland, alongside Ko‘oka, Pua‘aiki, Pua‘anui, go seaward of the Government road until Wainee and return again to that hau pit. The church is slightly within Waiokama. Malalaukalo is only a name-it is within the ahupa‘a of Waiokama (P. C. Klieger 1998:89-90).

There is a parcel of land near ‘Ūhā ‘Ilio called Kalua o ka Mano (see also place names discussion in Section 3.1). The Lindsey family, whose ancestral lands are located at Kalua o ka Mano, has a family *oli* (chant) which was used to call in sharks. This family was known to feed the sharks at this location and it was said that the sharks behaved much like pet dogs. This family knew a chant that they used to call in the sharks and feed them. As a young boy, Mr. Lindsey (see also Section 5.2.13) recalls seeing and talking to the man who did this and mentions a story of this man taking his canoe out and feeding the sharks. Mr. Lindsey also shared that this man was once on his way to meet some people at Olowalu and went by canoe instead of by foot and beat everybody there because he had harnessed a shark who helped him arrive faster. Today, this location is popular surf spot referred to as “Shark Pits”.

6.3.3 Inland Water Resources

The inland water ponds of the area surrounding the proposed project are noted in both the individual sketch maps of land commission awards surrounding the immediate area of Loko o Mokuhinia (see also Section 3.1.3 Mid- 1800s and the Great Māhele); as well as the S.E. Bishop’s 1884 map of Lāhainā Town. Mrs. Roselle Bailey shared that the ponds are *pu‘uone*, or sand banked, fishponds. *Loko pu‘uone* are described by Carol Araki Wyban, in *Tide and Current Fishponds of Hawaii* (1992:111), as coastal fishponds that are fed by streams and/or springs with outlets to the ocean and therefore brackish. Ponds were enhanced by clearing of vegetation and sometimes widened and deepened. Fish stocked in these ponds were euryhaline, meaning

adaptable to fluctuations in salinity of water. According to Wyban (1992:111-114), such fishponds were stocked with *ama‘ama* and *awa.*

As mentioned in the sections above, the area in which the Lāhainā Shores Hotel is currently located was described as being the property of Alice Ka‘ehukae Shaw. Mrs. Shaw was known to have been a lady-in-waiting for Queen Liliuokalani and it was said that she always wore black with some people acknowledging that they had been afraid of her as children. It was rumored that she was a *kahuna* and Ms. Lillian Suter remembers the walls inside her home being lined with sticks that were said to have held *mana* or power. Those interviewed remembered the ponds around her home and recalled people fishing from these ponds where *ama‘ama* (mullet) was plentiful. According to Mr. Sam Kadotani and Mr. Kenneth Sharpe, *‘o‘opu* and *aholehole* were also raised be in Loko o Nalehu.

In addition to the resources that could be found within the ponds, and although the species is thought to be no longer extant, Mrs. Roselle Bailey also recalled seeing Hawaiian Rails (*Porzana sandwichensis*) in the area during her youth. Along with the Hawaiian Rail, at least one reference to the Kōlea bird is made when looking at the metes and bounds description of Kalaimoku’s LCA (L.C.A 00526) where Loko o Kōlea is noted as a boundary, this name being an apparent alternative name for Loko o Nalehu.

6.4 Traditional Hawaiian Archaeological Sites

Past cultural resource management investigations within the proposed study area have documented the area’s rich cultural resources (see Section 3.2 Previous Archaeological Research). These findings include Kamehameha’s Brick Palace fronting the Lāhainā Public Library, the outline of which is still visible in courtyard, and Hauola, the birthing stone located in the water fronting library.

Prior to the establishment of the State Historic Preservation Legislation and Regulations, Kenneth Sharpe, in his role as a traffic director for Wackenhut during the 1970-1971 installation of the waterline for 505 Front Street development, observed the trenching activities which uncovered several Hawaiian artifacts such as *ulu maika* and a basalt pestle near the Take Home Maui store. According to Mr. Sharpe, trenching for this waterline ran the entire length of Dickenson Street and continued left on Front Street to the 505 block. He said that these artifacts were reburied in the trench near the Take Home Maui store. In addition to the identification of portable artifacts, Mr. Sharpe noted that a stone wall was uncovered near the Take Home Maui store and construction crews also uncovered a stone-lined canal which ran along Dickenson Street. Additionally, there was stone work uncovered near Maria Lanakila Church, by the mango trees, on Dickenson between Front Street and Luakini, and described as “fitted rock with flat sides” or possibly hand cut-stone masonry. It was believed that this was part of a canal which connected to Mokuhinia.

Pertinent to the proposed project, archaeological studies conducted by the Bishop Museum identified the cultural layers of the living floors of Moku‘ula Island in addition to outlining the fill events of Loko o Mokuhinia based on the results of subsurface testing (Klieger et al. 1995; Klieger and Lebo 1999; Klieger and Somer 1995) (see also Section 3.2.1 Previous Archaeological Research Specific to the Moku‘ula Complex (SIHP 50-50-03-2967)). The

research resulted in the conclusion that much of the island is still preserved under the overlying fill deposit of the existing Malu-ulu-o-Lele Ball Park and the listing of the overall complex on both the State and National Registers of Historic Places (see also Appendix A).

6.5 Waiola Church and Cemetery

First dedicated in 1823, Waiola Church, formerly known as Waine‘e Church, was the church attended by the royalty of Lāhainā and is the place in which the tombs of the highest ranking *ali‘i* of the 1800’s are located, a plot that is sacred to all Hawaiians. High chiefess Keōpuolani, the highest ranking *ali‘i* in Hawaii at the time and Kamehameha I’s most sacred wife, supported the missionaries efforts and became the first Hawaiian converted to Christianity (S. Kamakau 1992:262-263).

Inez Ashdown (1947a) makes reference to Mokuhinia river and says that *ali‘i* paddled up this “river” to attend church services. She states that the Mokuhinia River flowed where the park is today and the waters came from the West Maui mountains and entered into the ocean. It seems likely that she somewhat misrepresented Mokuhinia in her descriptions by calling it a river when it was actually a pond fed by several sources that included ground water/springs and /or seeps. During archaeological investigations conducted at the Moku‘ula site by the Bishop Museum, excavations on what was believed to be the eastern edge of the island facing Waiola Church uncovered the presence of a pier (Feature 11), measuring 2.6 m (8.5 ft) long by roughly 0.75 m (2.5 ft) wide in test units N20E6 through N20E28 (Klieger et al. 1995:184). It is thought that this is the point in which the *ali‘i* who resided on the island would launch their canoes to cross Loko o Mokuhinia to attend church services. Members of Waiola also noted that the corresponding launch and mooring at the church is located on the western boundary of the church grounds. Concerns regarding this significant crossing were raised by church members consulted for this study who wanted to be sure that the mooring remain in place and that the *ali‘i* crossing be recognized during the development and design of the proposed restoration effort.

Members of Waiola Church and Na Kia‘i o Waine‘e, the Waiola Church Cemetery Committee, also noted that there is a church easement, or path, that runs between the *loko* and the church grounds (see also Section 5.3.1). Historic references to this path, or road, also appears in the survey notes and metes and bounds descriptions of the Māhele for *kuleana* lots that share common boundaries with the church (L.C.A. 206 to Catalena [see also Figure 9 and Figure 10 above] and L.C.A. 010644 Apana 1 to Pi‘iko [Figure 20 and Figure 21 below]).

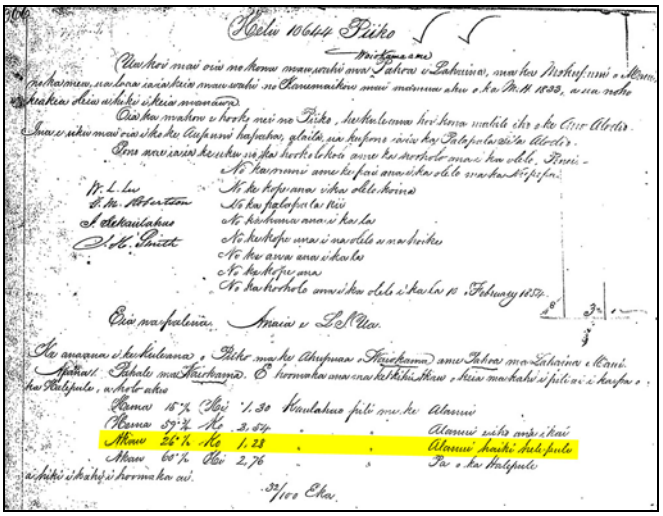


Figure 20. Metes and bounds description for LCA 010644 Apana 1 highlighting reference to "*Alanui haiki hele pule*"

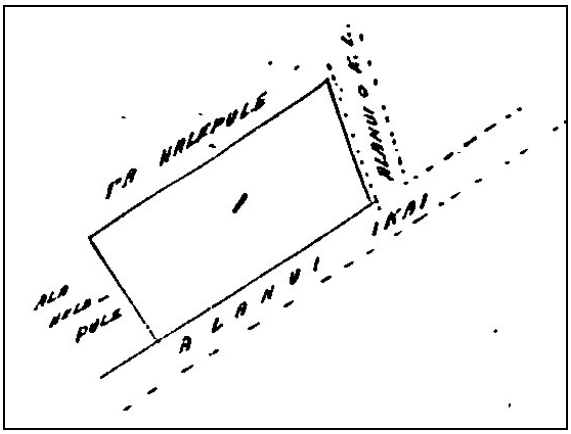


Figure 21. A portion of the lot sketch map for Helu 010644 to Pi‘iko showing Apana 1, note the label "*ala hele pule*"

Although all of the cemeteries in Lāhainā hold cultural and historical significance, and many historically influential individuals are buried in these cemeteries, it is at the Waiola Church cemetery, originally called Waine‘e Cemetery, that many Hawaiian *ali‘i*, and royal Kamehameha line are buried. Among them are Keōpuolani, the *kapu* chiefess who was the most sacred *ali‘i* of her time, outranking her husband Kamehameha himself, and mother to the ruling Kamehameha line. As a result of her acceptance of Christianity and with the consent of all the chiefs, Keopuolani broke the eating *kapu*, an act that led to the fall of the traditional *kapu* system (S. Kamakau 1992:223-224). Queen Ka‘ahumanu, Kamehameha I's favorite wife (S. Kamakau 1992:82), is also buried at Waiola Church cemetery. Queen Ka‘ahumanu also ruled alongside Kamehameha II, Liholiho, as regent and chief counselor (S. Kamakau 1992:219). In addition the these influential women of Hawaiian rank, the Ali‘i Kaumuali‘i who was the last independent *ali‘i* of Kaua‘i and the High Chief Hoapili are also buried on the grounds of the cemetery.

There is some speculation about the true whereabouts of the remains of these individuals. Originally they were interred at the royal tomb at Moku‘ula. In a letter dated May 9, 1947, Inez Ashdown explained that Mrs. William Ka‘ae (Mrs. Alice Kaehukae Shaw), 80 years old at the time and described by Ashdown as the authority on history in Lāhainā, Mrs. Ka‘ae explained that three coffins were taken to Waine‘e cemetery but did not contain the remains of the *ali‘i*. Instead they were filled with sand and thus placed in Waine‘e cemetery:

> I asked her about the actual burial of the chiefs here, and she said that when she was about 17 that Mrs. Bernice Pauahi Bishop moved some coffins from the old stone tomb to where the present headstones are now in Waine‘e cemetery. There were three coffins, but there were no bones in them. Only sand. But the coffins were placed on a wagon with a span of horses, and the people stood about with *kukui* torches to follow the wagon. But, the horses could only rear. They could not move the wagon. Then some of the older people "spoke to the spirits" and finally the horses could go on, and the coffins were taken to the present place. She [Mrs. Kaae] said that the old style was to "hide the bones of Ali‘i", so she

> does not believe the actual "bodies" of the Ali‘i are in the cemetery. However, they are someplace around Lāhainā in a hidden spot, so it "seems as well to say they are under the present headstones." (Ashdown 1947a)

Mrs. Alice Shaw, referred to as Aunty Ka‘ae in previous sections, is also buried in the Waiola Cemetery along its southwestern boundary.

6.6 Traditional Burial Sites and Other Historic Cemeteries

While traditional Hawaiian funerary practices were varied prior to European contact, Hawaiians most commonly interred their dead in sand dune deposits and caves. Often buried in a flexed position, with knees drawn up to chest, arms wrapped with hands tucked under knees, and head rested on knees, individuals may have been wrapped in *kapa* (bark cloth) with an outer layer of *lau hala* or other woven material. In cave burials, said to have existed at one time in the walls along Kahoma Valley, the bodies might have been flexed or laid in an extended position, or selected long bones and skull might be bundled in *tapa* (Buck 1957:565-573). Buck also describes platform tombs as being a common practice (1957:572). Additionally, individuals may have been buried with *moepū* (items placed with the dead) or any number of personal effects such as personal adornments, weaponry, or other sentimental items (Buck 1957:565-573).

Mr. Tama Kaleleiki shared that the bones of those who were closest in lineage to Kihawahine and those that revered her as their *‘aumakua* were interred either in the banks of Mokuhinia or dropped into the water itself. Mary Kawena Pukui describes the ritual practice of the those who are of the clan of Kihawahine in terms of burial interment where the bones of descendants of *mo‘o*, were wrapped in yellow tapa, and let down into a fresh water pool (Handy and Pukui 1953:153). Ms. Roselle Bailey also notes that there were burials on Moku‘ula Island that have since been moved.

With regard to the presence of other traditional burials that may be potentially affected by the proposed project, Mr. Kaleleiki expressed concern over the four remaining coconut trees that were once a larger part of entire grove along the boundary of Waiola Church and the lands which formerly belonged to the Shaws as there are burials beneath these trees. It was further mentioned that human remains were encountered during grubbing and excavations conducted by Maui County where their work was halted and SHPD was notified. Though human burial remains were not encountered during the archaeological study of Moku‘ula and Mokuhinia by the Bishop Museum (see also Section 3.2.1 Previous Archaeological Research Specific to the Moku‘ula Complex (SIHP 50-50-03-2967)), and with the above ritual practices in mind, concerns were raised with regard to potential encountering and disturbing previously unidentified burials during construction of the proposed restoration project.

With the arrival of foreigners to Lāhainā, specifically the Christian missionaries, Christian burial practices were established and coffin burials and designated cemetery parcels associated with the various denominations of churches, became part of the historic layout of Lāhainā. According to testimony gathered, as well as historic maps of the immediate area surrounding the proposed project area (Bishop 1884), it is known that the Shaw family owned the area in which the support facilities for Friends of Moku‘ula are proposed, and incorporates the lands where the Salvation Army is current located. Participants note that there is a map depicting the presence of chiefly tombs and burials located within this property. This would be the land section of

Waiokama which was a part of the LCA 7715.3 to Lota Kamehameha and after a land dispute ended in 1879 with Lahela Shaw purchasing it from Lota’s heir, Princess Ruth Ke‘elikōlani.

The following table (Table 6) lists historic cemeteries located in the current study area in Lāhainā Town. All of these cemeteries date to historic times and some are registered as State Historic Sites.

Table 6. Historic Cemeteries Within the Current CIA Study Area

Cemetery Name	Location	Description
Hale Aloha Cemetery/Lāhainā Episcopal (Holy Innocents Church Cemetery)	Waine‘e Street	Historic cemetery maintained by Lāhainā Restoration Foundation. Sixty-six tombstones and six unmarked graves.
Man Fook Tong Chinese Cemetery	Honoapi‘ilani Highway, near Aholo Road.	Irregularly maintained cemetery. Twenty-six tombstones and over seven unmarked graves.
Maria Lanakila Church	712 Waine‘e Street	This church was founded in the 1840’s and is regularly maintained. There are 291 tombstones and over 25 unmarked graves.
Puehuehuiki County	Honoapi‘ilani Highway	The Kā‘anapali Beach Hotel has maintained this cemetery since 1988. There are 42 tombstones and over 25 unmarked graves.
Lāhainā Hongwanji Mission Temple (Gov. Hoapili’s Lot)	551 Waine‘e Street	Property purchased in May 1911
Pu‘upiha County	Ala Moana Street, directly adjacent to Mala Warf	Three hundred tombstones and over one hundred unmarked graves. This cemetery is in a sand dune along the coast. The cemetery often deals with emotional issues as a result of wave action.
U.S. Seamens Cemetery	712 Waine‘e Street, within the Maria Lanakila Church Cemetery	Established in the 1840’s, this is the burial site of sailors who had died while at the port of Lāhainā. There is only one tombstone that remains of the over 100 burials located here.
Waiola Congregational Church/Cemetery	535 Waine‘e Street	Established in 1823 as Wainee Church, there are 134 tombstones and over 30 unmarked graves (see also Section 6.5 Waiola Church and Cemetery above)

It is important to note that all of the above cemeteries presented in this section are located within the study area for this CIA and less than one mile from the proposed project area.

6.7 Moku‘ula and Loko o Mokuhinia as a Traditional Cultural Property

A traditional cultural property (TCP) “can be defined generally as one that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that are (a) rooted in the community’s history and (b) important in maintaining the continuing cultural identity of the community” (National Register Bulletin No. 38). Based on the background research, formal interviews, and community consultation conducted for this study, as well as public testimony offered during public scoping

meetings held as a part of the USACE Environmental Assessment process, it is unquestionably clear that the inland island of Moku‘ula and the surrounding waters of Loko o Mokuhinia constitute a significant native Hawaiian traditional cultural property, not just at a regional or local level, but throughout the island archipelago. It was stated by individuals interviewed and consulted for this study that Moku‘ula may be the most sacred site in Hawai‘i Nei and its history is of National significance. Some believe that the restoration of Mokuhinia would provide modern day Hawaiians with a tangible connection to a place that was significant to ancient Hawaiian ritual and ceremony and critical to the history and politics of *nā po‘e kanaka* (Hawaiian people).

An *ahu* (altar or monument) was constructed in early 1990's atop Moku‘ula, and it was constructed while the area was still a ball park and prior to the Bishop Museum conducting their archaeological study of Moku‘ula. Those who participated in this study shared that this *ahu* serves as an altar for ceremony and worship. Mr. Keola Sequeira and his wife Apela Colorado, Reverend Kekapali, Mr. and Mrs. Ed and Pua Lindsey, and Mrs. Roselle Bailey, participated in blessing of this *ahu*. Prayers and an offering of *awa* was made by Mr. Sequeira who recalled that when he released the *awa* into the air, the wind caught the *awa* and swirled it around him. At that time he experienced a sensation of energy coming up through his feet, through his body and believed it to be the spirit of Kihawahine making her presence known.

The significance of this Traditional Cultural Property was recognized during the Torch March or *E Ka‘apuni A Ho‘a Kukui Na Moku ‘Aina* of February 20, 2009 which began and ended at this *ahu* location. It is notable that this large and very public Hawaiian cultural ceremony was performed at Moku‘ula and Mokuhinia and is a testament to the significance of this place to Hawaiian culture and history.

6.8 He Wahi La‘a no Loko o Mokuhinia – The Sacred Place of Loko o Mokuhinia and the Worship of Kihawahine

While the *kalana* of Lāhainā, which includes the area of the proposed project and adjacent lands, has been recognized and documented as a *wahi pana* or storied place (Dagan et al. 2009:127-128), Loko o Mokuhinia carries additional significance as a *wahi la‘a* or sacred place. The sacredness of Moku‘ula the inland island which served as a chiefly residence, is directly related to the surrounding freshwater pond, Loko o Mokuhinia. This *loko* has long been recognized as the primary home of the *mo‘o* goddess Kihawahine, an early ancestor of the ruling chiefs of Maui who was born a human and deified upon her death (see also Section 3.1.1 He Mo‘o, the Apotheosis of Kalā‘aiheana, and the Veneration of Kihawahine). The physical body of the serpent or *mo‘o*, namely their many vertebrae, was said to represent the linking of the lineal connection of generations of *ali‘i*:

> The royal mo‘o of Maui represents the indigenous royal family. She is the backbone that connects the present with the divine ancestors of the past (P. C. Klieger 1998:7).

6.8.1 The Original Extent of Loko o Mokuhinia

A picture is painted of the area by Ashdown (1947b), Klieger (1998; 1995), and Menzies (1920) that speaks of a lush grotto like area called Kalua‘ehu and/or Lua‘ehu described as being a larger fish pond surrounding Loko o Mokuhinia but connected and utilized for *lo‘i* and other crops. Additionally, there were canals which provided waterways for traveling by canoe and larger ships. Archibald Menzies (1920) describes the pond as partially irrigated by the Kahoma and Kaua‘ula Streams, and partially spring fed.

Concerns were shared about recognizing and acknowledging the original extent of Loko o Mokuhinia, and though difficult to identify the boundaries of *loko* at present, historic maps depict this area and the changes by which the development of Lāhainā Town on a Western model affected the distribution of the waters of pond. An undated map of the area surrounding Loko o Mokuhinia appears to show the town of Lāhainā as the initial Western style road system was being implemented (Figure 22). This map shows both the extent of the pond waters and banks; as well as, corresponding landmarks of the early 1800’s to include the walls of the former Lāhainā Fort at what is currently the Old Lāhainā Courthouse, Waine‘e Church, and the Prison.Though Klieger depicts the pond waters *makai* of Main Street (present day Front Street) as belonging to Loko o Nalehu (Loko o Kolea) (P. C. Klieger 1998:Figure 18), survey descriptions and testimony for L.C.A.s 302 and 4452 to Kuakini and Kalama respectively note that the pond waters adjacent and to the north of the lots belong to Mokuhinia (see Table 1 and Figure 11); therefore indicating that Loko o Mokuhinia also extended *makai* of the road. Mrs. Roselle Bailey, to this day, refers to the ball park area as a pond and pointed out that Loko o Mokuhinia once exited into ocean at Canal Street, which used to be an actual canal, and suggested restoring this street to a canal so that the waters of Mokuhinia can exit here.

The waters that contributed to that of Mokuhinia included Kuloloia Stream as well as Kaua‘ula Stream. Ms. Silla Kaina recalled that the area around Kuloloia Stream, near the location of the present day Jodo Mission, was often flooded after it rained. In addition to Mokuhinia being partially watered by waters of Kaua‘ula, Mr. Ke‘eaumoku Kapu and others indicate that there is a direct cultural connection between Kau‘ula Valley and Stream and Mokuhinia, beyond the hydrological connection. Female aspects are shared between West Maui Mountains (Mauna Hina), Mokuhinia and Kihawahine. Mr. Sequeira explained that there are three features which represent the two breasts and the vagina of a woman. Between the two mountains that represent the breast of a woman and the vagina, is a feature that resembles a *mo‘o*. The location of the *mo‘o* would then be in the womb of the woman. Ka‘ua‘ula Stream (which means red rain) originates from this area and, has little red rocks in it which is said to represent the woman’s menstrual period. Mr. Sequeira shared that if you go to that valley near the stream, and listen, you will hear the rushing of fluids and a thumping which he interprets to be what a baby would hear in the womb with the rushing of the mother’s blood and the thumping of her heart. This idea of the *mo‘o* being in the womb, combined with Kaua‘ula Stream being the source of Mokuhinia’s fresh water springs, makes the area very sacred. Levan says the fresh water ties in with the traditional home of the mo‘o in this area (representing the beginnings of life for the Hawaiian people) and therefore makes it a very sacred.

Mr. Tama Kaleleiki further shared that Loko o Mokuhinia is also connected to Kapo, who according to Beckwith (1970:187) is a sister to Pele and goddess of sorcery who was principally

worshiped on Maui “where she acts as an *akua noho* or god who possesses the deified dead and gives commands or foretells events through their worshipers.” Mr. Kaleleiki stated that that the breadfruit tree that stood at the path of the *mo‘o* was a *kapo‘ula* type of breadfruit - red *‘ulu* - where both the sap and the meat of the *‘ulu* was red. He noted further that this particular tree, which was once located near the minister’s house, was said to have been planted by Kapo herself who is also connected to Pi‘ilani.

6.8.2 Kihawahine Mokuhinia Kalama‘ula

Through the research and consultation conducted for this study, it is apparent that Kihawahine is the most revered and venerated of the *mo‘o ‘aumakua* (see also Section 3.1.1 He Mo‘o, the Apotheosis of Kalā‘aiheana, and the Veneration of Kihawahine). In her human life, Kihawahine was Kalā‘aiheana daughter of Pi‘ilani and Lā‘ieloheloheikawai, a *pi‘o* union of great *mana* (power), the offspring of whom is recognized as the ruling Pi‘ilani Line. As the *mo‘o* Kihawahine, her supernatural powers were so great that she was among the gods that Kahekili, *kapu* chief of Maui and ruler over Maui, Moloka‘i, Lāna‘i, and O‘ahu, worshipped as a means of keeping control of his government (S. Kamakau 1992:165) and Kamehameha the Great claimed her as his principle deity.

Kihawahine has been seen throughout her history as *mo‘o* and into the modern era. Ms. Alice Zephr Ka‘ehukae-a-Kamehameha Ka‘ae Shaw is the daughter of Patrick and Lahela Kuahu‘ula Nalehu Maelenopuhihiwa Kailiponi Kauhiopapau Shaw and known as Ka‘ehukai, Aunty Ka‘ae, Aunty Alice, Mrs. Ka‘ae (Inez Ashdown’s Lāhainā informant). Ms. Alice Shaw Ka‘ ehukai and her sister Mary Kawaiele-apu-ika-lani-a-Kamehameha Shaw Hoapili were *hānai* by Lota Kamehameha (King Kamehameha V) and therefore his heirs. The daughters were also the grandchildren of Kuahu‘ula Nalehu, a *konohiki* of Waiokama before the time of the Māhele. As a result of their lineage and land inheritance from both Nalehu and Lota in the *ahupua’a* of Waine‘e and Waiokama, they would inherit much of the eastern and southern shoreline of Mokuhinia. Klieger (1998: 87-92) draws the conclusion that they would also then inherit the role of *kahu* to Kihawahine. This was the understanding of some individuals interviewed for this study who believed that Alice Kaehukai Shaw was the last caretaker of Moku‘ula and Kihawahine. Mr. Keola Sequeira shared that the den of Kihawahine was located on the mid-southern side of the proposed project area and the Mrs. Alice Shaw’s burial location is along the southwestern boundary of Waiola Cemetery. It is thought that she picked this burial location to be in alignment with the den of Kihawahine.

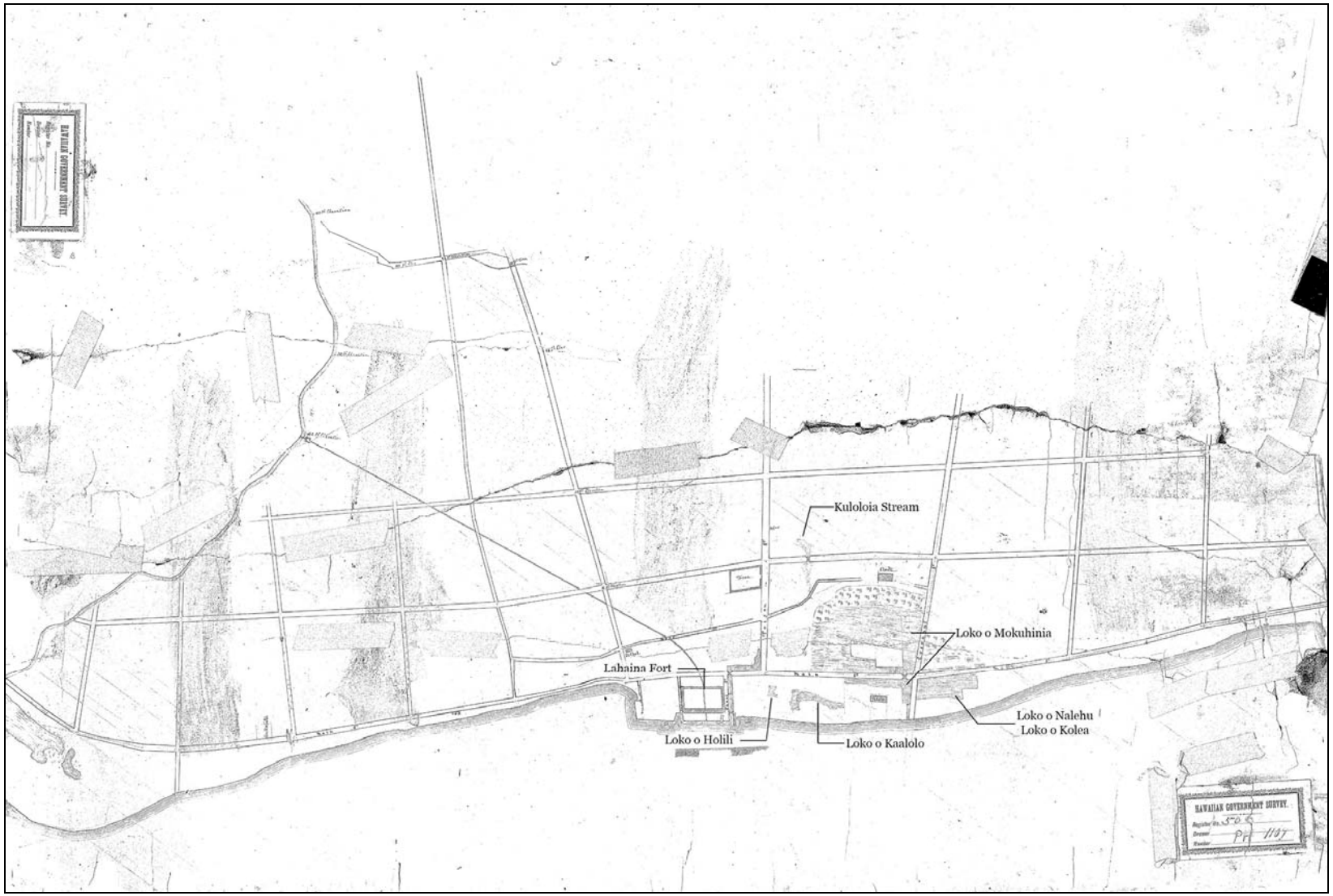


Figure 22. Registered Map 500 showing extent of Loko o Mokuhinia, labels added.

Figure 23. A portion of the SE Bishop 1884 map highlighting L.C.A 302 to Kuakini in blue and 4452 to Kalama in purple.

With regard to modern manifestations of Kihawahine, participants in this study have shared that Kihawahine has been seen where the Friends of Moku‘ula parking lot is now; as well as near the banyan tree in Kamehameha ‘Iki park. Community members also recall the 1838 account of Auhea Miriam Kekāuluohi, daughter of Kaheiheimālia and stepdaughter of Hoapili, nearly capsizing in her canoe on her way to church at Waine‘e. As the story goes, Kihawahine shook her canoe so much that she almost went overboard (P. C. Klieger 1998:50). Additionally, those consulted for the current study recalled stories told by *kūpuna* of hearing Hawaiian flute music coming from Mokuhinia in the early to mid-1900’s.

With regard to present day worship of Kihawahine, Mr. Sequeira has shared that he recreated her image (as sketched by BarnfieldP. C. Klieger 1998:11) using human hair and mother of pearl

eyes and teeth and utilizes this image in their worship of the deity Kihawahine. Some consulted for this study explained that today, people are still drawn to Moku‘ula to worship Kihawahine, and that although Mokuhinia is currently filled, and the exact location of the island of Moku‘ula forgotten by many, there remains some individuals who continued to worship this deity in privacy. For Mr. Foster Ampong, this is his religion, his belief system which must be honored. Ms. Owana Salazar makes the profound statement that “What Kilauea is to Pele, Mokuhinia is to Kihawahine” and that Loko o Mokuhinia belongs to Kihawahine – the domain of the living and very present *‘aumakua*.

Section 7 Summary and Recommendations

The significance of Lāhainā in both the Mokupuni of Maui and the Kingdom of Hawaii's cultural and political history stems from several elements that together made it a favorite place of Hawaii's *ali‘i* prior to western contact, a sacred and political center for the Kingdom of Hawaii during the formative years. One major element was the rich natural resources of this area. With waters from Kahoma and Kaua‘ula Streams feeding the *lo‘i* and other crops of the valleys and Lāhainā Village, a great deal of food was cultivated here. A famous early ruler of Maui, Kaka‘alaneo, lived in the Lāhainā Moku. Kaka‘alaneo planted the famed "shady breadfruit grove of Lele", known as "Malu ulu o Lele". His mischievous son, Kaulula‘au, then destroyed these *ulu* trees and was exiled to Lana‘i where he is best known for out-witting the spirits there and making the island habitable for humans. Kaka‘alaneo was also known for his attention to agricultural endeavors and it was said that the lands of the Lāhainā Moku were kept in the highest state of cultivation. The ocean resources, including fishing and *limu* collection, were equally abundant and has supported the population of the area in both pre-contact and historic times. Today, a great variety of fish and *limu* continue to be harvested from these same waters.

As the Lāhainā resources supported a substantial population it stands to reason that Lāhainā would be a chiefly center, the capitol of which would be the sacred lands of Moku‘ula. The great Chief Pi‘ilani ruled from Lāhainā and is believed to have died there as well. It is from Pi‘ilani that the sacred aspects related to the island of Moku‘ula stem. It was at Moku‘ula that Pi‘ilani's daughter, Kihawahine Mokuhinia Kalama‘ula Kalā‘aiheana was deified upon her death and became the *mo‘o* goddess referred to as Kihawahine. Her home became the pond surrounding Moku‘ula and her namesake, Loko o Mokuhinia. Beginning with King Pi‘ilani and continuing with Kamehameha the Great, who stayed here in around 1802, through the reign of Kamehameha III, Lāhainā Village and Moku‘ula became and remained a place for *ali‘i.* Their worship of Kihawahine allowed the continued flow of chiefly *mana* thus maintaining their connection to their ancestors. At odds with traditional Hawaiian worship and ideology was the influence of Christian missionaries who successfully converted the ruling class of *ali‘i,* beginning with Keopuolani.

From Lāhainā, the impacts of the Great Māhele, which introduced the concept of private land ownership and allowed for the purchase and lease of lands to sugar industry owners and others shifted Maui's economy from a traditional subsistence based model, to a market based model. As a result, many Hawaiians abandoned their *kuleana* lands for paid work with the sugar and pineapple plantations. Others continued to work their *kuleana* lands while simultaneously holding jobs with the plantations. Sugar cane cultivation was so extensive, Lāhainā was said to have been planted in sugar cane virtually down to the coast and between houses. Since the sugar industry decline and the official closing of the Pioneer Mill Company, the tourist industry as well as the real-estate industry has majorly influenced the character of Lāhainā over the past 30 years.

As it was throughout history, Lāhainā continues to attract people to its center, whether it's as a major tourist destination or a full-time residential community. Many current residents of Lāhainā have lived there for generations and are able to trace their lineage back to the time of the Great Māhele when their ancestors were laying claim their *kuleana* and further back in antiquity through their family *mo‘olelo*. We were fortunate to interview some of these individuals for this

study. What they recall regarding traditional and cultural practices were times when their grandparents and great-grandparents maintained their *lo‘i kalo* by traveling on foot to cultivate *mauka* parcels, and stayed at their family homes located here for weeks at a time. Some individuals interviewed for this study continue to cultivate these ancient taro patches. The need to traverse the land to reach *mauka lo‘i*, and maintaining access routes from *mauka* to *makai* is a concern for this community. Generally speaking, those interviewed describe their cultural practices as activities related to the gathering of food resources from their environment. Gathering of marine resources such as fish and *limu*, harvesting medicinal plants for *la‘au lapa‘au* and farming of taro were common practices of this area that continues today. Recommendations that the plantings to be used for the proposed restoration project consist only of plants that were present traditionally and historically were put forward by many who were consulted for this study

In addition to the Christian burial practices of the area and the many historically significant cemeteries all of which are located in relatively close proximity to the current project area, more informal burial practices also took place in the study area.

Those consulted also have deep concerns over the caretakers ship and maintenance of the restored pond and pose the following questions:

- Who will be financially responsible for the maintenance and upkeep of the pond?
- Who will be physically responsible for the maintenance of the pond?
- How will the pond water circulate with the ocean?
- What would the impact of the pump station located adjacent to the *loko* have on the restored waters of Mokuhinia?
- How would the potential impacts of this pump station be addressed?
- How will mosquitos be controlled?
- Who will have access/use of the pond and island?

With specific regard to the sewage pump station, the majority of the individuals consulted for this study have stated that the station be altogether removed, as the very function of this station is an insult to the sacred nature of this site. Additionally concerns were expressed regarding County and Federal involvement in the restoration project, the sentiment being that this *wahi la‘a* will be subject to rules which would require that this place be open to the general public, a place that had been *kapu* in traditional times.

While there are some with reservations about the project, as it is felt that because the monarchy left Lāhainā and reverted to Christianity, the pond should be left filled and an educational center or museum dedicated to the traditional history of the area constructed instead, the majority of individuals consulted support the proposed Mokuhinia restoration project and believe that the pond restoration will be beneficial to the ecosystem; water bird habitat and near shore fishing resources, as well as, enormously supportive to Hawaiian cultural practices, cultural awareness and with tremendous Hawaiian historical significance.

7.1 Recommendations

Past and present traditional cultural practices were identified within the current study area, first and foremost of which is the deification and worship of Kihawahine Mokuhinia Kalama‘ula and the ritual significance of the *loko* which bears her name. As mentioned previously Ms. Owana Salazar profoundly states “What Kilauea is to Pele, Mokuhinia is to Kihawahine.” Ms. Salazar wants it to be known that the goddess is still present, is still being honored and worshipped, and should not be thought of as an ancient Hawaiian goddess, but as an active, present deity. This sentiment has been a common thread throughout the consultation and interview process. While the restoration of Loko o Mokuhinia is supported by many in the community, concerns regarding design, construction and proper protection, awareness, and veneration of this sacred site during both construction; as well as, future stewardship and maintenance was raised by the community and cultural practitioners.

Connectivity to the sea was also a concern with regard to restoring the waters of Loko o Mokuhinia. Mrs. Roselle Bailey has shared that she would like to see Canal Street restored to a canal which would facilitate bringing back the original circulation of the pond. While the USACE has indicated that conceptual plans include utilizing the irrigation ditch that forms the border of TMK (2) 4-6-007:002 as an outlet, Mr. Ke‘eaumoku has requested that the outlet from the pond to the irrigation ditch be sited closer to the culvert off of Luakini Road and the Hongwanji Mission.

Perhaps most importantly, it must be recognized that the lands that Loko o Mokuhinia is a *wahi la‘a* or highly sacred site. This truth needs to be understood by all who are involved in the restoration project during each phase of work and proper cultural protocols should be observed during all aspects of the proposed project. To this end, it is recommended that everyone who would be involved with the restoration effort undergo cultural training and education developed by or in consultation with *Kūpuna,* the Friends of Moku‘ula, and traditional cultural practitioners of Lāhainā. At a minimum such training could include an educational aspect on the traditional and cultural history of Lāhainā, Moku‘ula, and Loko o Mokuhinia, as well as, the traditional cultural protocols to be observed prior to entering the work area and personnel expectations while working on the different aspects of the restoration project. To facilitate the protection of potential archaeological sites and ensure the cultural integrity of the project it is further recommended that both archaeological monitoring and cultural monitoring occur during the construction phases of the proposed project.

Bringing back the waters of Loko o Mokuhinia carries a heavy *kuleana* (responsibility), the caretaker ship and maintenance of which must not be taken lightly. With regard to long-term management, some believe that the Friends of Moku‘ula (FOM), a non-profit group who has been dedicated to the restoration of Moku‘ula since 1995, should be the primary stewards following restoration. Still others feel that stewardship should include others in the community and that this *kuleana* should be shared. Prior to commencing the project, the questions and concerns summarized above must be addressed and worked out between the project proponents and both lineal and cultural descendants of this *wahi*. Continued consultation and partnership with the community and the participants of this study must be carried out through all aspects of the proposed project.

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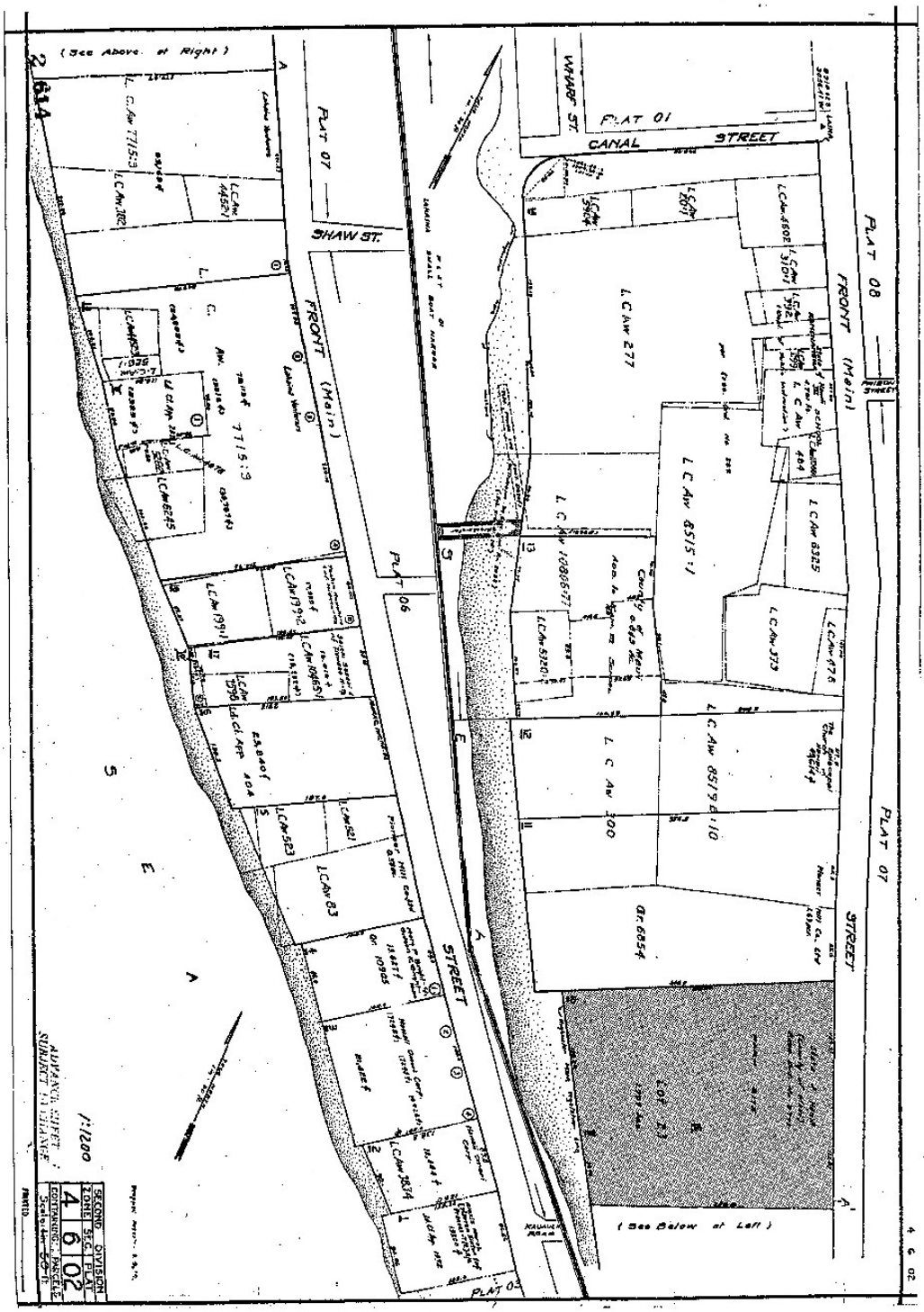
Appendix A National Register of Historic Places 50-50-03-2967


PLAT 08
FRONT (Main)
STREET
PLAT 07
WHARF ST.
PLAT 01
CANAL STREET
L C Aw 277
L C Aw 6515:1
L C Aw 373
L C Aw 8325
L C Aw 676
L C Aw 8519 B:10
L C Aw 300
Gr 6854
(See Below at Left)
PLAT 06
STREET
PLAT 05
SHAW ST.
PLAT 07
FRONT (Main)
(See Above at Right)
L C Aw 7715:3
L C Aw 7715:3
L C Aw 8245
L C Aw 1991
L C Aw 1992
L C Aw 8965
L C Aw 1596
L C Aw 821
L C Aw 823
L C Aw 83
L C Aw 2834
L C Aw 1432
Gr 10565
Gr 10565
Lot 13
KAUMALAPAU HWY
1:1200
SECOND DIVISION
ZONE SEC. PLAT
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PARCEL
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NPS Form 10-900
(Oct. 1990)

OMB No. 10024-0018

408

United States Department of the Interior
National Park Service

RECEIVED 2280
APR - 8 1997
NAT. REGISTER OF HISTORIC PLACES

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name King Kamehameha III's Royal Residential Complex

other names/site number Moku'ula; Loko Mokuhinia; Hale Piula; State Site 50-50-03-2967

2. Location

street & number Front and Shaw Street (Malu 'ulu o Lele and Kamehameha Iki Parks) ☐ not for publication

city or town Lahaina, Maui, Hawai'i (Waine'e Ahupua'u) ☐ vicinity

state Hawai'i code HI county Maui code 009 zip code 96767

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☒ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

Robert Colonna-Ageran 3/27/97
Signature of certifying official/Title Date

State of Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

☒ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register.
☐ removed from the National Register.
☐ other, (explain:)

Signature of the Keeper Date of Action

Edson M. Beall 5/9/97

King Kamehameha III's Royal Residential Complex — Name of Property

Maui, Hawai'i — County and State

5. Classification

Ownership of Property (Check as many boxes as apply)
- ☐ private
- ☒ public-local
- ☒ public-State
- ☐ public-Federal

Category of Property (Check only one box)
- ☐ building(s)
- ☐ district
- ☒ site
- ☐ structure
- ☐ object

Number of Resources within Property (Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		buildings
1		sites
		structures
		objects
1		Total

Name of related multiple property listing (Enter "N/A" if property is not part of a multiple property listing.)
N/A

Number of contributing resources previously listed in the National Register
0 (except as part of Natl Hist District)

6. Function or Use

Historic Functions (Enter categories from instructions)
government (capitol, royal residence),
religion (shrine), domestic (residence,
funerary (cemetery), agriculture/subsistence
(irrigation facility, fishing facility)

Current Functions (Enter categories from instructions)
landscape (park, parking lot, baseball)

7. Description

Architectural Classification (Enter categories from instructions)
N/A

Materials (Enter categories from instructions)
foundation
walls
roof
other

Narrative Description (Describe the historic and current condition of the property on one or more continuation sheets.)

--see continuation sheets

King Kamehameha III's Royal Residential Complex — Name of Property

Maui, Hawai'i — County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [x] **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [x] **B** Property is associated with the lives of persons significant in our past.
- [ ] **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [x] **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

- [ ] **A** owned by a religious institution or used for religious purposes.
- [ ] **B** removed from its original location.
- [ ] **C** a birthplace or grave.
- [ ] **D** a cemetery.
- [ ] **E** a reconstructed building, object, or structure.
- [ ] **F** a commemorative property.
- [ ] **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

Archaeology: Historic-Aboriginal
Prehistoric
Ethnic Heritage: Pacific Islander
Politics/Government
Religion
Agriculture

Period of Significance

A.D. 1600s-1860s, perhaps earlier

Significant Dates

A.D. 1837

Significant Person
(Complete if Criterion B is marked above)

King Kamehameha III

Cultural Affiliation

Native Hawaiian

Architect/Builder

N/A

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographical References

Bibilography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

- [ ] preliminary determination of individual listing (36 CFR 67) has been requested
- [ ] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey # _____
- [ ] recorded by Historic American Engineering Record # _____

Primary location of additional data:

- [x] State Historic Preservation Office
- [ ] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [x] Other

Name of repository:
Bishop Museum; Lahaina Restoration Foundation

King Kamehameha III's Royal Residential Complex — Maui, Hawai'i
Name of Property — County and State

10. Geographical Data

Acreage of Property 12.3 acres

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1	04	741450	2309100
2	04	741680	2309090
3	04	741800	2309700
4	04	741600	2309630

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Dr. Paul Christiaan Klieger, Associate Anthropologist

organization Bishop Museum, Anthropology Department date 9 JAN '97

street & number 1525 Bernice Street telephone (808) 847-8283

city or town Honolulu state Hawai'i zip code 96817

Additional Documentation
Submit the following items with the completed form:

Continuation Sheets

Maps

A USGS map (7.5 or 15 minute series) indicating the property's location.

A Sketch map for historic districts and properties having large acreage or numerous resources.

Photographs

Representative black and white photographs of the property.

Additional Items
(Check with the SHPO or FPO for any additional items)

Property Owner
(Complete this item at the request of SHPO or FPO.)

name State of Hawaii and County of Maui

street & number _____ telephone _____

city or town _____ state _____ zip code _____

Paperwork Reduction Act Statement: This information is being collected for applications to the National Register of Historic Places to nominate properties for listing or determine eligibility for listing, to list properties, and to amend existing listings. Response to this request is required to obtain a benefit in accordance with the National Historic Preservation Act, as amended (16 U.S.C. 470 *et seq.*).

Estimated Burden Statement: Public reporting burden for this form is estimated to average 18.1 hours per response including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding this burden estimate or any aspect of this form to the Chief, Administrative Services Division, National Park Service, P.O. Box 37127, Washington, DC 20013-7127; and the Office of Management and Budget, Paperwork Reductions Projects (1024-0018), Washington, DC 20503.

NPS Form 10-900-a
(8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number___7____ Page___1____

King Kamehameha III's Royal Residential Complex
Maui, Hawai`i

King Kamehameha III's royal residential complex in Lahaina, Maui (Figure 1), is the site of the home of the king of the Hawaiian Islands from 1837 to 1845 when the town was capital of the kingdom. The site is a traditional home for Maui royalty, noted as being the site of King Pi`ilani's residence in the sixteenth century (cf. Kamakau 1991:49, 1992:342). Almost the entire site, which consisted of fishponds, fresh water springs, islands, causeways, retaining walls, beach berms, residential and mortuary buildings, is buried by coral and soil fill and is presently used as a County Park. Extensive architectural and artifactual remains exist underground, as was demonstrated in a recent archaeological survey (Klieger et al. 1995).

Although most widely associated with the period of Kamehameha III, the site appears to be a place of traditional Native Hawaiian cultural significance. The islet of Moku`ula, located in the fishpond of Mokuhinia, was a sacred place protected by royal *kapu* (taboo). It was considered a grotto of a royal protector deity named Kihawahine or Mokuhinia, who traditionally swam through the surrounding fishpond of Mokuhinia in the form of a giant lizard (*mo`o*) (Kamakau 1964:85; Manu 1884). The goddess was a deified princess, daughter of Maui king Pi`ilani of the sixteenth century, whose family resided at the site (Fornander 1916-1917 V[I]:176; IV:242). Kamehameha I, upon his conquest of Maui in the late eighteenth century, adopted this deity. His sons and successors, Kamehameha II and III, were scions of the indigenous Maui royal family through their mother, Keōpūolani. The lizard goddess Kihawahine ranked in no small part as the guardian of the succeeding Kamehameha dynasty that was in the process of unifying the archipelago (Kamakau 1964:54). A continuing association of religious function, as a shrine to Kihawahine, continued at this site from the days of Pi`ilani to the establishment of the royal residence here by Kamehameha III.

Archaeological and historical investigations performed by Bishop Museum for Lahaina Restoration Foundation and County of Maui (Klieger 1993; Klieger et al. 1995) demonstrate that the surrounding Loko Mokuhinia pond was the site of indigenous Hawaiian aquaculture and pondfield agriculture, as determined from early land tenure documents (the Great Mahele of 1848) and eighteenth and early nineteenth-century ethnohistoric accounts. This traditional subsistence activity may have been much older at this site.

NPS Form 10-900-a
(8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number___7____ Page___2____

King Kamehameha III's Royal Residential Complex
Maui, Hawai`i

Traditional or pre-Contact Native Hawaiian materials excavated from Moku`ula included a basalt hammerstone, basalt flakes, volcanic glass, a shell fishhook fragment, and a urchin spine abrader (Klieger et al. 1995). Shell midden and animal bones found are indicative of food preparation and consumption activities at the site. A burial of several articulated piglets was also found at Moku`ula--this might imply a religious offering.

The royal complex established by King Kamehameha III (Figures 2 and 3) in the early nineteenth century consisted of a large (37 by 12 m), two-story western style coral block "palace," Hale Piula, on the beachfront of the site (intact from 1840 to 1858). Due to lack of funds, however, it was never entirely completed and only rarely used, and then only for state receptions or meetings of the legislature. Located immediately to the east of this coral block building was the large fishpond Mokuhinia containing a one-acre island linked by a short causeway from Hale Piula. On this sacred island of Moku`ula was a cluster of traditional grass houses (*hale pili*) that were used as a secluded, private residence for the king and his household from 1837 to 1845. The focal point of the complex, however, was a large stone building used as a combination residence and mausoleum. It was built on Moku`ula in 1837 to house the remains of the king's sacred mother, sister, his children, and other close members of the royal family. All were "children" of the goddess Kihawahine, despite the in-roads of missionary-inspired Christianity. While the growing town of Honolulu on O`ahu was the economic center of the kingdom, the royal complex at Lahaina, being the primary residence of the king, was its symbolic center.

The island of Moku`ula was surrounded by a stone retaining wall, and the causeway to Hale Piula was guarded by a gate with sentries during this particular historic period (Klieger et al. 1995). Recent archaeological subsurface excavations have ascertained that portions, if not most, of the encompassing retaining wall of Moku`ula is still intact beneath about one meter of soil and coral fill (Klieger et al. 1995). Other important features discovered include a preserved wooden pier that extended from the eastern shore of the island into Mokuhinia pond, postholes that might date from the period of Kamehameha III's residence, and cut-and-dressed basalt blocks from near the tomb area. Artifacts found in association with this era include ceramic sherds and bottle glass.

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An archaeological inventory survey of the Hale Piula region in 1988 (Fredericksen et al. 1988) has not provided conclusive evidence for the subsurface location of that portion of the site. However, Hale Piula must be considered an integral part of the royal residential complex of King Kamehameha III. Another portion of the site, a vacant lot, represents an undeveloped portion of the shoreline of Mokuhinia. It was examined archaeologically in 1989 (Fredericksen et al. 1989).

The entire site complex, consisting of wetlands, beach berms, islands, architectural remains of Hale Piula, the tomb, retaining walls, and causeways, was covered over by soil and coral rubble in the 1910s for the establishment of a county park. No surface remains of the complex are presently visible in the present park, which consists of ballfields, tennis courts, playgrounds, picnic areas, public restrooms, an undeveloped lot, and a parking lot.

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King Kamehameha III's Royal Residential Complex
Maui, Hawai`i

Summary

The royal residential complex of King Kamehameha III is significant under Criteria A, B and D of the National Register. King Kamehameha III's royal residential complex in Lahaina, Maui is important as a focus of the kingdom during the first half of the nineteenth century. Although the king had many residences throughout the islands, this was his primary residence and seat of the court from 1837-1845. The first Hawaiian legislature met here. While the economic center of the kingdom and the government of the prime minister (*kuhina nui*) were located in Honolulu, the royal seat was at this site in Lahaina during this period. As such, many national (Hawaiian) events, symptomatic of the broad patterns of change affecting the Hawaiian people since western contact, occurred here (Criterion A).

Kamehameha III's royal residential complex in Lahaina is also important because of its association with King Kamehameha III (Criterion B)(Figure 4) and the royal family during the times that the West Maui town was capital of the kingdom. The king's beloved sister, Princess Nāhi`ena`ena, was buried at Moku`ula in early 1837 (Kamakau 1992:342). Grief-stricken, the king decided to live next to his sister's tomb for the next eight years (Kamakau 1992:342). Over that time, the king's mother and other members of his family were interred there, including Kaumuali`i, the last independent king of Kaua`i, and Liliha, former governess of O`ahu (Klieger et al. 1995). Two of Kamehameha III's children by Queen Kalama were later buried at the Moku`ula mausoleum. In the eye-witness account of local resident Alice Ka`ae, told to Maui historian Inez Ashdown in 1947, Bernice Pauhi Bishop, last legal descendent of the Kamehameha dynasty, had the royal remains moved from Moku`ula to the churchyard at adjacent Waine`e Church (Wai`ola Church)(Figure 5) ca. 1884 (Ashdown 1947). The property is probably significant as a former burial site of any of these royal individuals. The Moku`ula site is similar to the burial mound of Pohukaina on the ground of `Iolani Palace, Honolulu; it is possible that remains still exist. The Maui site could benefit from the sort of protection afforded by listing on the State and National registers.

The "palace" of Hale Piula was built adjacent to Moku`ula on the beach during the 1840s, but never completed and rarely used (Wilkes 1845:4-5). Although used as a court house after the

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king moved back to Honolulu in 1845, Hale Piula was nearly in ruins by 1854 and strong winds in 1858 destroyed it completely (Lahaina Restoration Committee 1961). Some of the coral blocks were salvaged to construct the nearby Lahaina Court House, which is still intact.

While not much of the site of Hale Piula is known, the area is an integral part of the royal complex of King Kamehameha III.

The subsurface remains of King Kamehameha III's royal residential complex of Hale Piula, Moku`ula, and Loko Mokuhinia are also significant for their historical and prehistorical archaeological research potential. The site has already yielded much data (Klieger et al. 1995), and has the potential to yield much more data on Hawaiian history and prehistory (Criterion D). For example, pollen core samples taken from pond sediments under the fill of Mokuhinia during archaeological investigations (Klieger et al. 1995) show the presence of Polynesian-introduced plants such as coconut, ti, and taro. The earliest identifiable pollen (coconut) is found in Layer P IV, the base of which was dated by radiocarbon dating to 1940 ± 60 B.P. (A.D. 43-231). Taro is found growing in the pond at the top of this layer to the top of Layer PIII, where it stops. Pollen could not be identified in sediments below Layer P IV, so it was not possible to determine pre-Polynesian conditions (Cummings 1995:274-282). Because of this single radiocarbon date and limited pollen analysis, further archaeological work at the site could provide clearer evidence to a possible early date of human activity in the Mokuhinia area. This would be highly significant for an understanding of the early history of the Lahaina and Maui.

We have learned, through recent historical and archaeological investigations, the exact location of Moku`ula, some of its architectural features, and its relative state of preservation. We do not know the exact location, size, and shape of buildings located at the site, including Hale Piula. Further archaeological work would help us answer those questions. Further archaeological work in pre-Contact sediments at the site could provide us with more answers to more ancient cultural practices at the site. Perhaps through the further dating of organic materials, it would be possible to estimate the age of the earliest human occupation of Lahaina.

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While much is preserved in Lahaina that recalls the lifestyles and culture of the Christian missionaries and whalers in the nineteenth century, very little is demonstrative of the Native Hawaiian monarchy and the reign of Kamehameha III, Hawai`i's longest ruling king. Kamehameha III is notable for being the monarch during the era of profound changes in Native Hawaiian society, a society that was rapidly moving from subsistence to a market economy, and from chiefly to private land ownership. It was a society that was experiencing literacy, western concepts of law and foreign religious ideology. It was also a time when the Hawaiian people suffered grievously from introduced disease. Kamehameha III was the ruler during these transitions, and this site was his home during a sizeable portion of his reign.

Historic Context

The site of Kamehameha III's royal residential complex in Lahaina can be understood from three distinct historic contexts. The fishpond and its fresh water springs were a source of irrigation and nutrients for subsistence production, including aquaculture and agricultural activities. Flooded pondfields in this area were used to raise taro, while banks between ponds grew coconut, bananas, and other crops (Arago 1823 II:119-120). The reef and pelagic ocean regions adjacent to the Mokuhinia neighborhood were also an important resource for the human settlement of Lahaina. It stands to reason that the Loko Mokuhinia region was a productive location. The origin of chiefly residence at the site is perhaps related to political and economic control over this important area of production. Kamakau (1991:49, 1992:342) notes that Pi`ilani, first king of a unified Maui, lived at the site. His daughter, the deified princess Kihawahine, remained as the guardian (*`aumakua mo`o*) of the site and resided in a grotto at Moku`ula.

When the wars of inter-island unification began in the eighteenth century, Lahaina became more important as a convenient port and strategic staging area along the sea lanes between Hawai`i Island, Maui, Lāna`i, Moloka`i, O`ahu and beyond. Maui king Kahekili II occasionally spent time in Lahaina, as he did during his visit with Vancouver in 1793 (Vancouver 1984 [1793] III:876). Kamehameha I sojourned in Lahaina from 1802-1803 with his fleet and warriors, waiting for the appropriate time to invade Kaua`i (Speakman 1978:96). Writing on Kamehameha I's return to Hawai`i from his residence in Honolulu in 1812, La`anui noted that the king went to Mokuhinia

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for his residence (La`anui 1929 [1838]:89-90). It is theorized that from this chiefly settlement around Mokuhinia, which has royal associations going back at least to the time of Pi`ilani, that the Kamehameha III royal complex developed.

The Kamehameha III royal residential complex during the times of this king is the third and most important historic component. From 1837 to 1845, the compound at Loko Mokuhinia, consisting of the island of Moku`ula with its tomb and residences, and the formal "palace" at Hale Piula, was the seat of the royal court--it was the place where the first Hawaiian constitution was drafted and the first legislature was convened. While there were other royal residences in Hawai`i before and after this complex, this site is particularly important to the community of Lahaina and the Island of Maui, and to the memory of Hawai`i's longest ruling king, Kamehameha III.

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Boundary Description

The boundaries of the proposed registered area have been gathered from the 1884 Alexander and Bishop survey of Lahaina (Figures 2 and 6) that show the royal estate in Waine`e Ahupua`a. These boundaries can still be followed by modern tax maps, and were reconfirmed by Bishop Museum survey of the property in 1995 (Klieger et al.)(Figure 7).

The boundary of King Kamehameha III's royal residential complex on the east or *mauka* side of Front Street in Lahaina, Maui, includes the following contiguous parcels owned by State of Hawaii, known on Tax Map Key, Second Division, Zone 4, Section 6, Plat 07 and indicated with shading on accompanying map similarly labeled (Figure 8):

Parcel 1 (vacant lot)	2.0 acres
Parcel 2 (Malu `ulu o Lele Park)	7.5 acres
Parcel 35 (pump station)	.08 acres
Parcel 36 (parking lot)	0.9 acres

Parcel 2 is State of Hawaii property assigned to County of Maui for use as Malu `ulu o Lele Park by Executive Order #52. Parcel 36 was assigned to County of Maui by Executive Order 2889.

The boundary of King Kamehameha III's royal residential complex on the west or *makai* side of Front Street in Lahaina, Maui, includes the following parcel owned by State of Hawaii: Tax Map Key, Second Division, Zone 4, Section 6, Plat 02, Parcel 23. This 1.8 acre parcel immediately adjacent to the above parcels is indicated with shading on accompanying map similarly labeled (Figure 9). Parcel 23 is State of Hawaii property assigned to County of Maui for use as Kamehameha Iki Park by Executive Order #2771.

Note--on the two enclosed tax maps (Figures 8 and 9), the corresponding match points between the halves of the site bisected by Front Street are marked A and A'. Proposed registration areas are shaded.

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Justification

Boundaries of King Kamehameha III's royal residential complex include those city lots on public land that have been historically associated with the property. Parcels 37 and 38 of TMK (2) 4-6-07 are private lands and excluded from present nomination consideration. The site of the fishpond, Loko Mokuhinia, has been well documented in survey maps extending back to the Great Mahele of 1848. The precise location of Moku`ula Island was predicted on the basis of a superimposition of the Alexander and Bishop survey map of 1884 (Figure 6), Mahele materials, and modern tax maps (Figure 2). Recent archaeological investigations (Klieger et al. 1995) have proven that the actual location of Moku`ulu is within one or two meters of prediction, as shown in Figure 7. The precise location of Hale Piula, however, has not yet been determined by historical or archaeological means.

Both the Moku`ula and Hale Piula portions of the site of King Kamehameha III's royal residential complex are presently occupied by parks containing extensive recreational facilities (Figure 10).

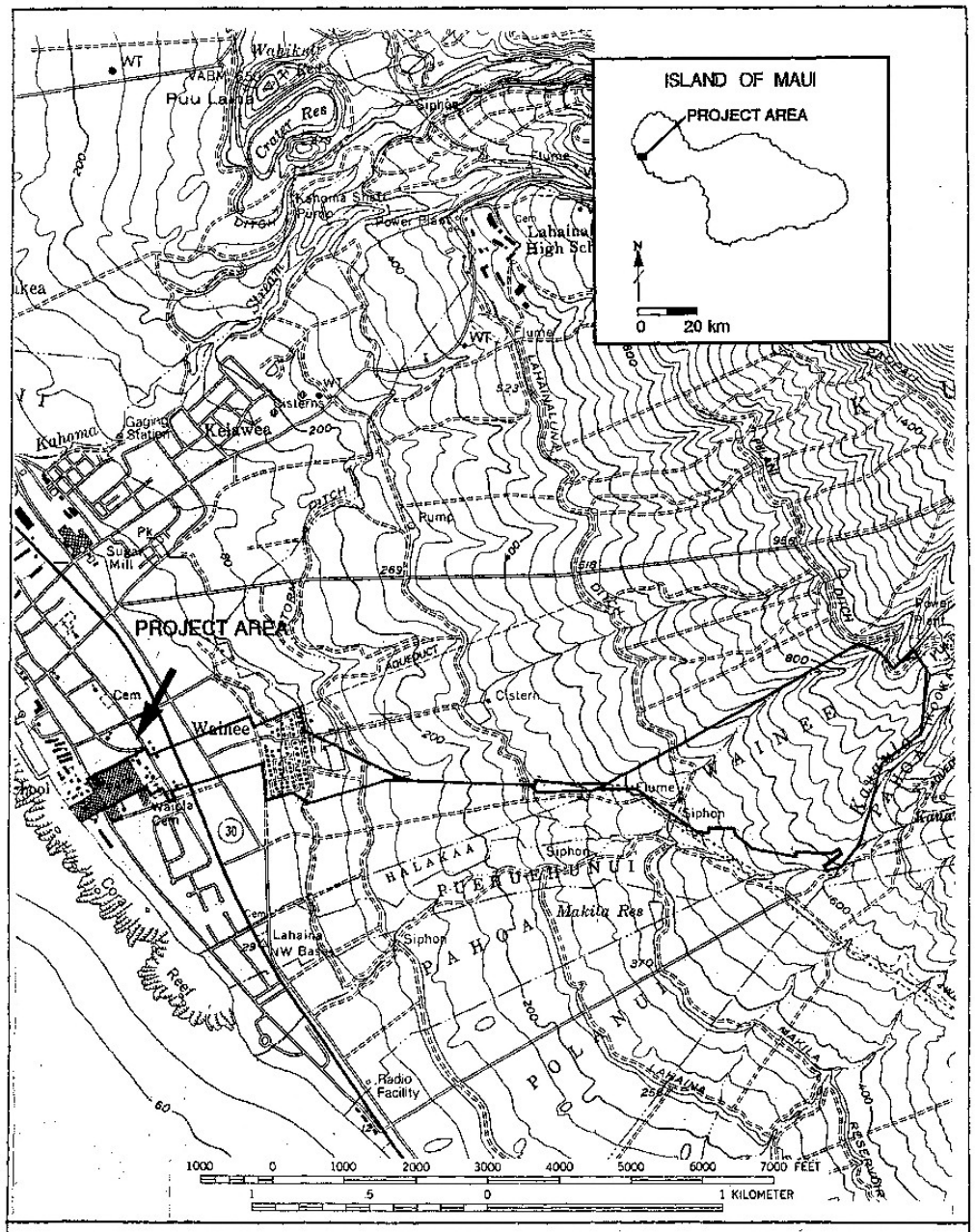


Figure 1. The Present Project Area and Waine‘e *Ahupua‘a*, Lahaina District, Island of Maui. U.S.G.S. Topographic Map 1:24000.

3

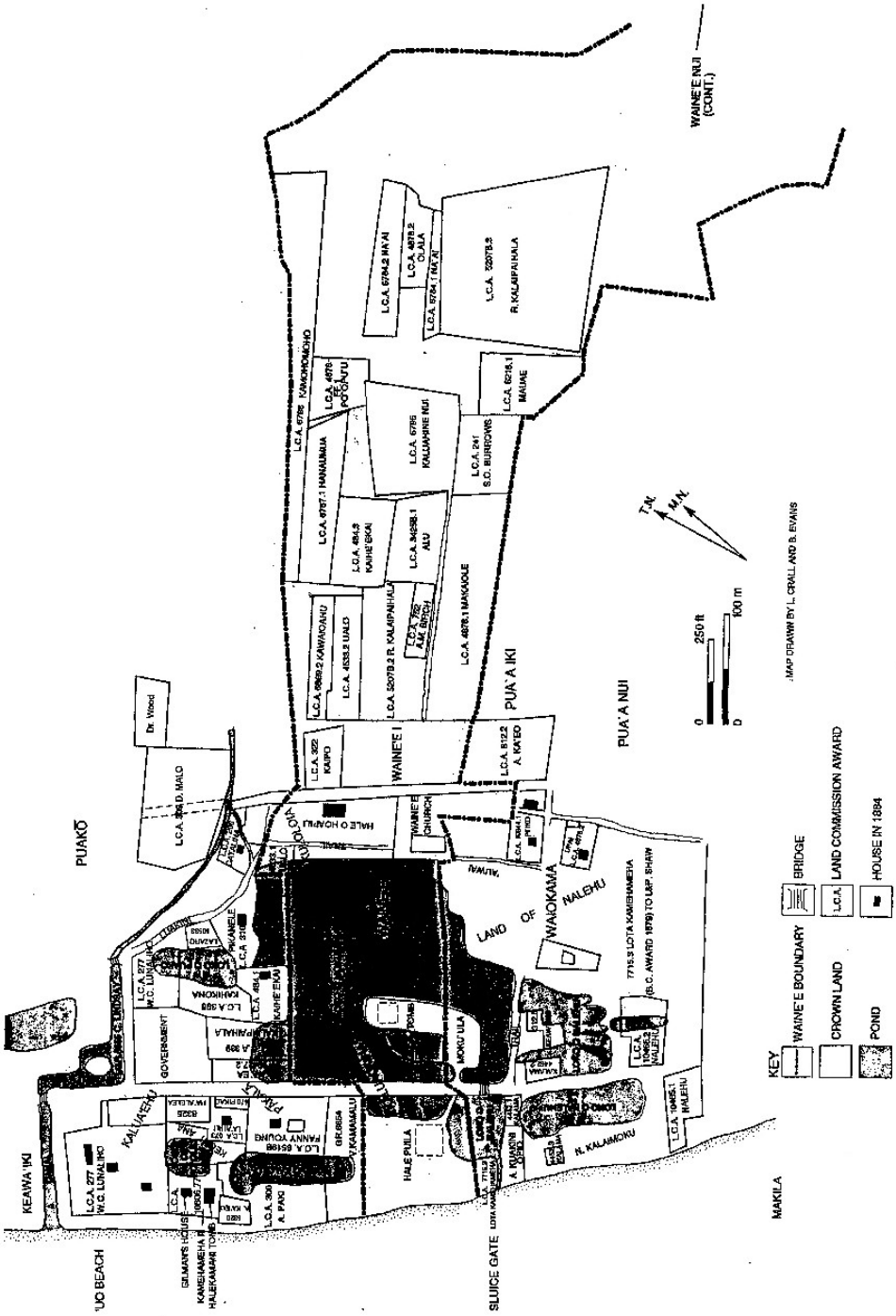


Figure 2. Reconstruction of Project Area in mid-nineteenth century, based on Alexander and Bishop survey of 1884, Great Mahele and other documentation. (Klieger et al. 1995)

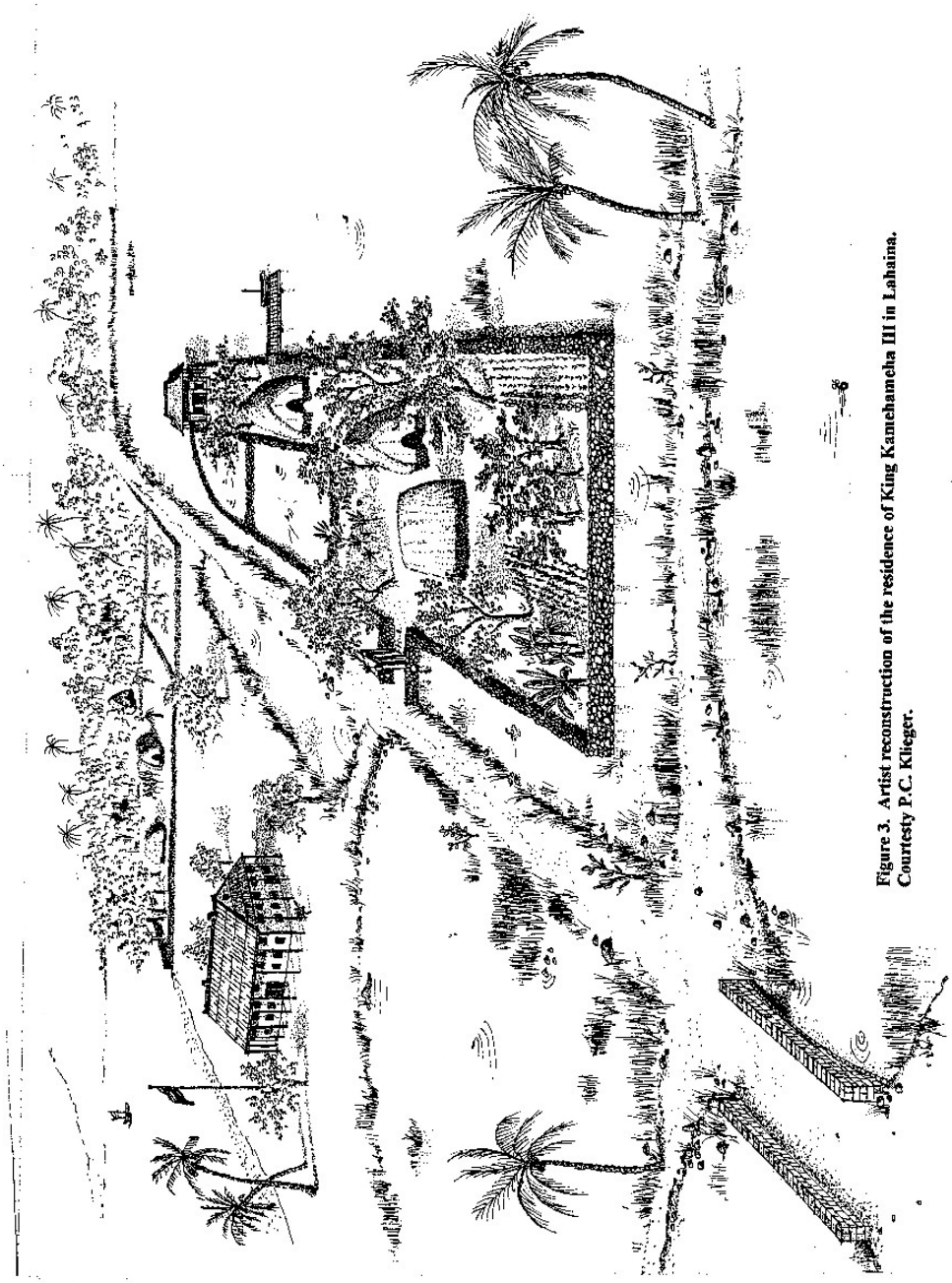


Figure 3. Artist reconstruction of the residence of King Kamehameha III in Lahaina. Courtesy P.C. Klieger.

Figure 4. King Kamehameha III of the Hawaiian Islands, 1841. Painted by Alfred Agate of the Wilkes Expedition.

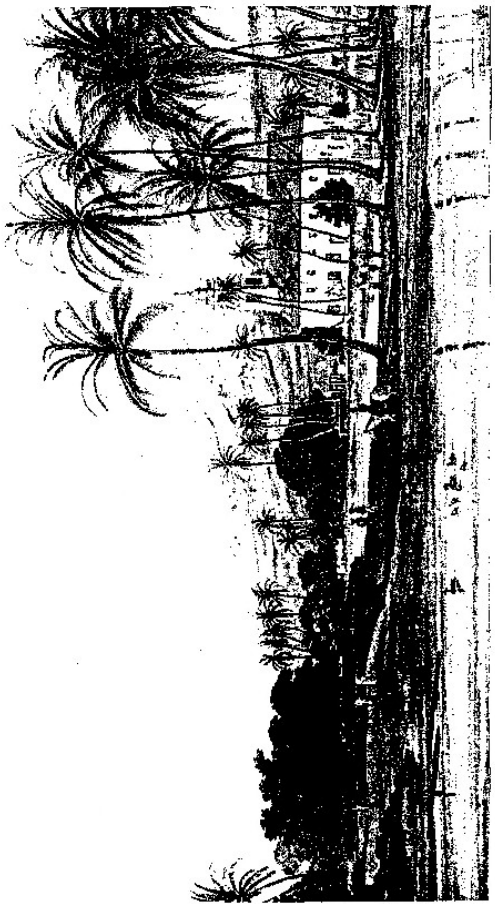


Figure 5. Waine`e Church by Sawkins, 1851. Moku`ula is on the left. National Library of Australia.

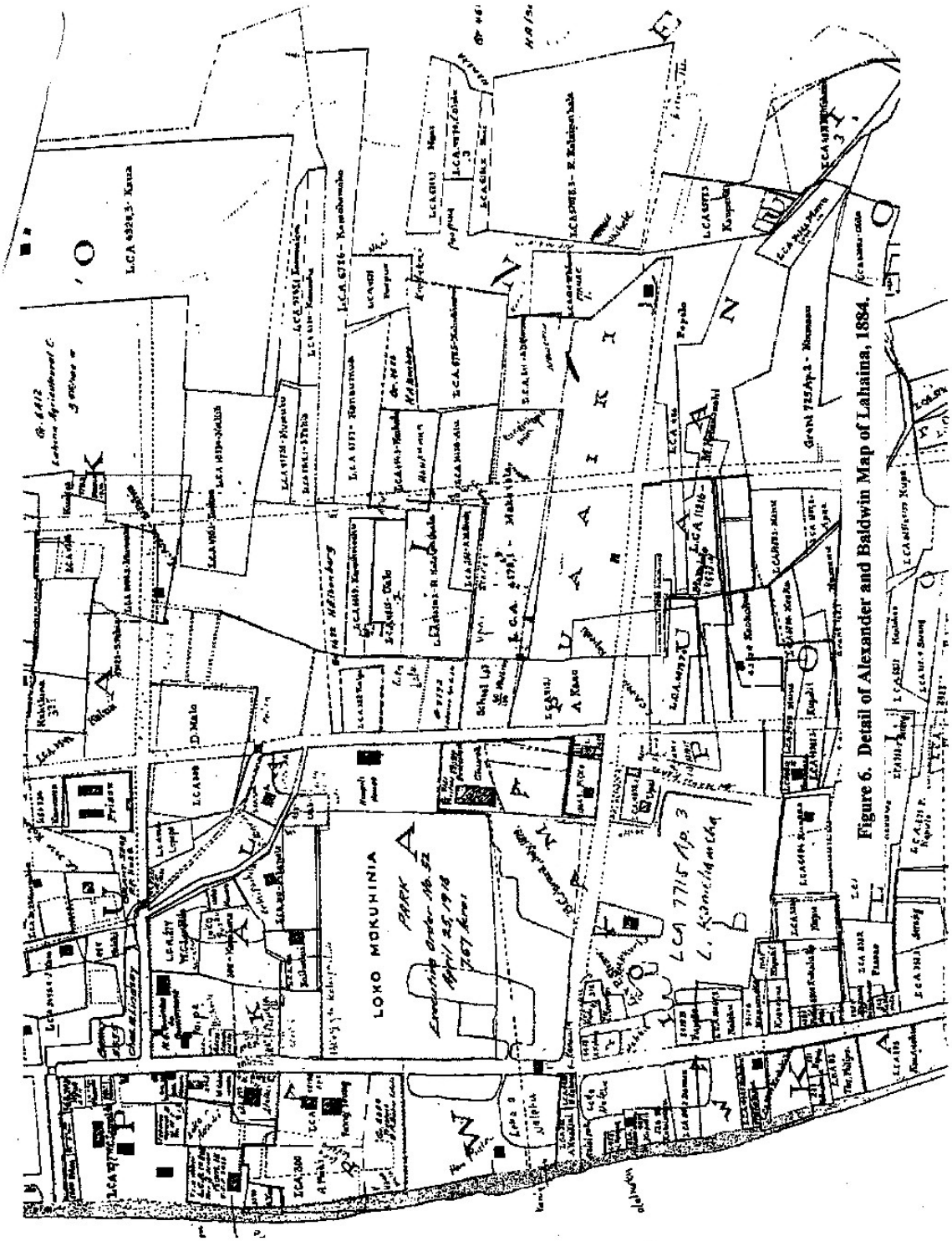


Figure 6. Detail of Alexander and Baldwin Map of Lahaina, 1884.

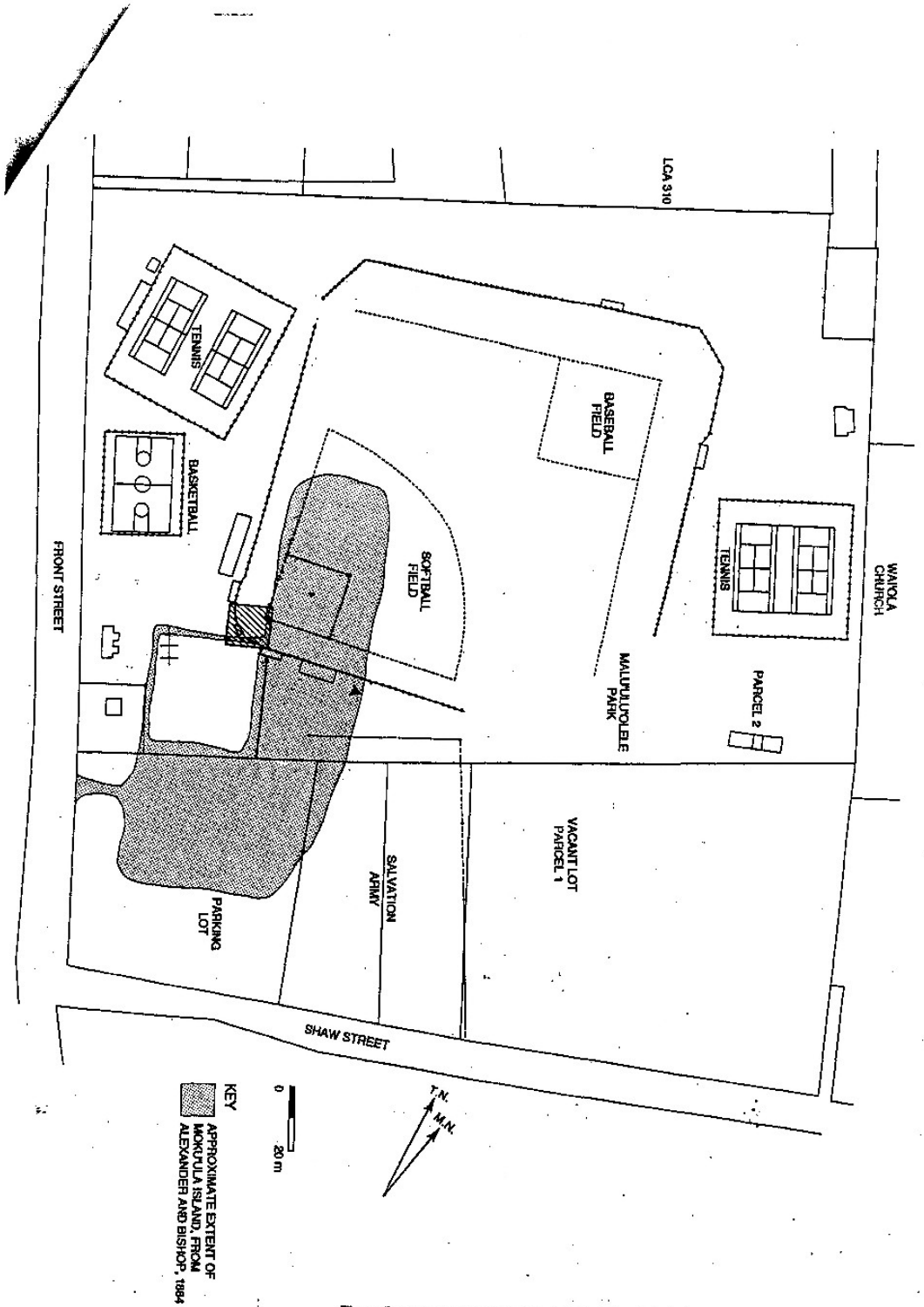


Figure 7. Bishop Museum Survey of Malu'ulu o Lele Park with superimposition of Moku'ula Site. Klieger et al. 1995.

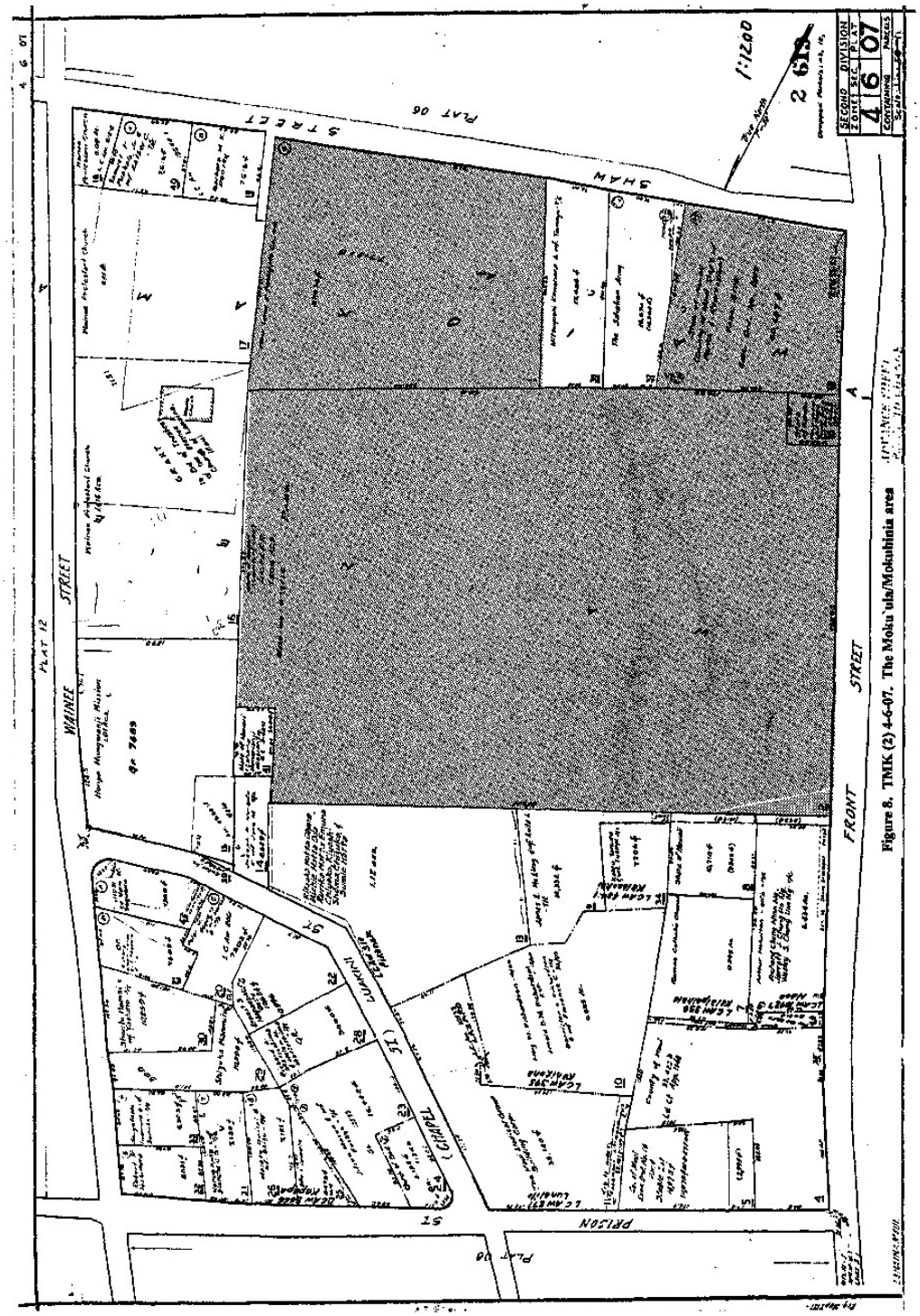
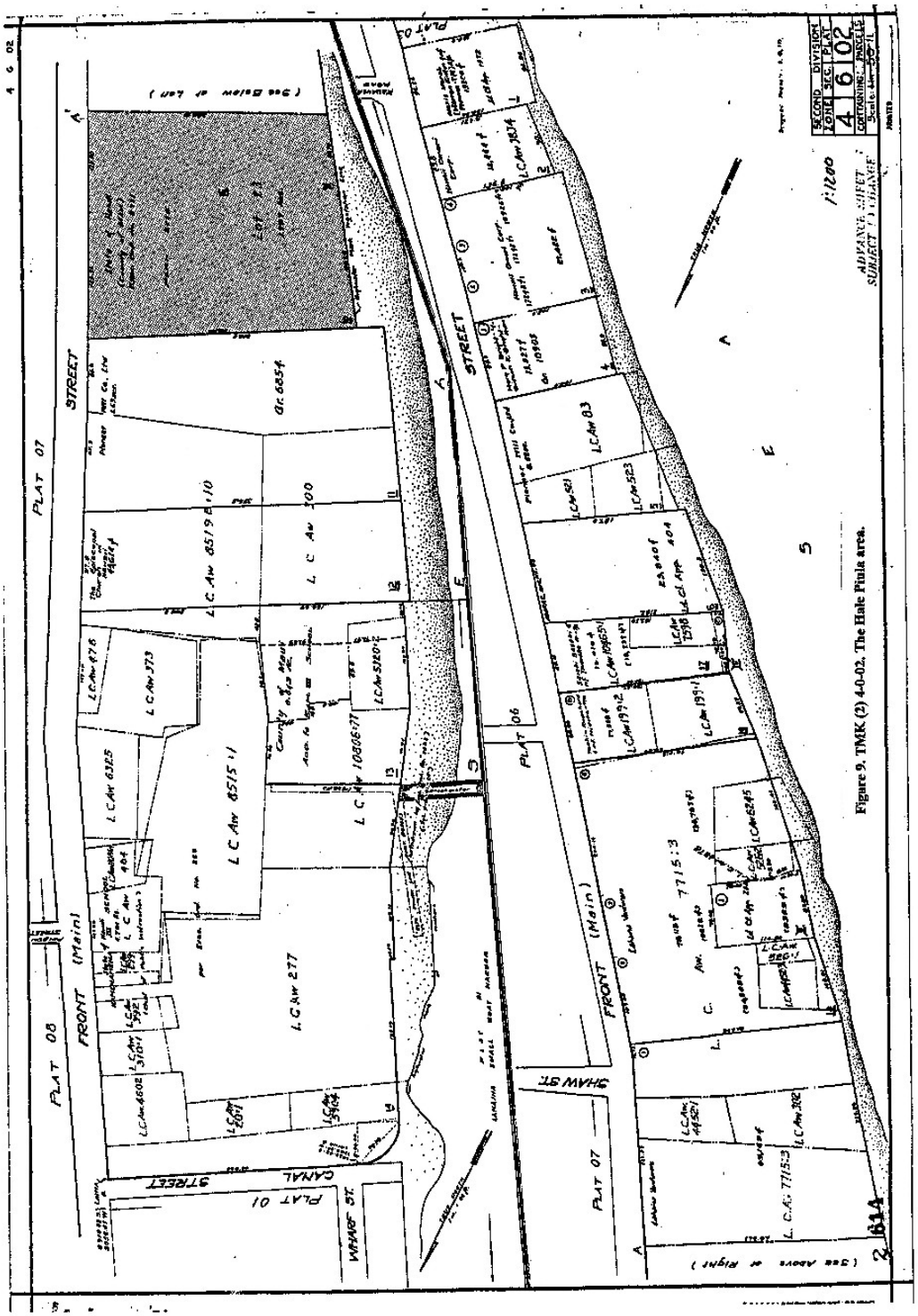


Figure 8. TMK (2) 4-6-07. The Moku'ula/Mokuhinia area


PLAT 07
STREET
PLAT 08
FRONT (Main)
L.C.Aw 277
L.C.Aw 8515:1
L.C.Aw 8519:10
L.C.Aw 100
L.C.Aw 373
L.C.Aw 83
L.C.Aw 1834
L.C.Aw 7715:3
L.C.Aw 8245
L.C.Aw 302
L.C.Aw 1912
L.C.Aw 1914
L.C.Aw 1590
L.C.Aw 523
L.C.Aw 404
L.C.Aw 3207
L.C.Aw 4608
L.C.Aw 3207
L.C.Aw 3207
L.C.Aw 3207

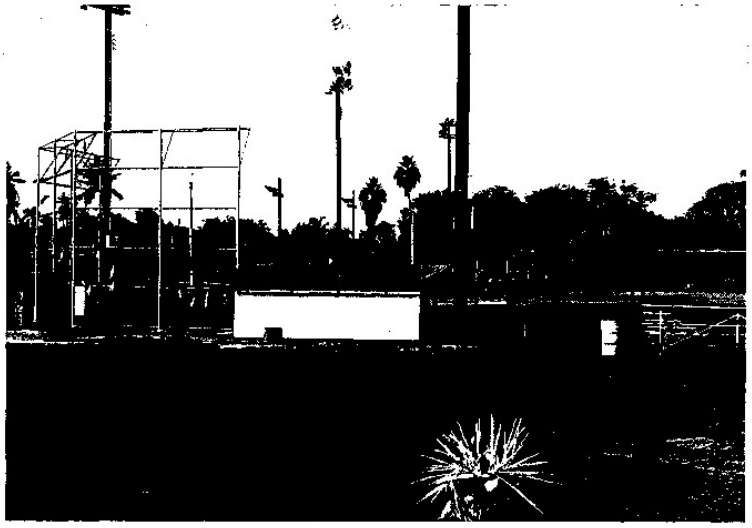
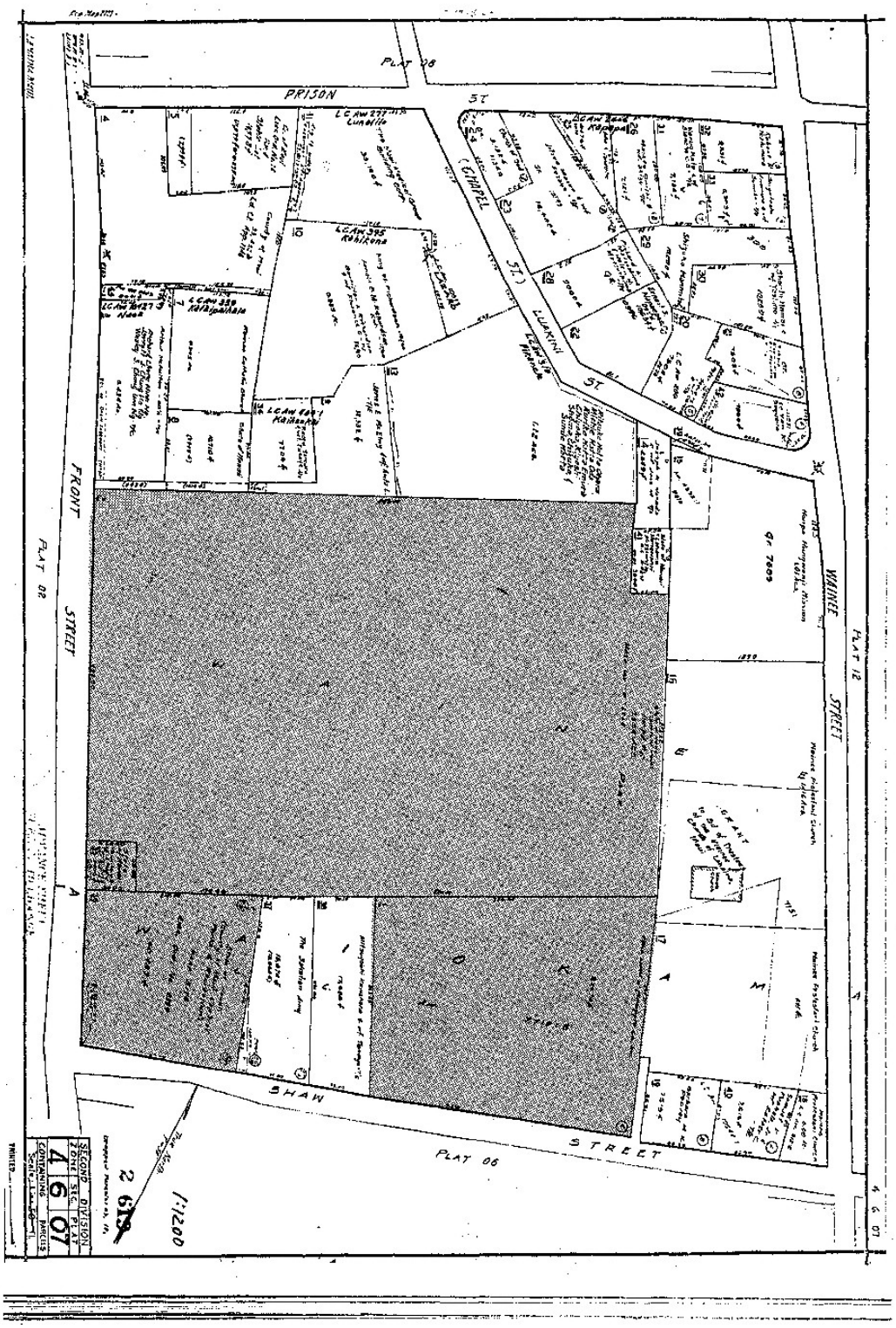
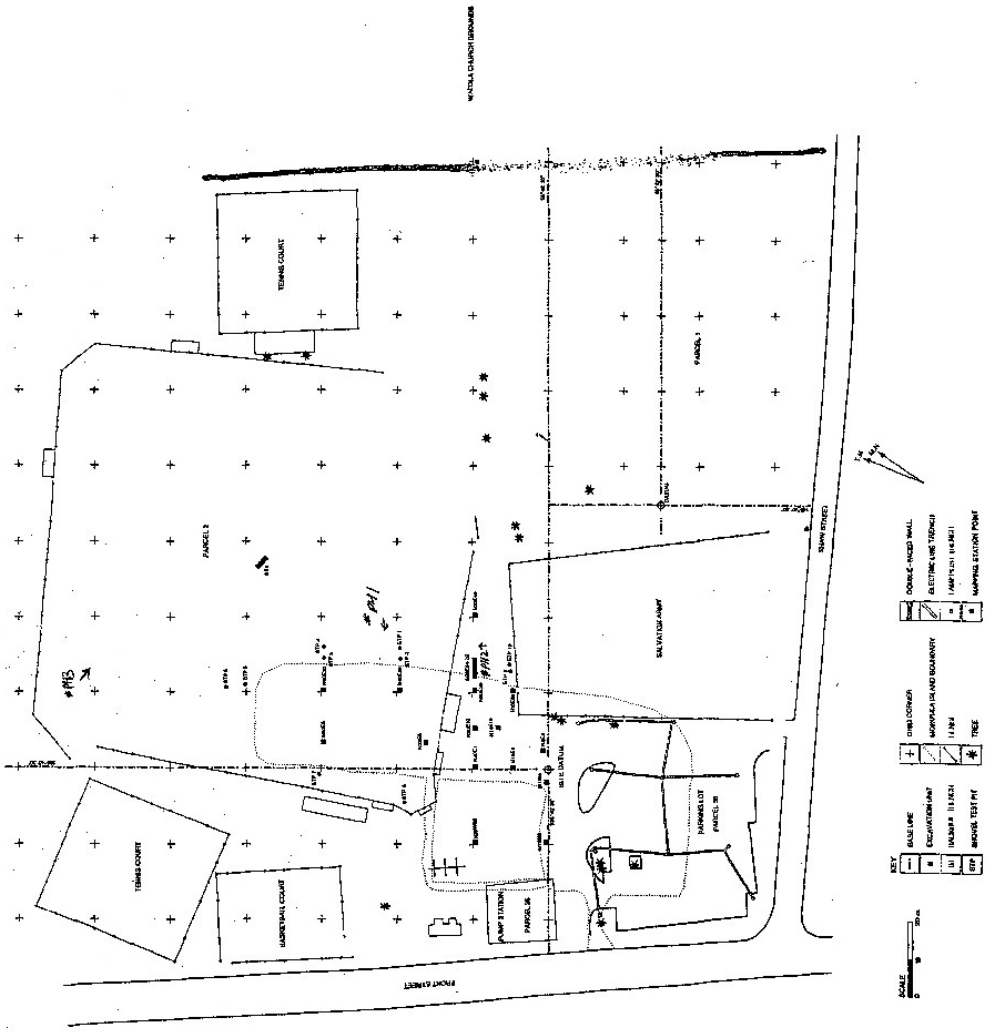
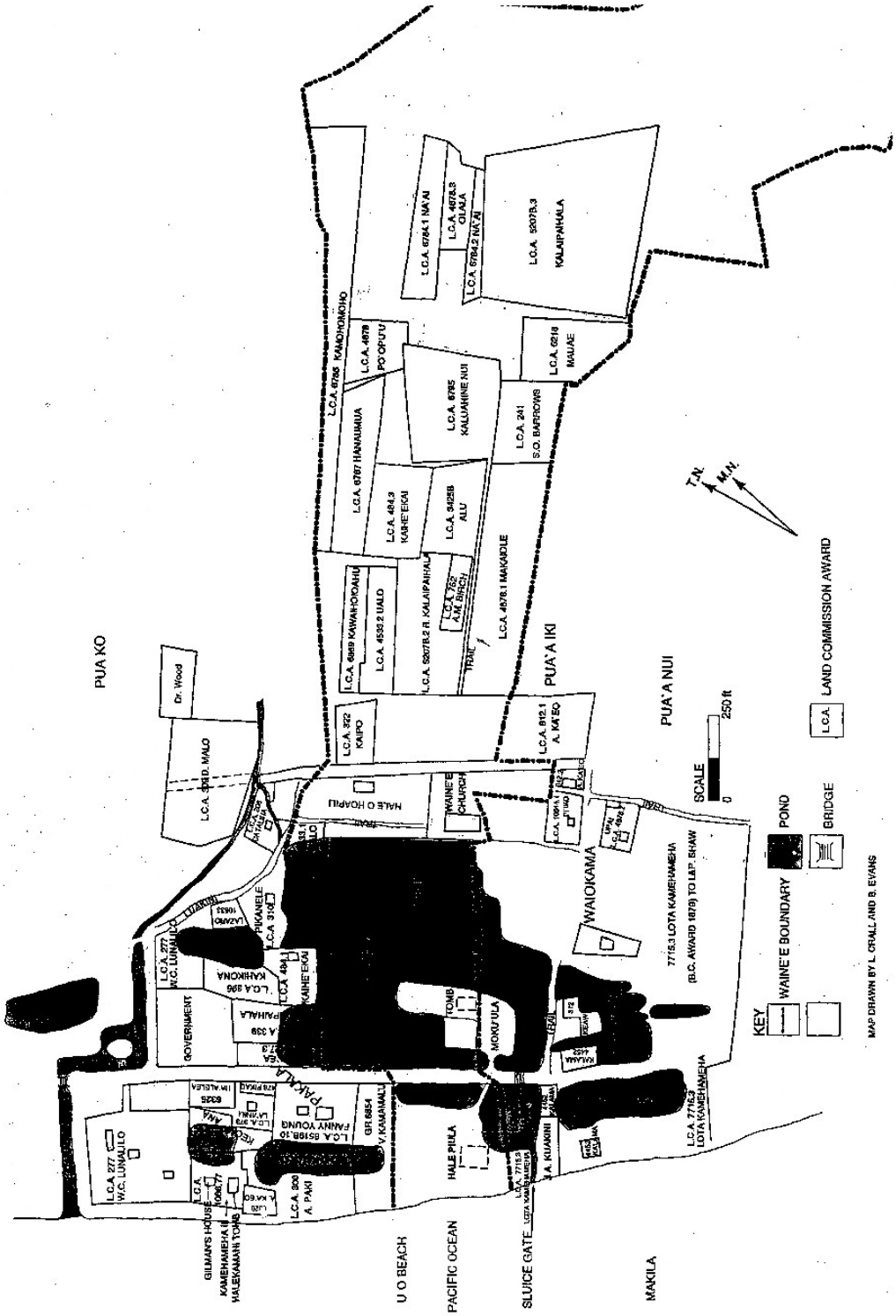


Figure 10. Photograph of present-day Malu`ulu o Lele Park, site of Kamehameha III's royal residential complex.


PRISON
ST
PLAT 08
CHAPEL
ST.
LUAKINI
ST
FRONT
STREET
PLAT 08
WAINEE
STREET
PLAT 12
SHAW
STREET
PLAT 06
1:1200
SECOND
ZONE
DIVISION
SEC.
PLAT
4
6
07
CONTAINING
PARCELS


TENNIS COURT
TENNIS COURT
BASKETBALL COURT
PARCEL 2
PARCEL 3
PARCEL 1
PARCEL 5
PUMP STATION
SALVATION ARMY
PARKING LOT
PARCEL 6
FRONT STREET
KEY
BASE LINE
EXCAVATION UNIT
INADVER. TEST PIT
DRIP LOCATION
MONITORING AND BOUNDARY
TREE
DOUBLE-WIDED WALL
ELECTRIC LINE TRENCH
MAPPING STATION POINT
SCALE


PUA KO
PUA'A IKI
PUA'A NUI
WAIOKAMA
HALE O HOAPILI
WAINE'E CHURCH
GOVERNMENT
PUKANELE
KAINE'EKAI
KAHIKONA
PAHIALA
PIKAKALA
TOMB
MOKU'ULA
HALE PILA
U O BEACH
PACIFIC OCEAN
SLUICE GATE
MAKILA
GILMAN'S HOUSE
KAMEHAMEHA III
HALEKAAIN TOMB
L.C.A. 277 W.C. LUNALILO
L.C.A. 200 A. PAKI
L.C.A. 8519B.10 FANNY YOUNG
GR. 6854 V. KAMAMALU
L.C.A. 7715.3 LOTA KAMEHAMEHA
L.C.A. 7715.2 LOTA KAMEHAMEHA
L.C.A. 6218 MAU'AE
L.C.A. 241 S.O. BARROWS
L.C.A. 6785 KALUAHINE NUI
L.C.A. 6787 HANAUMAUA
L.C.A. 6788 KAMOHOMOHO
L.C.A. 4979 PO'OPU'U
L.C.A. 5507B.3 KALAIPAHALA
L.C.A. 6784.1 NA'AI
L.C.A. 4978.3 OLALA
L.C.A. 6784.2 NA'AI
L.C.A. 4978.1 MAKAI'OLE
L.C.A. 5507B.2 R. KALAIPAHALA
L.C.A. 4533.2 UALO
L.C.A. 6869 KAWAHOIOAHU
L.C.A. 4984.3 KAINE'EKAI
L.C.A. 5428B ALU
L.C.A. 765 AME BIRCH
L.C.A. 812.1 A. KA'EO
L.C.A. 322 KAIPO
L.C.A. 300 D. MALO
Dr. Wood
T.N.
M.N.
SCALE
0
250 ft
L.C.A. LAND COMMISSION AWARD
POND
BRIDGE
WAINE'E BOUNDARY
KEY
7715.3 LOTA KAMEHAMEHA
(B.C. AWARD 1879) TO L.P. SHAW
MAP DRAWN BY L. CRALL AND B. EVANS

Appendix B Response Letters and Written Testimony

their subsequent followings. This is fact often shrouded and/or marginalized in today's Plantation/Tourist narratives marketed throughout Lahaina.

Kuleana…

The waters of kama (*Mokuhinia*) still flows to the kahakai at Waiokama….

It is our (kanaka o'iwi) history that must be told and respected before the foreigners

Foster Ampong

4-15-13
Date

Manuel Makahiapo Kuloloia
469 Maalo Street
Kahului, Maui, Hawaii 96732

March 11, 2013

Ms. Pua Aiu, Ph.D., Administrator
State Historic Preservation Division
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

He e-a wale no ke kai o Kuloloia-e
"He Kanikau no ka Moi Iolani Kamehameha IV", by B. Pauahi
Haleakala, Honolulu, Jan. 19, 1864
Ka Nupepa Kuokoa, Honolulu, January 23, 1864

The Kuloloia lineage and manifestations predate the conquest of Kamehameha and escaped the attempts of the victor to eviscerate ancient memory. Bernice Pauahi, in her dirge for Kamehameha IV, honored her ancestors and acknowledged the ***Sea of Kuloloia***, an ancestral name for Honolulu Harbor. ***The reef, fishery, and sandy beach of Kuloloia*** extended from Kamehameha I's enclosure, to the ***Heiau of Pakaka***, to the ***Fort***, to the wharf of James Robinson, to the shoreline properties of Kamamalu, Kekauonohi, and Kaunuohua, to the Queen Street property of Kamehameha III, and ending at the ***Pond and Stream of Kuloloia***, the 'Ewa border of the Kaka'ako area.

In his campaign broadside "E O'U POKII! E O'U LAHUI KANAKA MAI KA PO! E ALA! EIA KA LEO!" dated Dec. 28, 1872 against William Lunalilo, David Kalakaua invokes the ancients:

> E ka I! E ka Ahu! E ka Mahi! E ka Palena! E ka Paia! a me ka Luahine!
> E o'u pokii mai na kupuna. Ka poe na-na i na-i i ka aina, a i kukulu i ke
> Aupu-ni o na Kamehameha. Mai ka pa-ana laau mua ana i ka wai o *Keomo*
> a ka hui lokahi ana o na mokupuni i ke **Kai o Ku-loloia**.
> E ala! Eia ka leo!

T. C. Heuck Collection

Manuel Makahiapo Kuloloia
Page 2

Aiai, the son of Ku-ula, is associated with abundance, plenty, and reverence as he travels from Haneo'o, Hana to Honua'ula, to Hakioawa, Kaho'olawe, to Cape Kaunolu, Lanai, to Punakou, Molokai, to Makapuu, Koolau, to Kalia, to Kakaako, to the **sea of Kuloloia**, to Pakaka, to Kapapoko, to Ulakua, to Puuiki, and to Mamala ("Aiai, Son of Ku-ula, Part II of the Legend of Ku-ula, The Fish God of Hawaii", as translated from Moke Manu by M. Nakuina in Hawaiian Folk Tales: A Collection of Native Legends, as compiled by Thos. G. Thrum, 1907). The **Heiau of Pakaka** along the sand and reef of **Kuloloia** was demolished to suite the political, commercial, and religious motivations of its time. Our primordial ancestors, vibrantly found in the ancient piscatory fisheries of **Kuloloia**, its 'uku ako'ako'a and ako'ako'a, the coral polyps and coral, were egregiously destroyed, harvested, dredged, covered, and filled to consecrate foreign philosophies like the Kawaiaha'o Church and to accommodate international commerce. In 1839, Kamehameha III wrote to the Pope of the Roman Catholic Church and to France about their wrongs committed against the Hawaiian Government: ". . ., **a wawahiia ka papu makai o Kuloloia**, a hanainoia na waiwai o na Alii, . . ."

In our June 10, 2006 letter to Ms. Pi'ilani Chang of the State Historic Preservation Division, the Kuloloia 'Ohana submitted testimony by family members John Papa Ii and Samuel Kamakau:

> John Papa Ii, one of the first five members appointed to the Board of CommissionersTo Quiet Land Titles, commonly referred to as the Land Commission, notes in his Fragments of Hawaiian History the Kai 'O **Kuloloia** and Beach of **Kuloloia** as extending from Nu'uanu Stream to Kaka'ako. Ii depicts the royal residences of Hawaiians including Namahana, Keopuolani, Kamehameha, Keli'imaikai, Kuihelani, Liliha, Kalaniakua, Kalanimoku, Kalaimamahu, Kekumanoha, Kekuaiwa, Kina'u, Kaiwikokoole, Kekuaokalani, Ka'oleioku, and Hewahewa and his Kahunas along **Kuloloia**. Ii shows Hale 'O Lono, House of the Gods, and the shipyard of Nihoa contiguous to **Kuloloia**.
>
> The **Kuloloia** lineage predates the conquest of Kamehameha and escaped the attempts of the victor to eviscerate ancient memory. Namahana died at **Kuloloia**, O'ahu. In Ruling Chiefs of Hawaii, Samuel Manaiakalani Kamakau, who helped form the first Hawaiian Historical Association and also appointed to the Land Commission, mentions that Kaheiheimalie was taken to the stone house of **Kuloloia** at Waine'e, Maui upon her death in Jan. 1842. Kamakau tells of Ulumaheihei traveling to O'ahu, passing makai of **Kuloloia.** Kamamalu and the older boys and girls of the Royal School were comfortably situated at **Kuloloia** house, Waihe'e, Maui while attending a government conference in 1841.

Manuel Makahiapo Kuloloia
Page 3

A complete, unabridged map of John Papa Ii's description of **Kuloloia** and "Honolulu in 1810" as drawn by Paul Rockwood from data compiled by Dorothy Barere is located in the Bishop Museum Archives under SP/CP 102206 and SP203904. A copy of the Monsarrat sketch of Moku'ula, Maui and **Kuloloia** (late 1840's) is located in the Bishop Museum Archives under SP201919.

The Hawaii State Archives stores several mele of Kamehameha departing Molokai for O'ahu and ending with the Battle of Nu'uanu. In "He Mele o Ke Kaua I Nuuanu", I haku ia e Kalaikuahulu, a kope ia e G. Keola ma keia Buke December 15, 1880, He Buke Oiaio Kuauhau Alii, " . . . I Kaikua, I Kakaako, I Mamala, I ke kai o **Kuloloia**, I Pakaka. . . ." Kuluwaimaka's "Battle of Nuuanu" in the Kekahuna Collection states, ". . . I Kuai, I Kaka'ako; I Mamala 'I ke kai o **Kuloloia**; I na i'a hoolele o Kapawa. . . ."

On April 19, 1849 from Honolulu, Lorrin Andrews writes to Keoni Ana, Minister of the Interior, to purchase the reef of **Kuloloia** which joins the Fort and the wharf of James Robinson running to deep sea, "Ke manao nei au e kuai lilomai ia'u i kekahi apana kohola **i ka paia o Kuloloia**; aia e pili ana mauka i ka papu a me ka uwapo o James Robinson ma, a e holo ana a i kahi kai hononu; . . . ." The King and Privy Council met at the Palace 24th April 1849 and resolved that the application of Lorrin Andrews for a piece of land seaward of the Fort "be not granted."

On February 7, 1855, Land Commission Award #191 is issued to M. Kekauonohi for Apana 3, **Kuloloia**, Honolulu, O'ahu. It is bordered by V. Kamamalu, Kaunuohua, the King, Queen Street, and the kai. On March 26, 1917, Commissioner of Public Lands, Bertram G. Rivenburgh, submits to Honorable L.E. Pinkham, Governor of Hawaii, T.H., Land Patent No. 8317, in confirmation of Land Commission Award 191 to M. Kekauonohi, of land situate at **Kuloloia**, Honolulu, O'ahu. In her testimony before the Land Commissioners on January 13, 1847, Kaunuohua makes a claim for ". . . houselot on the southeast side of the enclosure for guns at Honolulu, **along the shore of Kuloloia**, the south side of this lot adjoining also the road called Waialeale."

He inoa e Kalohelani,
Hanai oe a Kaimihaku,
*Aloha au o ke kai o **Kuloloia**,*
Oia kai lana malie me he wai la.
"He Mele No V.K.K. Kalohelani"
Ka Hoku O Ka Pakipika, January 9, 1862

*Hoi no ka Lani i ka lulu, i ka pohu o **Kuloloia**,*
"He Kanikau No Ka Moi Iolani Kamehameha IV!", by Kamehameha V
Ka Nupepa Kuokoa, Honolulu, January 2, 1864

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Page 4

Malihini au i ke kai o Kuloloia
I don't know much about the harbor of Honolulu
("Some Hawaiian Proverbs," Hawaiian Almanac and Annual 1883, Thomas G. Thrum)

Ku i Oahu i ke one Kapu o Kuihewa
*I **Kuloloia** i Ulakua i Honuakaha*
I Hanaloia ke kahua o ka hale e kuai
Kulia i ka nuupaa Maopulani
I ka nuu paa i ka poki paa
I ka papa honua i lalo ia Kea
Ka hale Aimoku o Kelii
O ka Laepouhiwa ka Laekuma
O Kuma o ka ili paka i ka wai
I paka kahi paka lua paka kolu ka ili
He ili no Kama o Kamalalawalu
Kelii nona ka hale
("He hale no ka Moi Kalakaua", Bishop Museum Archives HI.M.61)

In "Hawaiian Place Names of O'ahu", family member and Hawaiian scholar Henry Enoka Palenapa Kekahuna records the beautiful sand beach, big pond, and stream of **Kuloloia** (The Kekahuna Collection, Hawaii State Archives):

Kaka-'ako, the land on the 'Ewa side of Ke-walo to **Ku-lolo-ia** Stream, where the Honolulu Ironworks and Fort Armstrong are now. There were formerly scattered dunes of white sand there.

Kuai, a canoe landing place that extended from where the Honolulu Iron Works is now, to where the former point of Fort Armstrong was, in Kaka-'ako, before the land was filled in.

Ku-lolo-ia, was a beautiful sand beach below Hale-kauila St., extending as far as the present Bishop Street. A big pond also named **Ku-lolo-ia** adjoined Hale-kauila St. at a point above the present Honolulu Iron Works at Kaka'ako. A stream from it flowed down right where the old Inter-Island dry-dock was.

Ka-pawa, a fishpond that was once above **Ku-lolo-ia** Beach, right where Pier 5 is now.

Manuel Makahiapo Kuloloia
Page 5

We have worked hard, struggled, and withstood criticism to preserve and to share the cherished, ancestral memory of antiquity. J.F.G. Stokes of the Bishop Museum sought out my great, great-grandfather, "Awaloa, the only Kahoolawe man" for the history and place names of Kaho'olawe. Upon request, Awaloa's brother-in-law Kauwekane penciled the place names of Kaho'olawe on a map, provided by C.S. Judd, Board of Commissioners of Agriculture and Forestry. This original map is in the Hawaii State Archives.

As a child, I listened to and admired the profound intellect of Ms. Rubellite Kawena Johnson as she shared her research and philosophy on the Kumulipo and of the Ku personages at the Science Building, Maui Community College with my grandmother Alice Kaohiki and father Leslie Aipalena. Ms. Johnson came to the family to witness the ***naka*** sea creature mentioned early in the Kumulipo, the Hawaiian creation cosmology. I am proud of my grandfather Wallace Aipalena Kuloloia's dedication to stop the destruction of his **Kukahiko** ancestral graves and Tutu Moloa home at A'awa, Makena, Maui. Moreover, I had been intimately involved in the Protect Kaho'olawe 'Ohana, Hui Alanui 'O Makena, and Honokahua struggles which awakened the consciousness of our community. I was at Keehi Lagoon for the departure to and return home from Mokumanamana and Nihoa when my father was part of a team returning the *iwi* on the sailboat *Stardust*. I was part of a team with dad to return the *iwi*, taken by a Kenneth P. Emory expedition of the Bishop Museum, back into Haleakala, Maui.

> *We perceive the idea of ensnarement, of being held fast, of inescapable retention through the phenomenal(sic) memories of priests of the heiau, embracing many essential purposes, many fields of precious knowledge, all that was known of creation, all that should become known, especiall(sic) of the life of man, through period after period of ancient tradition, era after era of history, reign after reign of royal rulers. Thus should be denied to oblivion the inestimable heritage bequeathed by the ages past, and to be yet bestowed by ages to come, indelibly recorded in storehouses of knowledge, the memory archives of the Hawaiian race.*
>
> ***"What is a Heiau?"*** Henry E.P. Kekahuna
> (The Kekahuna Collection, Hawaii State Archives)

Our Kuloloia 'Ohana submits this recordation in support of my 3/11/2013 Cultural Descendancy Claim Application, State of Hawaii, Department of Land and Natural Resources, State Historic Preservation Division, to the inadvertent discovery of human skeletal remain noted in the Amended Agenda, O'ahu Island Burial Council Meeting, Wednesday, November 14, 2012, VI. INADVERTENT DISCOVERIES, "B. Inadvertent Discovery of Human Skeletal Remain found in Nimitz Highway fronting Aloha Tower

Manuel Makahiapo Kuloloia
Page 6

Market Place. The OIBC Agenda of 11/14/2012 provided no Project Information such as Project Name, Landowner, and Tax Map Key (s).

SHPD representatives provided HECO (Hawaiian Electric Company, Inc.) with my e-mail address. On February 26, 2013, HECO representative Ms. Lori Hoo requested a Tuesday, March 12, 2013 meeting at HECO meeting room on the 1st floor of the Honolulu Club on Ward Avenue "to begin consultation meetings with the descendants regarding re-interment" of "an iwi kupuna that was found under Nimitz Highway near Irwin Park (near Hawaiian Electric's Honolulu Power Plant, in front of Aloha Tower Market Place)." An SHPD e-mail of 10/25/2012 1442 to HECO Ms. Loo indicates "that one long bone (a portion of the femur) has been found. . . ." This remain is being temporarily curated in the Honolulu Power Plant.

As a Kuloloia descendant, I have been previously recognized by both the SHPD and OIBC as a cultural descendant to iwi kupuna at the Ward Villages Shops, Keeaumoku Walmart, and Kawaiaha'o Multi-Purpose Building projects.

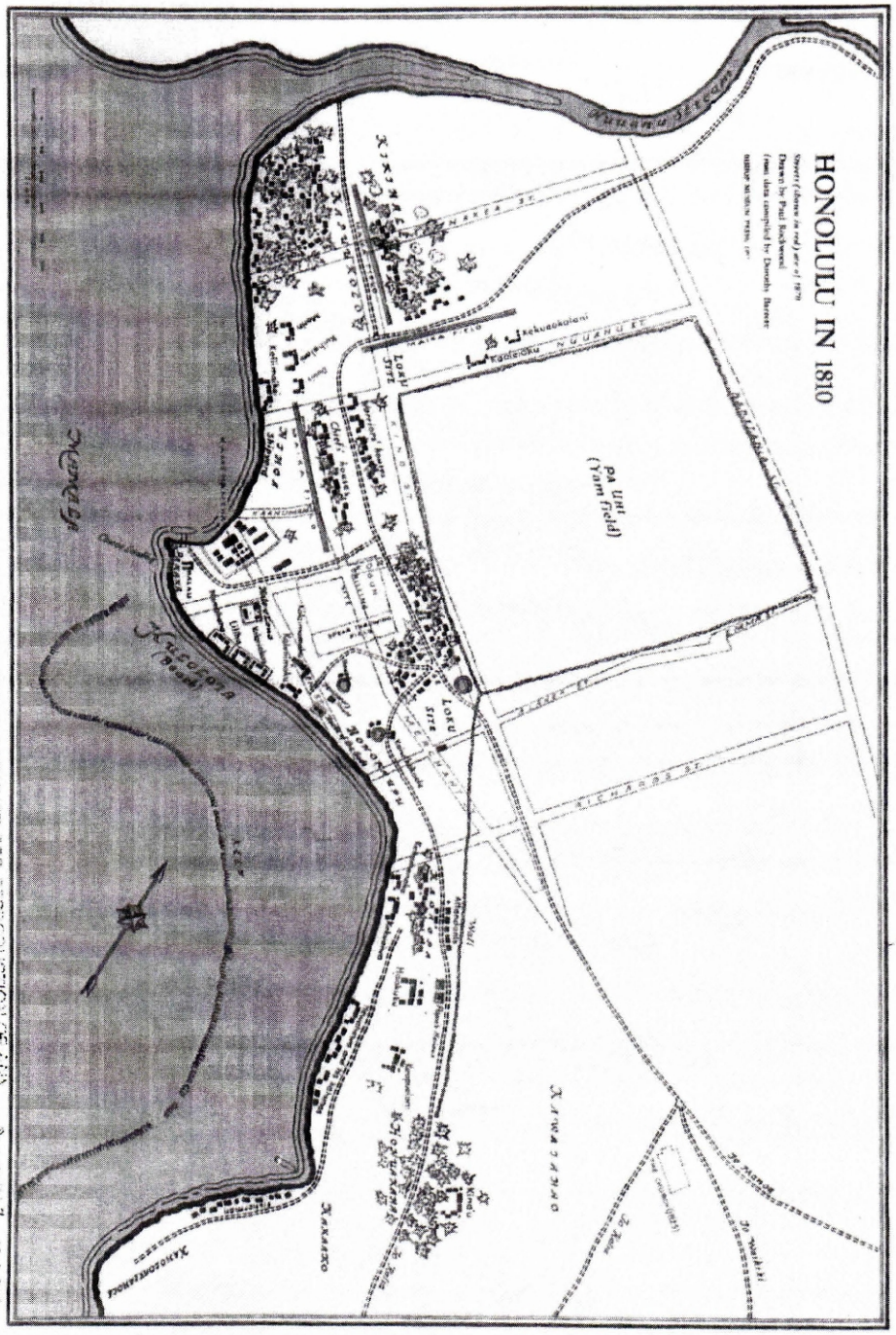
WE thank you for your support in allowing our Kuloloia 'Ohana to malama the iwi kupuna disinterred at Kuloloia, Honolulu, O'ahu by HECO representatives in Hawaiian Dredging in the construction of Hawaiian Electric duct lines on Nimitz Highway fronting Aloha Tower Market Place, a part of a larger Hawaii State Department of Transportation project to beautify and underground all utility lines along Nimitz Highway/Ala Moana Boulevard from the airport to Waikiki.

Me Ke Aloha Maluhia,

Manuel M. Kuloloia

Manuel Makahiapo Kuloloia

CC: Leslie Aipalena Kuloloia
Mr. William Aila, Chairperson, DLNR
Ms. Colette Machado, Chairwoman, OHA
Ms. Constance H. Lau, Chairman, HECO


HONOLULU IN 1810
PA UHI
(Yam Field)
NUUANU ST
NAHUA ST
RICHARDS ST
Loxu
Site
Kaiwahine
Kaiwahine
Kaiwahine

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

Descendancy Claim Application

(Please fill in all blanks to the fullest extent possible)

I. Applicant Information

Name: Manuel Makahiapo Kuloloio

Mailing Address: 469 Maalo Street

City: Kahului Maui State: Hawaii Zip Code: 96732

Phone (h): N/A (w): 808-347-3618 (cell): 808-330-2896

Fax: N/A Other: N/A

Type of descendancy applying for: ____ Lineal ✓ Cultural

Please check which documents you are providing to verify claim:

____ Birth Certificate ____ Death Certificate ____ Marriage Certificate

____ Census Records ____ Tax Records ____ Land Conveyance Documents

✓ Oral family history (Written or Recorded) ____ Other: _____

II. Project Information

* Inadvertent Discovery, VI., B; OIBC Meeting Agenda 11/14/2012

Project Name: State DOT (Airport to Waikiki); HECO excavation fronting Aloha Tower Market Place

Landowner: Not identified, OIBC Meeting Agenda 11/14/2012, VI., B.

TMK(s): Not identified, OIBC Meeting Agenda 11/14/2012, VI., B.

‘Ili/Mo‘o: Kuloloia Ahupua‘a: Honolulu

District: Kona Island: O‘ahu

III. Burial Information

Name(s) and death date(s) of buried individual(s):

Unknown

Burial description(s) if known:

Per SHPD Mr. Farm e-mail of 10/25/2012 1442 to HECO Ms. Lori Ito, "one long bone (a portion of the femur)..."

Relationship of applicant to deceased:

If reasonably believed to be native Hawaiian, these are ancestors that resided on Kulolaia, died at Kulolaia, and/or were buried at Kulolaia, Honolulu, O'ahu.

IV. Confidentiality Statement:
(Please sign only one of the two choices offered)

A. I request that the burial and genealogical information given above be restricted from public access [pursuant to HRS Chapter 6E-43.5(e)].

Signature: Manuel M. Kuloloia Date: 3/11/2013

B. I do not object to the burial and genealogical information given above being made available for public access.

Signature: _____ Date: _____

For Office Use Only

Date Application Received: _____ BSP Case Number: _____

Reviewed By: _____ Date: _____

Staff Recommendation: _____

Comments: _____

Date Documents Returned to Applicant: _____

2 *Last Revised 30 May 2012

Foster Ampong
58 Ho'ola Hou Street
Wailuku, HI 96793
(808) 760-8158

April 15, 2013

Anna Cordova
Cultural Surveys Hawaii, Inc.
1860 Main St.
Wailuku, HI 96793
Phone: (808) 242-9882

RE: Cultural Impact Assessment consultation/comments
U.S. Army Corp of Engineers Restoration Project
Mokuhinia, Lahaina, Maui

Kuleana…

Taking responsibility and fulfilling one's kuleana in large part is to recognize, acknowledge, respect and honor someone else's kuleana.

Wahi pana…

Loko o Mokuhinia *is* located in the ahupu'a of Waiokama and Waine'e and *is* **wahi pana** of my family. The *waters* from the wao akua of Mauna Kahalawai and Pu'u Kukui, m*auka* of Kauaula Valley and Pu'u Pa'u Pa'u has flowed freely *to* Mokuhinia, Moku'ula, the aina, muliwai and kahakai of Waiokama; nurturing and providing sustenance to the mind, body and soul of my family for generations whose *symbiotic relationship* remain unsevered and unextinguished from the time of *Ku-muli-po*.

Kanaka O'iwi…

As a lineal descendant of Waiokama-Waikane whose ancestors were born, thrived, died and buried at Waiokama a more *transparent and balanced* historical account of this wahi pana is necessary to remedy the false/injurious *historical context* presently perpetrated from the maligning and racist narratives propagandized by the ***early*** *Christian and Plantation foreigners* whose devastating effects continue to inflict great injury on the minds, hearts and souls of today's kanaka o'iwi Ohana.

Mokuhinia and its elements-relatives e.g. Kanaka maoli a me na (symbiotic context) kanaka o'iwi - Hawaii's inherent people and history (pre-1776 A.D.) ***were here before*** the foreigner, Captain James Cook, his lost-at-sea companions who simply stumbled upon our shore and/or

their subsequent followings. This is fact often shrouded and/or marginalized in today's Plantation/Tourist narratives marketed throughout Lahaina.

Kuleana…

The waters of kama (*Mokuhinia*) still flows to the kahakai at Waiokama….

It is our (kanaka o'iwi) history that must be told and respected before the foreigners

Foster Ampong

4-15-13
Date

Notes on informal interview with Ms. Owana Ka‘ōhelani Salazar with corrections and additions provided by Ms. Salazar.

28 March 2013

I met with Ms. Owana Salazar to discuss her connection to the project area and her concerns about the project. Very briefly, Owana's genealogy includes the following: Owana is a direct descendant of Keoua Kalanikupuapa‘īkalaninui, father of Kamehameha the Great, through her mother, the ranking High Chiefess Helena Kalokuokamaile Wilcox. Owana's maternal grandfather was Robert Keoua (same name as Keoua Nui) Wilcox, and her maternal great grandfather was the Honorable Robert Kalanihiapo Wilcox who was born and raised at Honua‘ula, Maui. He was an educator, a legislator, and eventually became the First Delegate to Congress, representing Hawaii in 1900-02. He was married to Princess Theresa Owana Ka‘öhelelani La‘anui.

Owana tells me that beginning in 1974, she attended annual ceremonies at Waiola Church and Waine‘e in celebration of the restoration of the Royal Tomb. While there, her mother presided over the annual ceremonies where their sacred ancestors were buried and honored. There in living practice of the tradition of Ancestral Veneration, Owana learned of their direct bloodline connection to this sacred area of Lahaina, the Royal Tomb of the Sacred Queen Keopuolani, Princess Nahi‘ena‘ena, King Kaumuali‘i, and other very high-ranking Ali‘i entombed in the shrine. The ceremonies and celebrations continued annually for a number of years until they were discontinued around the mid-1980's. Owana's mother passed away in 1988. In the years to follow, Owana would visit the Royal Tomb on her own, presenting Ho‘okupu with *lei* and *mele*.

Owana recalls that in 1998 or '99 she was living on Oahu, she and some friends were invited by Bill Kapuni to visit Lahaina for a weekend to see the new voyaging canoe that was being built. They arrived on Friday and ended up camping at the park near the banyan tree in Kamehameha ‘Iki Park. Keola Sequeira and Bill Kupuni were working on building the canoe that was at the time called Mo‘okiha. This park is directly across the street from the project area. On Saturday afternoon, both Thelma Kahaiali‘i and Ulu Kahaiali‘i came to see Owana. Upon seeing the two Kupuna with Owana, Bill Kapuni invited them all to attend the weekly *‘awa* ceremony that was held by himself and Keola, in the canoe building area with all the people involved in building the canoe. Most were *malihini* volunteers. Bill had also spoke of Keli‘i Taua and said he would also be attending.

It struck Owana as odd, that an *‘awa* ceremony was held every week and they all turned the invitation down. Until finally, after a lot of persistence on Bill's part, Aunty Thelma told Owana to attend and they would simply sit behind her but not participate in drinking the *‘awa*. It needs to be noted here that according to teaching from Sam Ka‘ai, when taking part in an *‘awa* ceremony, the participants are to mind what they say and take it very seriously. Sam taught that what is said in the ceremony reverberates in the heavens for 7 generations. That said, when this ceremony began, the lead participant (Keola) offered a prayer and "invited" Kihawahine to be present. The *‘awa* was mixed and one by one, the cup of *‘awa* was passed around. Owana says she was taken aback that most of the participants were uneducated about the *‘awa* ceremony and therefore treated the ceremony as their therapy rap session where they expressed their hardships and challenges with regard to building the canoe. It is because of their ignorance that they did not

treat the moment with reverence and respect, and they were not mindful of just exactly what they were taking part in. To add insult to injury, the *‘awa* ceremony was joined up with a Native American ceremony called “Give Away”. Putting it bluntly, it was *kapulu* and wrong to mingle the two completely separate traditions of separate peoples. And it must be noted here too that Keli‘i Taua was not in attendance.

After the “official” ceremonies were over, everyone just drank the remaining *‘awa* socially. Owana decided to bring a cup outside to offer on her own. Although it had not been raining, there were water puddles at a few locations around the Banyan tree. She poured the one cup of *‘awa* into one of the puddles and offered a silent *pule* in respect to Kihawahine.

The next morning (Saturday), a camera crew from Kodak came to take some footage of them sailing the other canoe, the Mo‘olele. Owana declined participation on the sail and chose to stay by the camp to play some music with her guitar. There were a lot of people around, it was Saturday and the beach goers were out and about. Owana offered her music to the sacred area discretely. Then, most unexpectedly as she was singing and playing her guitar, she noticed a woman sitting on the stone wall of the platform area towards the right. Owana turned her head to look, but no one was there. She continued to play her song, again she saw the woman, again she looked, and again there was no woman. After this happened a few times, Owana figured that she was perhaps seeing something supernatural and decided not to look directly at her, but instead, to observe through her mind’s eye and to pay attention to the woman by watching with peripheral vision. At first, the woman was sitting on a low rock wall, but then she began to pace a couple of times along the stonewall. The woman was very beautiful. She had fair skin, *‘ehu* blonde hair and was dressed in a dark, forest green color. Owana believed it to be the *‘aumakua* Kihawahine.

The next morning (Sunday) everyone was getting ready to leave. Owana made a phone call to Keli`i Taua and told him a little about her experience. Also asked him why he didn’t come. She was invited to his home in Haiku because he wanted to hear more of what she had experienced. During their talk, Owana fully explained her experience and the details of what she saw with the *‘awa* ceremony and the vision the following day. Owana felt it odd that the woman’s hair was so light… being *‘ehu* blonde. He then told Owana exactly this, “I am here to confirm that what you saw was true.” He further explained that Kihawahine was of the *‘ehu* clan and that her hair is not dark, but light color or what is known as *‘ehu*.

After this experience, Owana felt compelled to return to Lahaina so as to offer her help to “clean up” the *kapulu* messy ceremony. She patiently waitied until Keola asked her for her observance and what advice she had. Upon his asking, she asked that they not be so casual about the way they conducted the *‘awa* ceremony. She says she told him that when they call on the *‘aumakua* to be there, they come, so what is said during the ceremony needs to be thought out and reverent. He wanted that time to be for his working crew to talk, and Owana agreed it was a good thing to talk story together, but not to include that kind of talk within the context of the actual *‘awa* ceremony. She asked Keola to simply drink the *‘awa* with his crew socially. They were not educated enough to participate in such a high ceremony. After the talk between Keola and Owana, she left disappointed and saddened that her advice was not heeded, even though it had been requested.

Months later, Owana was continuing her regular commute between Oahu and Maui in order to perform at the Westin Ka’anapali. She considered it a special time indeed, that she would stay with Aunty Thelma Kahaiali`i. It was at this time that Owana says she began having dreams about Kihawahine and the Mo`o. One dream began with the memory of the actual experience where she sat near the banyan tree and played music, then poured *‘awa* into a puddle. After pouring the *‘awa* in the dream, Mo`o began coming up out of the ground and joyfully dancing to the music as she played. She described them as having a sort of hood like a cobra, an elongated face, reptilian skin and a body that stood upright on their hind feet. One particular Mo`o was wearing a beautiful brocade purple robe.

In another dream, Owana says she was once again at the same beach area in Kamehameha Iki Park. She walked towards an open doorway where a woman was seated. The woman was obviously not Hawaiian, and Owana said “Hello” and asked her with urgency, "Do you believe in the*`aumakua*?" The woman could not answer yes or no. Owana entered the doorway and saw a canoe being built, there was a man at the end of the canoe and Owana greeted him and asked the same question… he too could not answer yes or no. Owana says that the dream then took her outside of the house where she then saw a man leading a group of people, telling them about history of the area and about Kihawahine. She approached him also and asked the question, and he was also not able to answer. All three of their expressions were like they wanted to believe but didn’t. Perhaps they did not know how or wanted to believe in a mythological creature such as a Mo’o.

Upon awakening, Owana told the dream to Aunty Thelma. Aunty asked her, “What would you like to do?” Owana answered that she wanted to do as the dream showed her. So the following week, Owana brought *‘awa* with her and she and Aunty Thelma went to the Kamehameha Iki park together where Owana offered the *‘awa* and she took out her guitar and played two or three songs. All the time, Aunty Thelma was at her side. Owana explained that, of course, there were no Mo‘o physically observed coming out of the ground, but that this was an act of faith. After their ceremonial observance together, Owana put her guitar away and they decided to have breakfast together at a nearby restaurant. After their breakfast, Owana and Aunty Thelma strolled back to the park and sat on one of the benches. Lo and behold, a man came along leading a group of people, telling them of the area and of Kihawahine, and of the canoe being built, about the history of the area and its significance in Hawaiian religion - just as it had happened in her dream. She says she knew she had to approach him and ask him the question. As she listened to the words he spoke to the people, she heard him say words and phrases such as “was” and “used to be” etc., all indications of past tense. After he was finished with his talk, Owana approached him and politely asked the question. By that time, Aunty Thelma had joined them and introduced Owana to Keoki Sousa. Keoki responded that he did believe. Owana expressed her request that he speak of Kihawahine in present tense and not past tense. That she “is” and this is her home, her domain. She stressed to him (and to me) that they are still very much present.

Owana says, "What Kilauea is to Pele, Mokuhinia is to Kihawahine." She wants it to be known that the *‘aumakua* is still present, and should not be thought of as a thing of the past but rather an ancient Hawaiian *‘aumakua*, a deity that is present.

Owana related one more dream to me. In this dream, she found herself in what appeared to be a cave. There were many many Mo`o, perhaps a hundred or more. As she observed the many Mo’o, Owana saw that Kihawahine sat on her own chair, perhaps a throne, she was the only one seated. It was a simple solid chair. She appeared in the same form as when Owana had first “seen” her when she was playing music at the Park (with blonde hair and dressed in a forest green color). As the dream progressed, Owana said a beam or ray of light came from the top, angled (about 45 degrees) toward Her. The beam touched Kihawahine's solar plexus and began drawing her up on that beam of light. Owana’s visual of the dream then shifted and Owana was above ground, observing a hand holding a cup of *‘awa* being poured into a small area of water (like where she poured the *‘awa* that first night after that “ceremony”) When the *‘awa* touched the water, it instantly became the beam of light that was drawing Kihawahine upward.

According to Owana, she feels that this dream signified that when the *‘awa* is used in ceremony to call for the aumakua to be present, they are compelled to be present. Hence, the requirement for the utmost of care for what is spoken during that time of ceremony when the “veil” between the separate realities becomes more transparent or lifted. This is a sacred, sanctified time and respectful observance by all who are attending is required.

As for the project specifically, Owana is very concerned with the possibility of any modern structures being built where Mokuhinia and Moku`ula are. She feels that no structures of any kind belong there and wonders when the word “restoration” became “construction and development” instead. Several times she mentioned being especially concerned with bathroom facilities being placed in the area and would like to see the pump station (men and women’s bathroom) already present in the parking lot just east of Malu ‘Ulu o Lele Park to be removed. She says that it needs to be kept in mind that any structures and their subsequent waste will go in and/or near the sacred home of Kihawahine and other ancestors buried in Mokuhina. Owana is also concerned with any disturbance of the earth near the cemetery that may take place with the building of any structures. According to Owana, plans submitted to Maui County for Building Permit renewal, the non-profit organization Friends of Moku’ula (FOM) intend to build a parking lot and support facilities right next to the Waine’e Cemetery. There is evidence that FOM’s proposed development will disturb graves in Waine’e and other burials in Mokuhinia. FOM’s support facilities will include sizable bathrooms for men and women, a kitchen area, a meeting room, and possibly more.

Overall, Owana Salazar would like everyone involved in the project to do their best to understand and always keep in mind that Mokuhinia and the associated area is the domain of Kihawahine, the home of the living and very present *‘aumakua*. Moku’ula and Mokuhinia are sacred areas to be treated with the utmost of respect and reverence.

Pincess maori puananio tahiti Badoyen-Robinson

The following is a copy of an email sent to Ana Cordova on Ms. Badoyen-Robinson's behalf on March 19, 2013, concerning her mana‘o on the restoration of Loko Mokuhinia ecosystem.

Subject	**RE: mokuhinia cia**
From	Anna Cordova
To	'Kathy Corcoran'
Sent	Tuesday, March 19, 2013 4:22 PM

From: Kathy Corcoran [mailto:glorybe@hawaiiantel.net]

Sent: Tuesday, March 19, 2013 11:40 AM

To: acordova@culturalsurveys.com

Subject: mokuhinia cia

Aloha Anna,

Here is my mana'o that you requested on the restoration of Loko Mokuhinia ecosystem.

Like Akoni, who wanted to give reverence to our ancient gods and goddesses, I do not want our ancient gods and goddesses to be put on display and serve as an amusement for visitors for a price.

The proper way to restore the area would be to restore it as Akoni envisioned, as a place of reverence and not for amusement. The area needs to be restricted to the purposes of education, so children from local schools can come and see how their ancestors lived. The children need to be the ones educated, before any visitors. The teachers will need to be educated first, of course. This is sacred ground, and the only people who ever lived there were priests and ali'i, and this needs to be continued.

During excavation, workers need to follow some Hawaiian protocol, specifically that related to Kihawahine. Akoni Akana, at one time, wrote a column in the Lahaina News, explaining the proper protocols for her, and I will be even more specific. The protocols include being very careful what you touch, even on your own body. One must avoid scratching any itches, or expelling any personal waste from the body—urinating, defecating, blowing the nose, menstruating or spitting. Leave the site to take care of these, and wash your hands before coming back.

If people are serious about excavating and restoring the pond, they need to observe and practice these protocols because our physical acts have unknown consequences when on sacred land. In these modern times, it may be hard to understand how important it can be to follow these guidelines, but even today, there are many accounts of unexplained occurrences and tragedies at construction sites all around Hawaii.

As for plants, only certain royal medical practitioners, la’au lapa’au, were allowed near this pond to collect medicinal plants. These were located makai of the pond. Many breadfruit (‘ulu) trees grew makai, also, and these had been planted to symbolize the prosperity of the royal family. I was little when they were destroyed, and I remember it well. Also, regarding plants, it has been the experience in Hawaii that when invasive or nonnatives are removed from an area where they had been long-established, the forgotten native plants return. We can expect the same thing with Ma’ulu lele Park, where Mo’oku ‘Ulu and Mo’oku Hinia lie. (These spellings reflect the actual former pronunciation of these places, because they are related to the mo’o.)

If people have been collecting plants from the area since it was covered, please ignore them, because the traditions of the place are contrary to such gathering.

Sincerely,

Crown Princess maori puananio tahiti Badoyen-Robinson 283-4735

Daughter to Ali’I maoli puananio kahike Giffard-Badoyen

Daughter to Ali’I Manchuria Hapuku a Kakuhiewa-Giffard

Daughter to Ali’I Kina nawai hokuokalani Ike’ole a Kakuhiewa

Appendix C Formal Interviews

C.1 Friends of Moku‘ula Interview with Mr. Hailama Farden

03-30-'13 12:13 FROM-Kamehameha School 8455470 T-382 P0001 F-263

Authorization and Release Form

Cultural Surveys Hawai'i (CSH) is grateful for the generosity of the Kūpuna and Kama'aina who have willingly shared their knowledge and experiences for the preparation of a Cultural Impact Assessment that is being drafted for the Mokuhinia Ecosystem Restoration Project, Lower Waine'e Ahupua'a, Lahaina District, Maui Island, TMK (2) 4-6-007; 001; 035-038.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our assessment. Here are the procedures we promise to follow:

1. You will have the opportunity to review the written transcription of our interview with you. At that time, you may make any additions, deletions, or corrections you wish.
2. You will be given a copy of the interview transcript you have approved for your records.

For our records and yours, we humbly request your confirmation that:

1. You were given the opportunity to review the transcript of the interview.
2. You consent to the use of the interview with any revisions specified by you for historic documentation and academic purposes.
3. You consent to the interview being made available to the public.

I, Hailama Farden, agree to the procedures outlined above and by my
(Please print your name)

signature, given my consent and release for this interview to be used for historic documentation and academic purposes.

Additional Comments and Clarifications:

(Signature)

3/31/13
(Date)

Recording Date	August 19, 2010
Transcription Date	December 14, 2012 to December 20, 2012
Participants	Hailama Farden (HF); *Interviewer (1); Interviewer (2)*

Hailama Farden, Lahaina, Maui

(1): Starting with your name and where you were born and raised where you grew up and went to school and I'll try to take notes too.

Hailama Farden (HF): My name is Hailama Farden. I was born on Oahu at Queen Kapiolani Hospital. And I was raised by my grandparents both of Lahaina. And I was raised in Waianae, Oahu. And because I guess, they were both from Lahiana, that I spent a lot of time in Lahaina and sometimes even stayed there in the summers.

(1): What is your parents' names?

(HF): My grandperents that raised me are Rudolph Haleakala Farden and my grandmother was Harriet Sylva Farden.

(1): What year were you born?

(HF): 1971

(1): Where did you go to school: elementary and intermediate?

(HF): Waianae Elementary, intermediate and Kamehameha for High School.

(1): After high school, what did you do?

(HF): Went to UH Hilo, and I graduated with a degree in Hawaiian Studies with emphasis in performing arts and Hawaiian language, so a double emphasis.

(1): What is your earliest knowledge about Lahaina?

(HF): We used to stay with my grandmother's brother who lived on Luakini street. I guess around here on the map [pointing to location on map] which is right behind the wharf, directly behind the wharf center, Frank and Adelaide Sylva. And of course my auntie Addie is the last of these kupuna alive. She's going to be ninety-six in October. And so we'd go there a lot to stay, even though my other aunt lived there, my aunty Emma Sharp, which is grandfather's – grandpa is number ten of thirteen children, and my auntie Emma is number five…one…two…three…four…five out of thirteen children. So they lived out in Kahana area, but I spent most of my early visits with my grand-aunt and uncle, Frank and Adelaide Sylva. And the home that they lived in was the same home that she grew up in. Only recently, I guess in the last ten years, they knocked the house down and built a new one – kind of that old style where you gotta climb up the stairs, you hit flat and then you gotta take a shower outside, cannot take a shower inside the house. So there was this room with the shower head hanging from the –

and I mean that was up til recent – cement floor, real old style. And I remember, ha!, one of my favorite memories is … Bakery, and when the bread would come out we'd go to town – well actually I was always working at that time – down Front Street, is Haupo Bakery. So we used to go over there. Aaah, I used to buy all these loaves and they were about this big [holding hands apart to show size of large loaf] and you take one block of butter and put em inside the Haupo bread and then you eat the whole thing. Now she only makes once a month, one Sunday a month. Before, it was every other Sunday, now it's one Sunday a month. And you still go out behind, by her house. You have to go back of her house, but oh no, no, no, I'm sorry. They have that deli now, that's right. The house was after Haupo and then they have the deli. I forget the name of the deli. It's right behind McDonalds, in by Nagasako. It's right across the street from McDonalds, mauka side. Ah, sugars, I can't think …No ka oi Deli. Yeah.

(1): And do they sell the bread there?

(HF): Yeah, only once a month. So sad.

(1): Yeah.

(HF): That was the best bread, I tell you.

(1): It's like going to the Moloka‘i Bakery.

(HF): Yeah, but better than. That's the – Haupo bread is better.

(1): Really!

(HF): It's the French bread too you know. Oh, it's so good! Boy, I can eat that for days. And, my grandmother used to like the twist doughnuts. I didn't like it because they're real tough. You know it's not the soft twist, it's real tough. They still sell em too. And then they have this corn bread, or not corn bread, but some other bread, but that was a favorite. And I'm going to tell you, every time when I go home to Lahaina, we would get – we'd always have Nabeta fish. Lainihi is what they call in Hawaiian. But most of the Hawaiians call it Nabeta. And that kind of looks like a baby uhu maybe. And it has a little thingy, not a horn but it's a little thingy [making sign with his finger on the center of his forehead, like a horn] above it. And boy we can fry that and you eat the scales and all. That's the best eating fish. The reason you don't see it in the stores is because the fishermen who catch it, they keep it for themselves. It's a deep sea fish that you catch by hand line, but that, I remember that. And you know before, we'd have to go to the Kahalui side. But, they have the small airport, where the timeshares are all being built right now – those horrible things. I only say that because, you know, timeshares not hotel where we all can stay, you gotta timeshare to get in there. It's a preventative for all of us to stay over there. Not so bad if we can use it. But right over there was the old airport, that small airport where maybe six and nine passenger planes. Was Royal Hawaiian Air, then they became Reeves Air. And we used to land by the old smoke stack out there, and that smoke stack, it's sad when they knocked it down because that was a marker. That was a fisherman's marker. They used that to – so okay, from out here we know where to get certain fish. And they took that down. It's really sad. That's where the train turns around. So right across from there is where the old airport used to be. And I remember, they built the new airport out in Kaanapali. My family was all against it, and they're the most frequent riders now [laughter]. I remember my grandfather's number three sibling, his

brother, he had court every day with his uncle Carl. But when it came, on the day, he used it [laughter].

(1): It's just like the people who fought against H-3

(HF): Yeah, well some of them don't. I understand some of them still don't use it. But I think of Lahaina, Maui, as things that we could eat. Like, you go on this vacation you can get these things that you couldn't get here. Now you can get pretty much anything on any island, you know. I remember we'd come home with Maui onions, pog – I would insist I want pog cause we didn't have pog on Oahu. You had to have passion, orange whatever guava juice in Meadow Gold, but I didn't know the difference you know, pog was pog. And for some reason Haleakala Dairy milk and Haleakala Dairy juice tastes better than other. And oh, I used to like this – you go inside our house and you go outside you have one outside ice box. And the outside ice box was loaded with Haleakala Dairy soda – or Maui Soda Works. Maui Soda Works, and bottle you know? We don't have bottle like that no more. That was full. And oh! And then my uncle Frank used to take us fishing, all the time, weke season. Right where the … Union used to be parked? We used to fish over there for red weke‘ula. Oh boy, we used to always catch the weke. All the time, he used to take us fishing. And my uncle was a good fisherman, good diver.

(1): Which uncle was this?

(HF): Frank Sylva. You know, he was taught by his dad, my great-grandfather, Henry Sylva Henry Curtis Sylva. And Uncle Frank, he knew all the mountains of Lahaina, all on the West Maui side. Which is also called Wailuku Range. A lot of people don't know that. They just say West Maui Mountain but, on old maps it shows Wailuku Range. And Uncle Frank knew. And I tried to get him to – by the time I thought I need to interview him, he was already weak and hard to hear, and hard to respond. But sometimes when we was driving, he says, "Oh that is this" and he points to all the mountains. And the only one I can ever remember is Līhau because it's in songs, you know? Oh! And Ukumehame, which is above the park area. But, boy, he was a talented man; a very generous man, Uncle Frank. And you know – unfortunately out of what – that family, they married the Browns. And so there was two families, kind of like the Brady Bunch married each other, Sylva and Brown. And my great-grandmother was Mary Mikala Brown. She was born in Moaula, Lahaina. Moaula is where Baker Street is. In fact, her kau hānai, which was her mother's sister was Tutu Kahuhu Baker, who was that tree named after, Hoapii Baker. That's her husband. So she was born right there. Tutu, I have a picture of her inside, I can show you after. Anyway, so, out of about thirteen or eleven children of the Brown/Sylva clan, Uncle, and he's one of the older ones, he buried every single one of his siblings. In fact, when my grandmother passed away in 2006, I tried every effort to get him here, and he came down. And it was important for him to be there, to see the closure. And they were the closest, those two. They were full sibling because same mother, same father. But they were the closest two. But even the youngest all went before him.

(1): So what's the earliest history of the family in Lahaina?

(HF): Well, two sides, yeah? So my grandmother's side, like I said, Great-Grandmother was born in Moaula. Her name was Mary Mikala, and Baker because she was hānai to Tutu Kahuhu, but her true mother was Tutu Kahele, so I guess her name should have been Hauki; I don't know I never paid attention to what should be the name. But anyway, so she was born Mary Mikala and

then Baker, and her mother, like I said, her birth mother was Tutu Kahele. And Tutu Kahele's sister was Tutu Kahuhu. And so she gave her to her to raise. And there's some story in why all that happened, but then you gonna need too much time and too much tape for all those stories. But Tutu Kahuhu, we only have a few generations back that I think we know of, but as far as I know, the family is from there, from Lahaina. The Farden's on the other hand, Grandpa, Grandpa's dad, well, I call him Grandpa Farden, my great-grandfather; he was born in Maliko, in Makawao, in Maliko Gulch. Granny was born in Honolulu, but her family is from out past Kahana, because the land, that Aunty Emma's property, and we have the Puamana Place, which was – every sibling had land over there. That was all family land, inherited.

(1): Puamana?

(HF): Puamana Place. Not where Puamana is. And so, Granny's side comes from there. She was born on Oahu. Her mother was Tutu Nohokaha. And Tutu Nohokaha married a Hungarian man. And his name was Bastell, Bernhard Bastell. And he was a chief steward for Kamehameha the fourth or fifth. And that's why she was in Honolulu. She gave birth in Honolulu. He died when my great-grandmother was very young. And then she died right after. So that's why she went back to Lahaina. They had property right on Bethel – is it Bethel? No, Alakia and something – oh right, prime land. If we still had that today – but Tutu Nohokaha had it. So, she died, her daughter, my great-grandmother, Annie Kahalepoli would be adopted to the sister Tutu Kahalepoli, and that was another adoption, but that was her blood too. That was her sister. And it was their land that was out in Kahana, where our family's land is today. In fact, they're buried there. We don't know where, but they're buried there. We knew where they were, but when I went to go back and look, we can't see it anymore. It's flatted. So, we know right by the kiawe tree. They used to tie the horse up there, that's how I know.

(1): Is it mauka or makai?

(HF): It's mauka of the lower Honopiilani Hwy. So, like I said, Honopiilani Hwy is right here on the beach, then Poamana Place goes like this – it's a place that stops. So right above the bend is where there's this kiawe is, and behind the kiawe tree.

(1): Is that the bend that they call the 'S-curve'?

(HF): No, no, way beyond the S-curve. The S-curve is about a mile away.

(1): Okay

(HF): So, you gotta keep going out and then you'll see Puamana Place and the … bend is in the place. So you turn on Puamana Place, there's a little bend there, and right at the bend, you see behind the building is a kiawe tree, and that's where they buried, but we don't know. Now, interestingly, my great-great-grandmonter, Tutu Nohokaha, Granny Farden's mother, she's buried – if you go out somewhere out past that, I don't even know where, but it's on lower Piilani, you go a little bit more, then you look at one white wall and a blue house – kinda, I don't know, maybe about fifteen years old, with a blue ceramic roof, right above where the living room is – underneath is her grave. That was before the days that they had to check for graves, yeah? So sometimes I will stop over there and just look to be reverent, and then I will hope that I will see somebody and say, "Oh right there where you're living, that's my great-great-

grandmother’s grave”…just to do that. Now, Tutu Kahuhu folks are buried in, they’re all buried in Mala, gosh, what is the name of that cemetery? I went blank.

(1): Not the Seaman’s cemetery?

(HF): No, no, not the Seaman’s. Where Mala Wharf is, you get the Chinese and Japanese cemetery and then right in the middle there’s this dirt road in the middle, right mauka of that is where the Hawaiians are buried. It’s all bush kiawe and right at the top rise over there, you walk in, there’s graves. That’s where our Tutus are buried. They’re still there. Tutu Kahuhu, Tutu Kahele, they all buried in there. Uncle Hailama – they’re all buried there.

(1): What does Hailama mean?

(HF): Hiram. But you see, that was their name before. That was their last name was Hailama. Then they took it on – one part of the family, they took it on as their first name. One of the uncles, became first name. First it went Hailama, then they changed it to Hiram. They translated it to Hiram. And then one uncle used it as first name so the name kind of died out over there. But that was their last name, Hailama. You know, in those days, they look at people they admire. They didn’t have last names. So to help create a last name, they just pick something. So, I understand they picked it after Hiram Bingham. So they named Hailama after that Kahu. Cause kahus are powerful, yeah? So they took that name. That’s how – I’m named after Uncle Hailama, who is named after his family Hiram, Hailama family.

(1): My daughter just found a document that said that he married my great-great-great-grandparents.

(HF): Oh yeah, very common. I mean, Hiram Bingham was all over. In fact, his son is the one who discovered Machu Picchu.

(1): Yeah yeah.

(HF): So anyway, the family has always been there. Now, my grandmothers, like I said, Mother was born there, Moaula, although, her father was not. He’s from, I think, Makawao area. Cause that’s Portuguese Hawaiian side, so that’s Sylva. And Grandpa Sylva, Henry Sylva – his name was Henry Curtis Kulekana Sylva. He was the luna of a plantation. And all I know is, I don’t know where he was a luna, but I know he was a luna.

(1): Was he part Hawaiian?

(HF): Oh yeah, half Hawaiian, half Portuguese. And her mother, which is Tutu Marry Mikala – she was half Hawaiian, half English-French. And on the Farden side, Grandpa Farden, was half Hawaiian and half – we thought was German, but it’s actually French. But what it was – they were living in Germany. They were Huguenots that escaped France to go to Germany. We found that out 119 years later.

(1): Wow.

(HF): And the name is supposed to be Jardin, J-A-R-D-I-N. That’s supposed to be our name. But they kinda – I don’t know, my great-grandfather, you know, when you look at it, he wrote it clear. It’s not like they misinterpreted. So I think he was trying to deceive people and not show his last name. So he wrote, it says F-A-R-D. It was an ‘F’, cause he crossed it, and everything. He came from – he was supposedly whaling, and he came up to the arctic, and he – something

happened to the ship. The ship got damaged or something, so he came down to Hawai‘i. And when he got to Hawai‘i, he married this lady, Koholoholowa (spelling?) – no children, but he left her a whole track of land, cause he was very influential with the plantations, so he left her a whole bunch of land. And then he went and he slept with my great-great-grandmother Ka‘ili‘inikauhawahe (spelling?), and they had two sons. One was Charles Kekua Farden, and the other one was Alexander Farden. He took Alexander and went back to Germany, but we found out 119 years later that he moved to New York and he married some lady on the ship with him and went. And the other thing is, my great-great-grandmother was married to Kekua, so therefore, he had to go legally adopt his son in order to take him Maui. Take his own son, Alexander. Anyway, it’s all confusing, but that’s how life is.

(1): Yeah, oh yeah, I got a lot of those too. So, Charles is your line.

(HF): Yeah, great-grandfather. Yeah, all four – so I have four lines in Lahaina, or Maui. Yeah, all four of them from Maui. And then, my mother’s side, she’s half Japanese, half German.

(1): And what was your mom’s name?

(HF): Linda Hayano Oiday.

(1): H-A-Y-A-N-O Oiday, and that’s your mom?

(HF): Yep, so she was Japanese-German, cause her mother came from East Germany, my grandmother.

(1): Wow, interesting.

(HF): She was actually drafted in the Nazi air force before. But she escaped.

(1): Your mom?

(HF): My grandmother, and she escaped and then she met my grandfather while he was serving in the 4-42nd. And he threw her hair over her head, like that [making motion], and then she turned around and decked him. And that’s how they met. And they got married. Of all my grandparents, my grandfather is the last one alive and he’s 87. He’s the youngest too, cause even that grandmother was a year older. And then my other two grandparents were much older, so they died in ‘05’ and ‘06’and this grandma, German grandmother died in ‘99’. But they’re not from Lahaina.

(1): And your dad is…

(HF): My dad was Rudolph Haleakala Farden Jr. but everyone call him Randy. He’s the composer of the song, ‘Beautiful Kaua‘i’.

(1): Oh really? I love that song. So Rudolph…

(HF): Haleakala Farden Jr. And actually, he wasn’t born that. He was born Wayne Evens Farden. Where they got that from, I don’t know. Then when my grandfather thought, “I guess I’m not going to have any more children,” they changed his name legally, at age 52, to Rudolph Haleakala Farden Jr. My dad created Randy himself because he hated Rudolph the Red Nosed Reindeer. So, he died in ‘99’ too. My mother died in ‘75’. They linked it to some pesticides on Maui that killed my mother. In the 1980’s, before Erin Brockovich came along, when you threaten to sue, they came around and heavy handed you. And they said you better win because

we’ll come back after you for malicious prosecution, malicious suit. And so my dad took a 2,000 dollar settlement. That’s it. And I couldn’t pursue it because he did it acting in my stead. But it was Maui Land and Pine. Ten people got this. That’s how they found out. One survived. Everybody got aplastic anemia. And it’s only a certain body type, certain body chemistry that reacted to this.

Part II

(1):…cause we lived in Kaanapali for a year, and the water was so chlorinated, you wash your hair and it would turn green, to counteract all the garbage that was in the water.

(HF): Now, did you get a hold of my auntie Emma?

(1): No, they wanted to wait until after…

(HF): Cause you’ll probably want to fly up there if you can, because she would be the last one of them that can tell you if this – I mean, she was born in 1917, so I don’t know when they changed, but my grandfather remembers the marsh as it says here, as it was. He used to talk about it. And I don’t think I ever have him on tape, talking about it. I didn’t interview him. He went to Lahainaluna. He graduated from Lahainaluna in 1932. He was supposed to graduate in ‘31’ and what was sad is I didn’t realize it, the year 2002 was their anniversary, yeah? 70th anniversary and I should have took him to the David Malo Day stuff. I didn’t think about it til the week after. Cause Kamehameha would make a big deal about every five year graduation. I didn’t know if Lahainaluna did that. I didn’t think about it. He went to Lahaina but I didn’t hook him up for the thing. But his class is the one who put the ‘L’ on the mountain.

(1): Really?…Cool.

(HF): And I know we interviewed him on that, cause we were talking about it. And out of thirteen children, number ten, his father, Charles Kekua Farden, who was the luna of the plantation, he’s the one who was being trained to replace his father. But he didn’t want to have that. He didn’t want anything to do with that. So he would do stuff like sabotage. He would put stuff in the gears, you know, the huge gears, for the thing. He said he would stick metal things in to break the gear cause when it breaks you can go upstairs and sleep cause it takes a long time for the persons come Wailuku side or Kahalui side too, gotta come over and fix that. So he would do those kinda – well when he was a kid he would do worse. He would flood the whole ‘auwai. He would lift up the whole ‘auwai and let it flood. And then they would go ride inside the river. My great-grandfather planted the mango trees by Lahainaluna. So as you’re going up Lahainaluna, and if you turn right to go to the stadium, the mango trees all over there, my great-grandfather planted all of those. Beyond that were a whole bunch of ‘ulu trees. Grandfather cut those. And when he cut those, all the Hawaiians got angry with him, because that’s their food, yeah? But the thing is he cut em because they would climb and they would fall. And I guess even back in those days they worried about people suing, or anyway, being liable. If you talk to a lot of old folks about Great-Grandfather a lot of them didn’t like him. They say he was really grumpy and mean, but it’s interesting because his own children would say, “Oh yeah, he was very strict with us, very stern.” But, you know, I guess there’s reason for that. And then granny was a bit different.

Her name was Annie Kalepoli (spelling?) Shaw Farden. She was very humble and sweet. That's the reason. Tutu Kalepoli, and her husband was William Shaw. And they were raised – she was raised out in Kahana, where our land is. And Tutu Kāne, which I do have a picture of somewhere of Tutu kāne Shaw, William Shaw, used to get always drunk. And Tutu kāne ne would fall off the horse. And then the horse was so good, would stay right there. And when he wake up, he get right back up on the horse. Or sometimes it would bring him, and he was hanging off the horse like that, and it's taking him home. That was Tutu kāne. Tutu Kalepoli, you know, we used to – we have a picture of her. It's very blurry. We had big beautiful pictures of Tutu Kalepoli, and Tutu kāne, and it was given to someone, and that person lost the picture. Well, they took a snapshot of the picture, so that's all we have, but it's still blurry.

(1): Was she the one that lived on the corner of Shaw Street, and then they called her the Kahuna?

(HF): No, no, no, that's Tutu Kai. Tutu Kai, and her name was Mrs. Kai. And they all know – and you ask Auntie Emma – she'll tell you everything you want, Tutu Kai . They all, ooh, they so afraid of her. In fact, I thought she lived across makai side cause she had a mullet – 505, that's where she lived. And so, she had a mullet pond, and my grandfather, he was the real naughty one of them. And he would steal mullet from her, and she would come over and yell at my great-grandfather about that. Of course, it's all done in Hawaiian. But she always wore black. And she had bulrush in the front yard. And when they – Auntie Em told me this story – when they used to walk by, when they get to Tutu Kai's house, they run! Cause they afraid of her. And then they walk the rest of the way. But Auntie Em was no saint herself because she the one – she would hide in the bulrush and when the younger ones would pass by, she'd jump out and scare them. I was going to tell you about Tutu Kai. She was related to Tutu kāne. Maybe that was his sister, I'm not sure. That's John Link's grandmother by the way. And he remembered her, but of course he's gone now. But, Tutu Kai would always wear black, and they always accused her of doing kahuna stuff, but I don't think she did. I think they just conjured this up – you know, the old scary lady that lives in the – that was their relative you know. Like I said, she had her own little mullet pond, and when number seven child died in 1923, her name was Arora Milaina (spelling?) Farden. When she died at age 15 in 1923 of Typhus fever, Tutu Auntie Kai, from her house, wailed and walked out until she got to Puamana. And you know, I think you folks know, yeah? Puamana is not where Puamana is that they call today. Puamana is from where Lahaina Shores is, three properties – the third property is where Puamana is. They have the Norfolk Pines, which I think they just cut down. That's a easy one to remember. So anyway, she wailed from her house to the place, wailed wailed. She still went, she came into the house, she looked at Aunty Milaina was lying on the bed and she said "Aah, she was kahuna" and it caused more stir. There was some talk about her family being cursed.

Part III

(1): Who was the connection to Isaac Davis, you said?

(HF): Oh, Tutu Malia. Had Tutu Malia, Tutu Kahuhu – remember I was telling you Tutu Kahuhu? Tutu Kahele – these great Tutus. Then you had Tutu Iowela (spelling?) and Tutu

Iowela was a bachelor, he had no children. And then there was Tutu Maka and she was the last one. Tutu Maka was blind. But the first one was Tutu Malia, and Tutu Malia had married Alika Adams and there was a connection to Isaac Davis. So that whole family is one line. And her – I don't know if you remember Auntie Hanna Demillo from Lahaina – If you folks remember her. Auntie Hanna is from that line – the Demillos from Lahaina.

(1): Is that John Demillo?

(HF): Yeah, that's his mother.

(1): Oh, okay.

(HF): But she died already, Auntie Hanna. And they come from direct line.

(1): From direct line, from Isaac Davis?

(HF): Isaac Davis, yeah.

(1): There is somebody else that I interviewed recently that was from his line too.

(HF): Plenty, there're plenty.

Part IV

(1):…There's Kalepa…you said Kalepa, Serano…

(HF): Well, I told you about my sister's Trask from the – and I ran into someone recently who told me Kaluakini. I forget who they are now. They were also Kaluakini. Funny, cause they say, "Oh I know this relative, I name him." and I go, "Oh! So, you folks are the…" "Ooh!" they thought. "Test you!" [laughter]

(1): I know that they were related to the Coopers in Hana too.

(HF): Oh, I don't know that.

(1): Yeah. Trask, Kaluakini and then…

(HF): And then there's the Smiths and Nakoas and Davises, but you know, I don't know who their – I mean some of their family all still lives there.

(1): Smith, Shaw – any Shaws left?

(HF) Yeah, plenty

(1): And then wasn't it- I want to say Robinson but…

(HF): Yeah, Robinson too. They out in Kahana. Nakoa, Smith, Robinson, they all in the same area as us. Sarah Nakoa's husband – she was a Hawaiian scholar who's from over there. That's all their same family.

(1): Sarah was the one – she taught over here.

(HF): Yeah, she was such a sweet lady. – No! That's Sarah Quick, not Sarah Nakoa – but she also worked here at Kamehameha. She worked in the Hawaiian studies department. But Sarah

Quick also – there's a Hawaiian Studies Institute and a Hawaiian Studies Department. So, Sarah Nakoa was in the Hawaiian Studies Institute. And Sarah Quick, which became Sarah Keahi – oh, Keahi is another family. Moon Keahi's family.

(1): Yep, I interviewed him – Uncle Woon.

(HF): You Did?! Oh wow.

(1): Just before he died, you know.

(HF): Oh good.

(1): The weird thing is – he wanted – I came like around 4:30 and we didn't finish til like after 11:30. He just wanted to talk and talk. We had a really long conversation.

(HF): How come you didn't come contact me before? I coulda had you talk to my grandfather. He loves to reminisce. You'd need about – you think I'm bad? You should see. You'd need about five, six videos, and how much tapes, because Grandfather, oh he'd keep talking! But then you just collect it all. It's all good cause once they shut their eyes – pau.

(1): Yeah, and then – so his wife fed us and everything. But I just let him - whatever he wanted to talk about. "Whatever"...I thought, and then at the end, I said, "Okay, I take your picture". And I took one and I said, "Oh, I have to take this again." So I took it again and the same thing happened. And I took everybody that I interview, and none of them had that happen. In the picture…

(HF): Mine weird or what?

(2): No you look good.

(HF): I no like die, das why. [laughter]

(1): When I develop it, it's like…

(HF): Double exposure or something.

(1): Yeah, and then within a couple weeks, he was dying. Yeah, so a lot of people that I done that – one – Nahale? Auntie Josephine Nahale? In Kahulu? She died that night!

(HF): What are you interviewing her for?

(1): For projects in…

(HF): For other things, oh Good! You know, that's what I want to do, is get the Waianae things going. And I interviewed – shucks! – and I don't know where this tape. I had three copies of this tape. And I gave one to Kalena Sylva, one to Mrs. Quick, and I kept one. And all three of us can't find our copies. But the lady who I interviewed is still alive, but she's bed ridden and she completely doesn't talk. She's just a vegetable. And I wanted it cause she's the only one who saw the dog, Kuilialoa (spelling), the Kanioili (spelling) point dog, and she's the only one who saw that, and she's telling the story about seeing that. I know it, but it's second hand if I tell it. But if, you know, people can listen – I just hope it's gonna turn up one day. And I got her on video telling about Aloha io Waianae And then she's singing it because she's mad cause people don't sing it right. [begins singing song in Hawaiian] But she says, "There's no la! No la!" She's upset so I try to teach everybody, don't sing it with "la" cause the family doesn't want it.

(2): Sounds like Auntie Alice Namakilu, yeah?

(1): And Wiliama, what's Wiliama's last name?

(2): Waiohu

(1): Oh, Waiohu, do you know the Waiohus?

(HF): No, but you should talk to the Nakoa family. I don't know how much they know of their kapuna – that's what's sad. But Alice Aki Jr., the daughter, she's good! She knows stuff. She lives in Makawao side. She's good.

(1): I can find her in the phonebook? Cause the reason I wanted to talk to her is, her father, Sam. I wanted to know if he's the son of Sam Aki. If it was, then it's my great-grandfather's uncle. I mean my great-grandfather's brother.

(HF): Oh, so you kinda related, yeah?

(1): Yeah, cause there's only two of em. Kikipi had two sons.

(HF): Auntie Margret was born – she's from Lahaina, but she got hāpai when she was in high school. So she left school – and she's older than my grandfather. So, she went back to school, Lahainluna, and when she went to Lahainaluna, yeah, Grandpa met her there, knew her there. Eventually her husband dies. And before the husband dies, he turns to his brother, and says to his brother, "You marry my wife." which was Uncle Peter. And Uncle Peter did that. He married her. And they were married long time, maybe fifty some odd years, because even though it was her second husband. And Peter Haupo, and then he has a sister too that come from that second marriage. But he was so good. I remember at her funeral – I got there before he did – and he walked down the aisle and his tears were not just here. [pointing to his cheeks] I swear they were flying off of his eyes. That's how hurt he was that she died. I could see them falling off of his face, his tears. That's how strong he was crying. And he was cute because he would sing all kind of dirty songs he'd make up [begins singing in Hawaiian] and then he has this other verse that's real… [continuing to sing in Hawaiian] but then there's this real dirty verse that he does. [laughter]

(1): It sounds very Samoan though.

(HF): No. It's just Hawaiian play, change the 'K' to 'S's [continues singing]… but then there's all this other talk about – oh, it's really graphic, the other verses [laughter]. He would have been good to interview, cause he knew a lot about Lahaina too.

(1): Was he born there, the senior Peter?

(HF): Yeah, the mom is … And the senior is Alice Haupo Aki.

(1): Wow, so many families there.

(HF): And the Japanese – some of them they know a lot of Hawaiian stuff too because they were all raised among them, so you might check some of those. And Addie might know some names of people. Go to Lahainaluna school records and whoever's in school 1931, '32', '33', that's going to be the last people alive. Find out who the oldest graduate is. And then just go for them because once they pau, they pau.

(1): Yeah, I interviewd Sammy Kadotani several times but, the whole group from Pu‘ukolii – The two brothers and then there's a Filipino lady, and it's interesting cause they have the map of the Pu‘ukolii, and so they can tell you….

(HF): Oh, they do? But, you know what's interesting? I asked them about Pu‘ukolii. And the way they describe it – it was a whole town. It's like nothing now – just flat and cane field, and wow.

(2): You know Danny Noe's wife was from there too.

(HF): The current wife? Or the first one?

(2): The first one.

(HF): Oh, really…

(1): Well somebody is related to – his mom is buried at Pu‘u keka‘a

(HF): Oh really?

(1): Yeah, in the Japanese section.

(HF): The rumor we have is that our family owned that.

(1): Pu‘u keka‘a?

(HF): Black Rock, yeah. My great-grandmother was telling Auntie Irmgard one day, she said, "You know, I was supposed to own all of this area by Black Rock." And apparently, my great-grandmother owned a lot of land. They come from ali‘i line. They had a lot of land. And there was some shenanigans, like Mr. what's-his-face…the one the beach is named after him…

(1): Flemming?

(HF): Flemming. Oh, he was a crook. You know, he went and tried to tell my great-grandmother "Eh" and he did this to a lot of people, "I got this land, can I trade you for your land?" And he trade and give you junk land and he's taking prime land from you. And he did that a lot! He take all the ocean land and you know…

(1): He did all the genealogies. I tried to copy as many as I could because they let me come into their archives and the historian there, she's really sweet. And she just let me have whatever I wanted. Cause, I knew that – see the folks were Shaws and Robinson, so I wanted to make sure cause every time I seen them

(HF): Yeah, cause she and them come from Honokowai. Her family comes from Honokowai.

(1): Yeah, but the names were all over from Lahaina to wherever. I wanted to get as much as I could so I'll have to look for some of those files.

(HF): Yeah I have some from Tutu Hawea – genealogies list – but these come from the – these genealogies come from – I guess the connection to Poa (spelling?) is Will. And she was leaving all these 33 or so families, and she has all these lists of all these other genealogies.

(2): So at Puu kekaa, so you guys, did you trace it back to …

(HF): No, you know, it seem like my great-grandmother wasn't interested in it. She just said that. And great-grandmother was very humble. She probably didn't want to pursue it. On my other side though, we have a land court whatcha call – case that's been in since what, 1919. And it's still there. It's on hold, 175 acres. A lot of it's in the forest reserve area.

(2): The only reason why I ask is they're doing some development at Sheraton, and again with Puu kekaa itself, yeah? So, it was just at the CRCR burial council.

(1): Oh yeah, so much stuff on that – the guys who actually – he's in construction. I can't remember his name now, but he lives in Waikapu and B.J. is what they call him. But anyway, so between him and somebody he was related to – had a mortuary or something like tha,t and so they asked him to go out there and gather up all the bones and stuff.

(HF): Really…recently?

(1): No, in the 60s.

(HF): Oh, I'm sorry, in the 60s.

(1): Yeah and they said they got em in wheelbarrows and everything and then they were taken to three different places and you know the churches turned em down. So nobody knows where they ended up. But then they talked about the burials that were within the Black Rock. There's a cave. And then on top, cause that used to be kula land before.

(HF): That's a whole battlefield too. That's why the Sheraton is haunted, yeah?

(1): Well in the shaft, in one of the elevators, there's a burial hidden in there.

(HF): Is it the lady with red hair? You know only one time, I had an incident over there. I was young. We went there, and it was 1981 or so and I was there with the Honolulu Boy Choir, so

three of us had one room. We were all sitting there and my bag rolled across the room. I never forget that. I was a kid, yeah? But for us, it was like, we knew about this place, so we just – the bag rolled… dun.dun.dun.dun… like that. Woke up in the morning and there were footprints this size [holding index finger and thumb about 4 inches apart] on the glass door at the top. But nowadays we would take picture! We would say "Everybody come look!" You know, but we just stared. That's the only experience I had over there, or any like that kinda stuff.

(1): There was a popular singer from Maui, oh he used to be over there and he used to stay in one of the rooms that was on Black Rock side. And every night the same thing would happen, the doors would open or slam and everything like that. Or TVs would go on…

(HF): And you say "Hello!"

(1): I forgot his name!

(2): Arias

(HF): Oh, Rodney? [laughter] well, he's still alive, you can ask him. You can interview him!

(1): No, all kinds – and then so my husband worked there too. We lived there. We lived in one of the cottages that was facing the golf course. Yeah, it was very…

(HF): You know, I wanted to say, how are you folks all starting to say – everybody is starting to say "Lahaina (la-hai-NA)" and "Ka anapali (KA-ana-pali)". I did ask the old folks this – even the Hawaiian speakers, and they go – What did you hear? Like, if these are people in their 90s, what did you hear your kupuna say? They all said "La-HAI-na." They all said "Ka-ANA-pali." And Pukui wrote in her – that's why I wonder if they got it from them cause Pukui said she believes that's where it came from. But if it came from that, it doesn't mean it is. You know, it just means it came from that. Like, I don't go around saying we should say "Wai-pa-HU" because everyone knows that's where it came from, the spouting water. But the name is Wai-PA-hu. And so, people ask me – if anything, I can agree there is a kahakō maybe on the first..(?) of La-HAI-na. but La-hai-NA, I've never heard…

(1): Ok, pahu is just pahu right? The drum?

(HF): Box, drum, casket. [laughter]

(1): Well, the reason it's called Waipahu, was because the sound of the water coming out, the source of the spring and it was so loud, it sounded like a drum. That's why it's Waipahu.

(HF): Well, there actually was called Waipahu in Waipio – Kamea, Waipio. And that's where they say they named it from that. But you know again, it's a transferral of a name. It doesn't mean it's going to stay the same. You know, like for example, 'Maui' is 'Mauiloa' but we don't have to say 'Mauiloa' cause it's 'Maui'. But I was just wondering, cause I see with Akoni folks, they spell Ka-ANA-pali. But I've never heard the old folks – I've even asked the old folks if they heard – I said the word – if I show it to them or if I just say 'Kaanapali' "how did the old folks pronounce it?" You know, and then they say 'Ka-ANA-pali' okay, I've never heard KA-ana-pali. So I'm kind of leery about that. But again, we're starting a new trend, yeah?

(1): I was born and raised on Kaua‘i and we don't say 'Kaua-I'. All the old timers don't say that.

(HF): But – we got people on tape from the late 1800s that all say 'Kaua-I'. I had this talk with what's-his-name, Auntie Gladys Brant's grandson, who was telling me…

(1): Randy

(HF): Yeah, Randy, and he said "No! That is the Ni‘ihau version." I said "No, that would be 'Tauai'". But anyway, I said, the Bishop Museum has tape of people. This is 1920, so they were born in – 1860s, 1870s. They all are saying 'Kaua-I' consistently. So that's why I was telling – that's why I look to ask now. Sadly, in Lahaina, there are not too many people interviewed on those old machines – I went look already, that's why. And Pukui went there a few times. And that's where I found Alice Aki's tapes. Alice Aki's at Bishop Museum, talking about Lahaina. And that's where I got that song. You know that song, I told you I got from her? From the tape. Otherwise, we'd never know that song. And she's funny because she's talking about "There you know, me and my ma and pa we…" and then she'd talk Hawaiian and then she go English. Then she talk Hawaiian, then she talk English. "Oh yeah, some people they come …(In Hawaiian)…they pray to Jesus and then they come to see Mama. They pray to Jesus, they come see Mama." She was just kinda criticizing. She goes "Yeah, just like that one Charlie Farden. He come to … and then he go mama …" And she talking like that. And, yeah it's funny cause hey, that's my great-grandfather she talking about. [laughter] It's a nice tape you know. There's a whole bunch on Lahaina but no ancient kine, like the Kaua‘i tapes. They're fabulous. You know we even have – I pulled Lana‘i tapes. I want to hear certain things. And what I was trying to do – I used to teach Hawaiian 5. We used to try to – they're not dialects. You need 10,000 speakers to have a dialect. So they're called geographical differences. So we're trying to help my students in Honors Hawaiian 5, document the differences in different areas. Now that changes. Now, Once Hawaiian became standard to Honolulu/Lahaina Hawaiian, then the language went common like that. Unless the rural area, East Moloka‘i, East Maui.

(1): Yeah, Hana has very different dialect.

(HF): And my auntie, Adelaide, I think it's cool because she has all of these 'lika-pu' instead of 'Li-ke-pu' and she doesn't realize she's doing that. She say 'pahaku' instead of 'pohaku.' Plenty!

So I try to document cause she’s the only Olowalu Hawaiian speaker on tape. The only one. You know, and it’s sad because people didn’t go around. Pukui tried! She did her best to get. So she found Alice Aki, that was a gem. And she’s good. Larry Kimura got Kalepo, Mr. Kalepo on the Kaleo Hawai‘i show. So there’s very few Lahaina – but like I said, the old Kahu – Ooh and then you have a Jenny Wilson, she’s great. She’s from Moloka‘i – East end Moloka‘i. Her Hawaiian is so… Aah!

(1): That’s another one. Cause when I was there, they don’t say ‘Moloka-I’.

(HF): No. They don’t say it.

(1): Cause it’s Moloka‘i. Because they said that if you’re in Kaunakakai and you go out in the waters like that, they have all these blue pukas, and the water swirls, so it’s like ‘molo-kai’.

(HF): Yeah, but if that were correct, it would be ‘Kai-molo’. Cause it doesn’t make sense backward. And I was told when – whatcha-call his name? He’s the one that started this. The whole family? Ayau. Eddie Ayau. He’s the one who started this ‘Moloka-I’ thing. And the whole Iau family will stick to it. Their grandmother Harriet Ne says it’s ‘Moloka‘i’. And if you go to Bishop museum, Harriet Ne is on tape saying ‘Moloka-I’.

(1): Really? [laughter]

(HF): So…and that goes back to the fact that Pukui was trying to find reason for the name and maybe this is what they’re trying to infer or maybe that. But again, if it’s churning waters, it’s ‘Kai molo.’

(1): So where would it be ‘Moloka-I’ then? What’s the meaning?

(HF): Oh, actually, there’s a person from Hilo. He was born in the 1930s, where he was writing. And Theodore Kelsey was a haole man who learned Hawaiian – was curious about these things. So he’d find Hawaiian informants and he’d write to them in Hawaiian and ask them questions: “Can you tell me – I heard there are five maile. Can you tell me about that? Here’s a dollar.” So he’d send the man a dollar and the man would write back “Yes. There are five maile.” And he names them, and he goes “But there are actually two others that are this and this.” And yeah, this man just loved to share. One question he had was “Do you have the meaning of the islands?” And he names all of the islands. And it’s consistent with mele a kapui (spelling?), so it says: Hawai‘i, Mauiloa, Lana‘i kaula, not like the kahuna, but Lana‘i kaula, Moloka‘i ahina, Kahoolawe was Kahoolawe. Of course some people refer to it as Kaholoa. Oahu alua, Kamawai lualani moku is Kaua‘i, and then Ni‘ihau. And then he goes on, I think to Kaula and I think to Lehua too. But he explains each one. And I can’t recall it off the top of my head, but that’s in the archives. You look under Theodore Kelsey. It’s cool, cool stuff, because sometimes the guy writes in English too. But this man is great. You know this chief, he adds information. He asks

for 1, 2, 3. The guy comes back with 17 things, different stuff, really cool. And this man says "Oh, you've heard of the chief Keawemauhili? His name is actually Keawe (and he puts the dash) ma-u-hili. And that makes sense because ma-u is the old word for mau-u, which is grass. So this is the braided grass. That makes sense in Hawaiian! And whenever the old Hawaiians used to put a dash – that later became ‘okina, and a kahako over the next vowel. So that's why we know it's ma-uhili. So, interesting, he's writing these things. And he just writes, and then he probably ends with this "Oh but I don't know, I'm just a humble person." You know?! But hey, this man was born before me. This man was born before my grandfather. This man knows something. And then one time he wrote to him saying "I'm sorry, I don't have any more information to give you, so please do not send me any more money." Then he, Kelsey, he's so funny. He sends him a letter and he says "I'm sorry that you're unable to help me. Do you know of anyone else can help me? Because I have these other questions, and here's a dollar for that person." And he writes the question! And the man writes back. "Okay, since you're asking, I know this information." So he gets it back and forth a few times. And then it just stops. Maybe the man dies. Well, the man used to write letters to the editor of the newspaper too. Umm, the name starts with a 'Z'.

(1): ...?

(HF): No. I don't know about that. It was a Hawaiian – I had a conversation with one of my English teachers about him. Really interesting, this man. So he gives all these translations, and there's a lot of good stuff too. And recently, I've been studying Pukui's hand notes – now, there's Pukui's hand notes that are here at Bishop Museum. And then at a certain point, George Beacon, Auntie Naumaka's son-in-law got angry with the museum, so he stopped sending the – what he'd do is have all of Pukui's hand notes, and he was typing them. And as he's typing them, he'd send them to the Bishop Museum. So they store it. It's the Hawaiian ethnographical notes, hand notes, right? Well, when he got mad at the Bishop Museum, he stopped sending to Bishop Museum. Then he started sending them to the Smithsonian. So there are 3,000 pages of stuff at the Smithsonian. So I went into studies there. I went through all, every single file. I pulled some of them too cause some of them were interesting. And I found that there are some examples of the same thing at this museum. But there's stuff that are at the Smithsonian that are not here. And the reason he sent them to the Smithsonian is because Naumaka Beacon taught Dr. Adrian Kepler hula. And Dr. Adrian Kepler is over there. So, Adrian is a good friend of mine, so every time I go over there, I spend a whole week, take a whole week to study. You know, 3,000 pages – I actually started indexing it for them. I got a study grant to go, then I started an index for the things because I said, "How do I know what to look for?" cause they're just in boxes. That stuff is so valuable! I found a chant that they wrote for the Buckingham Palace, and one they wrote for the Papacy, you know, the popes? Interesting! Wow! Cause I look at this, and there's something strange about this name, so I start reading the chant and okay, I see… Ladona, and then I'm reading and Ah! This is for Buckingham Palace! Ah, that's what that means! Buckinihama…I didn't know what that was, Buckinihama, what is that? So I reading and oh! Buckingham Palace! That's so cool!

(2): Wow!

(HF): I was just reading it before you folks came.

(2): Oh yeah?

(HF): Cause she also has written notes on lele. And she has the names of three original ‘ulu trees that were brought. From those trees, all other trees grew. And I don’t have them in my head, so I went to look if I had that, and I didn’t bring those back. They’re still in Washington.

(2): We have a story with the names of some of the ‘ulu trees.

(HF): Well, I don’t know if those are the children or – because there’s three. According to Pukui’s notes, the three original were brought by – they named who brought em, and what they were named.

(1): From where?

(HF): And they said the original is still standing. According to these notes in 1960, one of the three original is still standing at the site - oh no, I’m sorry - two! One is in the prison. And one is at Baldwin House.

(2): Oh, okay. I know that they – well, I know they have one at Waiola Church, and this guy just came to my office and told me they were gonna cut it down. And I gotta call Grayle about that.

(HF): But, I don’t know, cause they said three. And I don’t know why I remember about the flying. They flew – something about them flying.

(2): Yes, the flying ‘ulu.

(HF): But the one behind Baldwin House? - is supposed to be an original. It has a name. Cause they describe it. They say the one behind Baldwin House, and it has a name of it – of that tree. And I think the prison was another one. And they used to hang people from that ‘ulu tree at the prison. That I know because I heard that. I guess if they killed somebody, they’d use the ‘ulu tree. And I think it’s on the mauka wall. There’s the ‘ulu tree over there.

(1): Hanging tree.

(HF) :Yeah. And you know that car in front of the prison?

(1): Yeah.

(HF): That’s Uncle Frank’s car. [laughter]

(1): Really?!

(HF): Yeah, he had em in his garage, and then Lucky – Jim Lucky – he asked Uncle Frank if he can have that car – He said “Ah go.” [laughter]

(2): Ah, now that’s a good piece of…trivia.

(HF): So that came from Uncle Frank.

Part V

(HF):…um, Hoapili’s bowl, the net for the bowl. I have his palau. In fact, I have it in my safe here. The palau, I can show it to you. They belong to Hoapili, because Hoapili was the kau hānai of my great-grandmother. Hoapili Baker raised my grandmother, Mary Mikala Baker, who became Mary Mikala Sylva. Who, after grandpa Sylva died of flu – he had the flu epidemic – she married Reverend John Minamina Brown. So then she became Mary Brown from Lahaina, Maui.

(1): This is a kāne? Hoapili?

(HF): Yeah.

(1): Okay, was he the one that was also married to Keopuolani? Or no?

(HF): No. You know I was trying to get that information. Auntie Edith McKenzie was a little – not sure on certain things on that, because I say it couldn’t have been the same one, cause of the time difference. You figure, this has got to be the 1880s and of course Keopuolani dies way before that. But this is not also the same Hoapili that’s on – Governor Hoapili of – that’s Robert Hoapili Baker. So I don’t know. That’s all confusing to me too.

(2): How about…is it K.C.? The guy that works with Auntie Edith?

(HF): Oh T.C.

(2): T.C .Okay.

(HF): He’s a Cambell. His grandmother is from Makena. And I interviewed her. Her name was Mrs. Cambell. I know her Hawaiian name is – oh shoots, I forgot. Anyway, Esther Cambell was her name. She’s from Makena.

(1): They said the Lu‘uwai is from Makena.

(HF): Yeah, Makena is a beautiful place. I only went that convention last year. The first time I ever went to Makena.

(1): Really.

(HF): It’s a beautiful place.

(1): When I lived in Kaanapali, we used to try to get down that end all the time.

(HF): Oh, I like to go pick limu over there.

(1): Yeah.

(HF): You know it’s funny cause you know – people – and I can see it now. I never thought of it before. But, it’s like, people go to the beach and the first thing they want is they jump in the water. Me – I look what’s on the rocks. You know, that’s just how I grew up, and I enjoy it. I remember – talking about that – Uncle Frank, one time we went one place and he put his ear on a rock, like this…We were on the what they used to call the papa, which is the sandstone cliffs, yeah? He put his ear and he says “Oh, there’s a shark in here.” And I would believe that Uncle because he knows! He knew! And you know, I mean, god, that man was so good, and I’m sad that I didn’t learn certain things from him, cause you know I started learning Hawaiian language stuff so I went down the Hawaiian language route. But the cultural stuff that he had was so valuable. I mean, I wish I learned how to throw a net from him, you know? But he’d take me fishing and he goes, “Oh, you gotta do this.” He used to scold me when I’m doing something wrong, impatient, noisy, or whatever. But I was thinking about, one time he was diving, and he used to go pick limu all the time at Launiupoko. And we used to go too. And one time we went diving, and you know, out there it’s not too deep, so you can see him. Then the sharks – I guess the reef sharks, whatever they were – you could see the fins, yeah? They just pop out of the water like that. My grandmother is panicking. “Brother! Brother!” And then, he hears, you know, and you know Hawaiian fishermen, they don’t like that kind of stuff. You don’t do that kind of thing! But he thought, “Oh something wrong.” So he comes all the way to the shore – “What’s the matter?” he goes. “There’s a shark in there!” she goes. “Ah goodness!” [waving his hand dismissively] He goes back outside. I thought, “Oh! There’s a shark”, you know? Cause when I was growing up, that’s the time ‘Jaws’ was out, yeah? And we used to lay net – ah beautiful – I mean just good stuff. And now the law tells us what kine size net hole you can have. It’s so stupid. But I remember when I was a child. One vague memory I have – and I tried to get my grandfather – Oh! Right when he died I had this memory come back to me, cause I was looking through pictures and I found it. They used to go get sharks. This is interesting cause it’s a good example of how not every family – that’s their aumakua, because they hunted the shark. And there’s one picture of my grandfather and grandmother standing with a shark hanging from the tree. And they went out – they would go out and catch sharks. And I know that they buried it, cause I remember being told to stay away from the hole. All that memory came to me. So they catch the shark. They did whatever they’re gonna do, and then they buried it. And I tried to find

out where it was cause I don’t remember. I just know it was taken when we went camping. And I remember it was on Maui. And I always thought it was on the other side of the island – and all these uncles, my grandmother’s sister, Annie, her sons, and my uncle, and my other cousins. And I was just four years old, that’s how young. So my uncle was still alive, so I went to try to talk to him, but cannot hear me, cannot see, so I could not get a – why did we go hunt shark? I want to know this. I remember, cause they were teasing Grandpa too. “Ha ha uncle!” cause he would throw up. He’d get seasick. They’d go on the boat. You know, the little boat, and he’d get seasick. So I remember that happening. But that was a unique thing that I think it helps to document that now. I mean, just like I hear people from Kula used to kill pueo to eat. You know, they would tie this net across two poles. They put a spear behind it, and then they tie a rodent here. So when the owl would come down to grab the thing, it would pierce the owl. So they killed the owl to eat. So that’s why I said – See? Different people have different aumakua, and that wasn’t theirs. Everybody goes “ah, ours is the shark.” You ask 90 percent of people, gonna say the shark. But I always tell the people, “If that’s your aumakua then you should be feeding it. You should be taking care of it. Otherwise it’s not your aumakua.”

(1): My great-grandpa did.

(HF): Yeah, I’ve interviewed a lot of kapuna. Yeah, I had one – I was so surprised – Mrs. Keb from – she was born and raised where Leeward Community College is now. So there was this river that went down to the Pearl Harbor, and she was telling me all about this. Now I got this interview one week before she died too. I didn’t know. I just called and said, “Can I come now?” So I went there and she’s in the hospital bed, and then they told me after, “Hey, Mama only has just a very short time to live.” And she was so good. She just told me all – And I said, “Did you have a name for the shark?” And she says, “Yes.” “Well, what was the name?” She goes, “I don’t remember.” But it was neat though, that she had a name. This was a shark. They fed it. They did this all the time. It’s like a dog. A shark is like a dog. You feed it, it will come to you for food. Now, my cousin Manamo (spelling?) Imamura – they called him Blah. And he was in – he lived – it’s my cousin Kalolo’s husband. Her mother was Auntie Emma Sharp. They live right next door to Auntie Emma in Kahana. He had eels! He fed them every single night. He’d tell me, and I’d go “Ah!” I’d go look, sure enough, he puts the food and the eels appear. Every night he fed them. And they have a streetlight right over that bend. And you look down and I couldn’t believe. With my own eyes, I saw the two eels. Two eels come up and he’d feed them. But, you know, that was a person – he knew everything about fishing. I did get to interview him. But he knew everything about fishing. And pure Japanese man, but was just among Hawaiians all the time. So his Hawaiian pronunciation would be bad about certain things. But I know what he’s talking about cause the context. But the value of the stories that he’s telling, you know, about how if a shark got into the net and got the fish, then all the people would let the fish out or something. Then they have to sit. They put the net on the ground, and they all sat on the net in a circle, and they have to ho‘oponopono. And they have to talk “I did this. I’m sorry.” Mihi actually. It wasn’t just ho‘oponopono. It was mihi. And then when they realized what the problem was, then they go out and fish again. Another one is – they talk about the koa, the fishing koa – if you go into somebody else’s koa, you don’t have any business going into there. And he identified – I said, “Can you tell me where?” and he did. In his interview he said, “Oh,

this is from the Smith family. This is from the Nakua family." He's telling like that. So that was kinda neat to know the fishing grounds of the family. Now, the Smith's still use theirs.

(1): Some of them even make their own.

(HF): Yeah, but the Smith's still use theirs. And when we went out one time – I'm going home next weekend to Lahaina. But when I went to – one Christmas, I was up there and they had akules. They just brought akule in. Oh wow! Fresh, just pulled in from the – Oh, that was so good, you could eat that raw. You can fry it. I had em, all kinds a things, you know?

(1): Sedang? Is that the name of the…?

(HF): That's the one! Yeah!

(1): That's the one? Yeah, I interviewed a couple of them.

(HF): Oh boy. I mean, I always felt shame cause I don't go over there, yeah? And then when I do, I saw the sign.

(1): Yeah, they got the boats and everything. It was so cool just watching all that. They were saying because now that law with turtles? You cannot kill the turtles. The turtles are so much and the shark, they feed on the turtles, so now you get more sharks coming in. So then it makes fishing bad.

(HF): Yeah, you know, my thought is they should create a law where Hawaiian families who know how to, can hunt one turtle a year. And you know that's another part of our culture. If the old folks don't teach the young folks how to clean the turtle, how to eat the turtle, then that's one part of our culture gonna be gone. And I wanted to document it because we used to interview all these Hawaiian language speakers. But all the men are gone. There are very few Hawaiian speakers that are men left. I just found one from Hanalei that I need to go and – husband and wife speak Hawaiian. They live out in…

(1): Hashimotos? (? Muffled)

(HF): No. They have a Hawaiian name I've never heard of in my life. I can't think of it right now. But they live in Manoa I think. He's from Hanalei, Kaua‘i. And she's from Moloka‘i.

(1): Because there's a turtle medicine. They used to make medicine out of parts of the turtle.

(HF): Oh yeah, could be.

(1): And now that's gonna be lost cause we can't…

(HF): Yep, unfortunately. That kine medicine is usually family medicine. Which means for their family, certain lines, you know. Like there's certain people that kauna‘oa is their – so they boil the kauna‘oa. And we used to get kauna‘oa from Cut Mountain before, yeah? But I don't think they have kauna‘oa anymore. And you know Cut Mountain, yeah?

(2): Yes I do.

(HF): Okay, so it's obvious why it's Cut Mountain. But my grand-folks, every single time we went to Lahaina, they had to remind me about how the wind used to blow, and they always had to hold the roof down.

(1): Kaua‘ula winds.

(HF): If they don't hold the roof down, the roof gonna blow. That's all ingrained in my head. And Uncle Frank was telling me one time, that he was driving home and he saw the white dog. And he said as he got closer, it got bigger, and bigger. And it was as big as a cow he said. So he knew Hawaiians tell you turn around, don't go.

(1): Warning.

(HF): Yeah, it's a warning. So he saw the white dog and he turned around. And there was an accident up ahead. But he just knew better. You turn around. He was a fire captain too. Yeah.

(1): Yeah, the kaua‘ula wind, actually, somebody disturbed that. I mean destroyed that rock that used to have a hole in it and create the wind. Somebody got tired of it and went up - that's according to one of the interviews that I had.

(HF): I never heard of that rock.

(1): I don't remember who did [it]. They knew who it was that went up there and broke it up.

(HF): Well the Kaua‘ula wind come every forty years, but it hasn't come for…

(1): It destroyed the Waine‘e Church couple times.

(HF): Yeah, that's why they changed it from Waine‘e to Waiola.

(1): Waiola.

(HF): Yeah, it was Waine‘e church, they changed to Waiola because well – And then you know you look in that movie, *Hawai‘i,* where the bell has fallen off and is rolling down? That's all part of that story. And they were warned not to build a church this way because the wind. So that whole thing from that story is pulled from that. I never heard of a Kaua‘ula rock. That's interesting.

(1): Makes sense though if there's a hole and there's a wind tunnel coming through, it would have that sound. And it's big enough.

(HF): Yeah, I don't know. I've never heard that. But the folks I talked to all talked about the Kaua‘ula wind that you hear whistling first. And you knew it was coming down. And my grandfather said you look up there, you see this wall – A wall coming, of dust. And the dust contained – he talked about cane tassels, so I guess it pulls up. And he said that's just it. When you see that, there's nothing you can do. And I had pictures of destroyed buildings in Lahaina and Olowalu. And I wasn't able to verify whether that was an earthquake, or if it was a Kaua‘ula wind. I wasn't able to, but they were destroyed. I mean there's one shot of the bank and only the safe is – I mean the whole building – the room of the safe is about this big, and what happened was, I had it up here at Kamehameha archives, and it was attached to pictures of an uncle of mine. And when the niece of my uncle came, she gave the whole book to her, because it had nothing to do with Kamehameha, I was just storing it in there. And I told her, "I wish you didn't do that because there was other things in there, historic things." But she wanted it cause that's her uncle and that's all she...

(1): Did they know the date? Cause if you know the date…

(HF): I can't remember. It came from Auntie Margaret. That was her book and she was the oldest sibling, yeah? And so – but they were actual pictures of there. It was all Lahaina. It goes all the way from Olowalu to Lahaina, these pictures.

(1): Did they talk about when the time living at Puukolii?

(HF): Uh-huh. Not much though. There was all these camps though, they said. They were all camps. In fact, I went to the Greater Lahaina Reunion in 1987, and all the family's back, and things. And that's really when they have that camp, and that camp, and this camp. Yeah, I never thought of asking the older ones about the houses, you know, that they stayed in. One auntie, Auntie Dianna described the homes. She did not live at Puukolii so, she described the three homes, meaning the Lahainaluna Road home, the Mala home, and Puamana home. Before Auntie Erngard died, I had her draw the floor plan of Puamana, but it's scribble, scribble, scribble. It's hard to look at you know, and understand. Yeah, so the family – Great-Grandfather bought Puamana in 1915 and he moved in, in 1916. It was built in 1915 and 16. And actually he bought it from Prince Kuhio. Prince Kuhio signed the deed because it was owned by Queen Kapiolani's estate. And that land, it supposedly had connection to a Chief Puamana. And that's why he named it. The name Puamana was on the – and it's probably the area named after the

chief but he named that property after that chief or that thing. And they moved in 1916. And the house was knocked down in the 50s. So it really didn't have a long life, 40 years. Termites got it.

(1): Wasn't there a heiau around there too?

(HF): I don't know.

(1): On the ocean side?

(HF): I know there's ka papa limu a kapiolani. The reef – and that only tells me that Kapiolani brought the rocks over there to plant the limu there. I can tell that. Again, that was her estate. The beach, two areas – one was Pualanui, and one was called Keawaiki. And Keawaiki is in the songs. I've seen that. That's the one…

(2): The brown?

(HF): No, no, I'm talking about – not that song Kiawaiki. I'm talking about a Lahaina song. It has a Kiawaiki. And that is – I blank. I just can't think of the first word but it's to the tune of *Hawai‘i Aloha*.

(1): Pualanui, did that have something to do with the Lindsays by any chance?

(HF): Yeah. That's in front of their house.

(1): Okay, It's bits and pieces of information…

(HF): Keawaiki is in front of Puamana

(1): Keawaiki is in front of Puamana. Okay.

(HF): Yeah. The sand. (begins singing in Hawaiian). I didn't think to find that song. I should have looked for that song. I coulda sing it to you folks.

(1): You know, there's songs about Puamana too right?

(HF): Yeah. *O Puamana*, Great-grandfather wrote the words and then Auntie Erngard wrote the music, yeah?

Part VI

(HF): …in Lahaina, and Puamana, and as she was going – well she got the words and then Auntie Emma comes in the door and she said, “Oh Emma, listen to this.” And “Well that’s nice.” And she said “Yeah, I think I want to write this for Puamana.” But she said, without even thinking, she just said that like that. And Auntie Emma went, “Oh” so she started to kinda fiddle around with steps, you know, foot work. And then I guess other sisters were there, and then, soon as Grandpa came home for lunch, Great-Grandfather came home for lunch from the plantation, they go,“Daddy, Daddy, sit down. I want to write this song for Puamana.” So she plays him the tune and Great-Grandfather just comes out “Puamana….(Hawaiian)…” without even asking. She already write that down. And then you know what? I had this conversation with Auntie Erngard later. Talking about ‘me napua haloa naunau’ I said, “You know, Great-Grandfather was such a gruff person, not soft or compassionate like you would think. So, he wouldn’t talk about flowers.” I said, “I think he was talking about you folks. Talk about the sweet soft flowers, sweet fragrant flowers, I think he’s talking about you, his children.” Auntie Erngard went, “Yeah, I think so. I think so” Of course, that’s the mind of the Hawaiian composer, you know. And then she said, “Oh Dad, you have to add in the…” He always used to say…the coconut would go de-tre-de-tre-de-tre-de. The leaves would blow against each other like that. And they would rattle and he’d go “napinapi maile.” He’d say that. So she tell him that. So he wrote about the coconut trees. ‘Kuu ho me i ka olu a ka niu’ ‘In the grove of the trees’. Yeah? …(In Hawaiian)…so he stuck that in there, that rattling. And then …(In Hawaiian)…is ‘home on the sea’…(In Hawaiian)…now this is neat cause Great-Grandfather’s own interpretation of the moon…(In Hawaiian)…means the shining, the glowing of the moon. That’s what it means. But he said, when you look at the flickering on the water, and you see the white, and it flickers off and on, he said it’s like the white konane pebble jumping over the black. So that was his own interpretation that he added to it. And then ‘haina’. I wanted to share another one with you folks, because this one was passed down from the Tutus of Lahaina. And it is *Kananaka*. Now there’s Eddie Kamai’s documentary goes and cites that Tutu Kauhailikua (spelling?) wrote it. But I do not believe Tutu Kauhailikua wrote that. And I can tell you this – if that was – Auntie Emma, Auntie Erngard, they learned this from the old folks of Lahaina. Auntie Emma was Kauhailikua’s main student.

Part VII

(HF): (Singing song in Hawaiian and playing ukulele)

Part VIII

(HF): Kauhailikua was Auntie Emma’s main teacher, and she was her main student. And she taught her all these hulas. She would have taught her. She would have said something. Auntie Emma, she was still alive when Auntie Emma was doing *Kananaka*. She would have told her “I wrote that song.” I don’t believe she did. And I know that he has Auntie Pua saying that, but I love her dearly, and I know that she may have been told that by him prior to the interview, and

thus she's repeating when she says, "Your grandmother wrote that." Auntie Pua was born in Kona and Uncle Ned was born in Lahaina. And I got to interview both of them together, and that was really neat cause I did it in Hawaiian, although her Hawaiian wasn't as strong as Papa's. Papa wow. Great. I mean, a funny man too. But anyway, so *Kananaka* is a Lahaina song. And it was taught to the old ladies who would get up and do this. So, they learned it. The aunties learned it. The version of hula that I'm showing you is what they learned from the old folks, which is passed on from the old folks. [begins hula]

Part IX

(HF): Yeah, too bad I can't think of that other song. Shucks! E na hono-a-piilani. That's the old Lahaina song that is to the tune of 'Hawai‘i Aloha'. I have the words but I just didn't prepare for it. Then there's another one I got from Alice Aki, which is the oldest sibling of Peter Apo.

(1): Oh, I didn't know that.

(HF): Not Alice, the one alive. Her mother.

(1): Cause that's my maiden name, Aki.

(HF): Oh yeah? Oh.

(1): Was she married to Sam?

(HF): Yeah, well no. This one, yeah. I think this is Sam. (Sings song in Hawaiian) So I got that from her and I don't know anyone else who knows that.

Part X

(HF): …Yeah, could be. But she was older than Auntie Pua. I think she might be 15 to 20 years older, which is possible. Otherwise, it's the daughter – but I don't think it's the daughter cause that's too young, that one. Yeah, but oh, she was good. And her mother was Tutu mima Apo. And Tutu Mima was – Oh! – I can sing you one more. Tutu Mima Apo was a medicine woman. Oh! Beautiful strong woman.

(1): From Lahaina?

(HF): Yes. In fact, in Auntie Emma's house had a painting of Tutu Mima. She was one of…she was close friends. (Sings song in Hawaiian) That's *Lei hiwahiwaiwa* written by Tutu Mima Apo. And that other song I sang is *E ono a hanoa*….

C.2 Friends of Moku‘ula Interview with Mr. Keoki Freeland

Authorization and Release Form

Cultural Surveys Hawai‘i (CSH) is grateful for the generosity of the Kūpuna and Kama‘aina who have willingly shared their knowledge and experiences for the preparation of a Cultural Impact Assessment that is being drafted for the Mokuhinia Ecosystem Restoration Project, Lower Waine‘e Ahupua‘a, Lahaina District, Maui Island, TMK (2) 4-6-007; 001; 035-038.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our assessment. Here are the procedures we promise to follow:

1. You will have the opportunity to review the written transcription of our interview with you. At that time, you may make any additions, deletions, or corrections you wish.
2. You will be given a copy of the interview transcript you have approved for your records.

For our records and yours, we humbly request your confirmation that:

1. You were given the opportunity to review the transcript of the interview.
2. You consent to the use of the interview with any revisions specified by you for historic documentation and academic purposes.
3. You consent to the interview being made available to the public.

I, George W. Freeland, agree to the procedures outlined above and by my
(Please print your name)

signature, given my consent and release for this interview to be used for historic documentation and academic purposes.

Additional Comments and Clarifications:

George W. Freeland
(Signature)

2/12/13
(Date)

Recording Date February 11, 2010

Transcription Date January 3, 2013 to January 9, 2013

Participants Keoki Freeland (KF); *Interviewer*

Keoki Freeland, Lahaina kama‘āina, Lahaina Ahupua‘a, Maui.

Mr. Freeland was born in Lahaina in 1939 and was raised in a house where the Wharf Shopping Center is today. His parents owned and operated seven movie theatres throughout the Lahaina district. Mr. Freeland worked for many years for the Pioneer Mill before retiring and becoming a member of the Lahaina Restoration Foundation.

Keoki Freeland (KF): …is George Warren Freeland. I'm known as Keoki Freeland. I was born in Lahaina, March 14, 1939, and raised in Lahaina. I went to Kamehameha III School, and Lahainluna High School. From there, I went to the mainland, to the University of Notre Dame, graduated as a mechanical engineer with an industrial option. Came back, worked with the Hawaiian Sugar Planters Association as a trainee for a number of years. Then I worked on seven plantations, but I ended up at Oahu Sugar, and worked there for 21 years. Then I came back to Maui in 1985, and worked at Pioneer Mill from 1985 to 1995. I ended up there as Vice President/General Manager of the plantation. When I left the plantation, I went with the Lahaina Restoration Foundation, and there I learned about the history and culture I never was told about when I was growing up. I grew up in Lahaina during the period known as the Plantation Era. And people like me, who were part Hawaiian…I didn't know, but my parents purposefully kept information from us, made sure we didn't learn things, especially things Hawaiian. But I never realized that until I went to work with the Lahaina Restoration Foundation. I was somewhat unusual in that my father did not work for the plantation. He had movie theatres throughout the Lahaina district. He had seven movie theatres from Honolua all the way to Olowalu, with the main theatre at the Banyan Tree Park. That was the Pioneer Theatre. But because he catered to both the management class, as well as the working class people in his movie theatres, everybody was my friend. You know, I never realized that there was a class system between the management, and the working class people. I was able to go into the Filipino kid's house and get food. He came to my house. We played games. Japanese kids, haole kids, no matter what, Portuguese kids, everybody was my friend. I never knew that there was a division line. Until I began to work with the Lahaina Restoration Foundation, and I think backwards, that certain kids never went across a certain line back and forth. But I was able to. So I was somewhat unusual in that fact, whereas, my wife grew up in Kohala on the Big Island – same thing, plantation town. And her father was the factory superintendent, so he was in the management class. And she's part Hawaiian, just like me, but she experienced the class system. She was the damn haole, you know, whereas, I was never ever called that. And I was somewhat larger than most of the kids, and athletic-wise, I was, you know, not too bad. So when it came time for sports or playing games, or whatever it was, they always choose me to be the captain, or the leader, and all the

kids would say, “choose me, choose me! I want to be on your team.” Whereas my wife was the kid that was always left to the side. Nobody wanted her. So there was a big difference in how I grew up, and how the normal people grew up during this plantation era. I was somewhat sheltered. So that when you come to Moku‘ula, I knew nothing about Moku‘ula, nothing, nothing at all. That is where we played ball. We ran track. That was Malu‘ulu o lele Park. Moku‘ula did not exist. I knew nothing about it. My parents purposefully made sure I didn’t know that. As a matter of fact, more on the Salvation Army side of the area right now, was the Lahaina Dump. That’s where all the rubbish and ‘opala was dumped. And it was always burning all the time. You know, so, that’s where we played ball, like I said, and ran track, and that’s where the dump was. So the history of Moku‘ula, I started learning about it when I went with the Lahaina Restoration Foundation, and that was in 1995. So I’ve had three experiences, if you want to call it that, where it appears that Moku‘ula, or maybe Hawai‘i, may be a lot older than what normal people think it is. One is the original archaeological survey, and what they found. There’s one item in there that they found, a single sample of an ‘ulu pollen, you know, breadfruit. ‘Ulu is not native to Hawai‘i. But when they carbon dated that thing, if I remember right – now don’t quote me on this date, because you gotta go look at the report – but I seem to remember, it was 265 BC, was the date that came up with that sample. And Akoni, and all the other archaeological people said, “Ah, there’s something wrong. It cannot be. That’s too old. Something’s wrong with the sample.” So it’s not common knowledge or published fact that they’ve actually found this. They said something is wrong, so it cannot be that early, 265 BC. That’s number one pointing at maybe Hawai‘i is older than what we think it is, and Moku‘ula possibly, can tell us that. The other one was, from my understanding, the royalty from Easter Island came to Lahaina. I don’t know what date. But very early when Moku‘ula got going, and they had read the archaeological survey, and from what I understand – I was not there so I’m telling you this second-hand – according to their ancient chants and stuff, and writings, they came from the island of Moku‘ula, spelling a little bit different. And they’ve been hunting for this island all over the Pacific, and they have never been able to find it. So they wanted to see Moku‘ula because of what they read in the archaeological survey. Some things in there that seem relative to what they know about Moku‘ula. So they wanted to see Moku‘ula. You go there, on Front Street, what do you see? It’s nothing but a ballpark, right? There’s nothing to see. So what do you see if you’re standing there, looking mauka? Every peak and every valley is precisely described in that chant.

Interviewer: *Right. It is.*

(KF): So they said, “This is where we came from.” Well now, they’re talking about much older period of time than what we were talking about. They don’t have a date. But they’re talking about coming from Moku‘ula, going to the west coast of the Americas, going down South America, then going to Easter Island. And what we know in time, is the coming back, not the going. The going is much older.

So they were here, and they left from here, and went to the west coast, and then down to South America, and Easter Island.

(KF): And Easter Island.

Is that where they picked up the sweet potato, you think?

(KF): mm-hmm [nods] because the sweet potato, all the potatoes actually come from South America. That’s where it originated. But you know, you don’t have a paper trail that really proves that, except you know it originates from there. But how did it get throughout the Pacific? You know, that’s why they sail Kontiki, to try and prove it, that that’s where it originated, but the Kontiki fell all apart. Okay! Anyway, that’s two instances that I’ve experienced, pointing that Moku‘ula possibly can tell us that Hawai‘i possibly is a lot older than what we think it is. The common age, from what I understand, is that Hawaiians came around 400 AD. That’s the agreed upon period of time, that is talked about by archaeological people at the present time. Okay! The third thing – I once heard of this name, this man talk by the name of Doctor Xavier Walters. He is an astro-anthropologist. Now what is an astro-anthropologist? He is very versed in the study of the stars. That’s where the ‘astro’ comes from. And the ‘anthropologist’ is the study of man. He’s a haole man. He was over 70 years old when I heard him talk. It was very difficult to understand what he was saying, because he speaks at a level way the hell up here someplace [holding his hand above his head] and I only can pick up a few pieces along the way, as he’s speaking. And this was done at Kaanapali Beach Hotel. Lori Sablas was there, she knows. She can confirm what I’m saying. But Dr. Xavier Walters talks about – well, let me go back to Moku‘ula. He says, you know, he comes up with this definition of Moku‘ula. He goes through the ‘Mo’ and the ‘ku’ and the ‘u’ and the ‘la’ and fifteen minutes later, he comes up with the origin of man! And I don’t know how he got there. Because he’s speaking at this level that’s – but he talks, and he comes up with that. I said, “Whoa!” you know, “Where did you get that?” And like I said, he’s a haole guy, but he’s very versed in the Hawaiian language, and he’s heard some ancient Hawaiian chants, and he can date when that chant was written, and the way he does it, is this way. He says, the zodiac, well the heavens and the stars, change about once every 2,000 years. Okay? So, you know what stars are in the sky at a certain time. So these certain chants that he’s heard, they talk about certain stars, and he knows, “that star’s not there now. It was way back when.” And he’s talking about, not 2,000 years ago, 8 – 10,000 years ago, that Hawaiians were here. And whoa mackerel! That’s, you know, way different. Now he also, knowing the stars and stuff, and these chants, he also went out looking for certain things from these chants. If you go to a certain place, you gonna find a crack in the wall, or a ‘V’ in the mountain, and when the stars, at a certain point, you’re going to have a light beam coming through, and it’s going to point to a certain heiau. And he had a map of the Hawaiian Islands, and he pointed out these heiaus that he’s found on the different islands. An airplane navigator cannot fly a line straighter than these heiaus lined up from Kauai to Maui. Just straight as an arrow, then it bends to the Big Island. And he got all that information from these chants, and he’s hiked through the mountains, and he found these things. So, there. That’s item number three.

Was his name Francis Xavier Walters?

(KF): I think so, yes. All I remember is Xavier Walters.

Yeah, I read his reports.

(KF): Well, like I said, he’s hard to understand when he’s talking, and I’m only picking up a few pieces as he’s going along. But that’s what I picked up. It looks like Hawai‘i is a lot older than what we think it is, and he’s pointing to WAY older than what we think it is. So, that’s what I know about Moku‘ula, these three experiences that I’ve had. One of em is a second-hand, which was the royalty from Easter Island. But, okay, that’s about it as far as what I know of Moku‘ula.

What I would like to see, is that someday we can do more archaeological surveys and find out more of what is there, to not only confirm, but maybe even expand of what we know about Hawai‘i. Now, obviously, that’s where the royalty lived, and if you look at the area, you know why they lived there. I mean, you had plenty of fresh water coming from mauka, the reefs and the ocean, and then the sunlight, and the soil, and everything was the best, the most perfect place to be. And it makes sense that the royalty picked that spot.

Do you know, by any chance, anyone before Pi‘ilani that lived there? Because Pi‘ilani held his court there at Moku‘ula*.*

(KF): Right. No I don’t. Like I said, I knew the place as Malu‘ulu o lele Park until I went with Lahaina Restoration Foundation. Now, Lahaina Restoration Foundation is connected with the Friends of Moku‘ula, because – and this was before my time – Friends of Moku‘ula, when they were getting started, received a grant from the county to do the archaeological survey, but the Friends of Moku‘ula had not received their 501c3 status yet at that time. And without receiving it, they could not receive the money. So Lahaina Restoration Foundation said, “If you want us to handle the money? We’ll hire Bishop Museum and have them do the archaeological survey.” So that was the agreement. So the money was run through the Lahaina Restoration Foundation. They hired the Bishop Museum. They did the survey, and then by the time the report was written, Friends of Moku‘ula had received their 501c3, and the remaining money was returned back to Friends of Moku‘ula when the report was…

Was that Christian – how do you say his last name?

(KF): Oh, Dr Christiaan Klieger.

Well, when you were growing up, where did you folks live?

(KF): Well, I lived, actually, where the Wharf Shopping Center is now. Our house was right there. Right across from, on the mauka side of Front Street, across the street from Banyan Tree Park.

Oh, okay. And who was your father?

(KF): George Alan Freeland.

And he was the one that owned the movies.

(KF): Well, my grandfather was the real entrepreneur. He was an Englishman, came from Coburn, England, ended up in Lahaina, married a full-blooded Hawaiian woman from Lana‘i. She was a Kahu‘hu, but she had previously married Dr. Davidson, the town doctor. And he passed away and then she married my grandfather. My grandfather was the one that built the Pioneer Inn, in 1901, and was involved in all kinds of other businesses around town. And my grandmother, with Dr. Davidson, had a bunch of kids, I can’t even tell you how many. I think she had a total of fourteen kids with the Freeland and the Davidsons. But in the early 1950s, all the kids had left Maui, except my father. He stayed home and he ran the family business. So he was doing all the work and of course he was paying them their shares and all this kind of stuff. So what he did was, he bought them all out. And in doing so, he had to sell some of the properties but he kept the Pioneer Inn, a portion of it, as his main income. Now, he had these movie theatres, the only one that was on the property was the one that’s right next to the Banyan

Tree Park, which was the Pioneer Theatre. The others were on plantation camps, so they were in buildings that were part of the plantation. He was leasing them.

Oh, okay.

(KF): In those days, very few people had automobiles, so instead of their coming down to the movie, what he did was he had these movie theatres in the camps for the people, they would just walk to the movie theatres. Every night he had a different feature, because there wasn't enough people to run the movie more than once. But I remember - when was it?- Monday nights was Filipino feature, and Thursday nights was Japanese. The rest of the nights was English. But that's the way he went. And you know, he had the news of the day and the cartoons and it was, what we see on TV today, is what we learned through the movies when I was growing up.

How much did it cost?

(KF): Ten cents.

Wow. [laughter]

(KF): But ten cents was big money!

It's still hard to get. [laughter]

(KF): When I was in high school, some of vacation time, I worked in the pineapple fields, got paid a dollar an hour and thought, "Wow, rich!" Now I think back, that's only eight dollars a day! [laughter] Now you can hardly hire the guy that goes cut the grass for ten dollars an hour, much less eight dollars a day. That was my first job, working in the pineapple fields.

Do you remember which ones?

(KF): Well, I was out on Kapalua, the whole area. Hoehana, pick pineapple.

So was Don Fleming around at the time?

(KF): Old man Fleming, yes. Yeah, and it was called Baldwin Packers at that time, not Maui Land and Pine.

Interesting.

(KF): Then later on, I was promoted, like the second or third year working out there, to drive the pineapple truck. That was big promotion, a dollar-half an hour. [laughter] Drive truck.

So, I got your father's name.

(KF): George Alan Freeland. See my grandfather is George Freeland. My dad is George Alan and I'm George Warren. My son is George Warren Hay. In tradition, in our family, all the first sons are named George.

Okay, yeah.

(KF): So, however, because you don't want to be confused when you say George, my dad was always called Alan. He was never called George. I was always called Keoki. My son is always called Warren. None of us are called George until you write on a formal piece of paper. Then you gotta sign your name George.

Do you know where the George came from originally? Is it from England?

(KF) Yep. Colburn, England.

Colburn.

(KF): C-O-L-B-U-R-N.

You know, Colburn's in Oahu is a big family.

(KF): Hmmm.

Okay, so what was your mother's name now?

(KF): She was Lolita Warren. She was from Honouliuli on Oahu.

She was from makai or mauka Honouliuli?

(KF): Honouliuli Ranch is where she came from.

Oh, Honouliuli Ranch.

(KF): I think the house was mainly – ah, I never did see the house. It was gone by the time I was born.

There was a time when people from that area used to go and dig clams from Pearl Harbor and stuff.

(KF): Mm-hmm

So can you tell me about what the place looked like – Moku‘ula *area looked like when you were…*

(KF): Pretty much what you see right now with the ballpark, with the exception of the Salvation Army side. That was the dump. From where the – we're talking about putting the parking lot at Moku‘ula, all the way down to Front Street. That whole strip there was a dump. And it was always burning. They used to burn whatever could burn, and then crush it down a bit and dump some more. Then the next dump they moved, was to create a village, which is above Canoes. You know where Canoes is? The restaurant?

Yeah.

(KF): Above Mala?

Yeah.

(KF): Up the hill, you see a cinder cone up there and there's a crater. That is called Crater Village. And that was the next dump. And the dump after that was the Olowalu dump, where it is now.

Where? Down by Ukumehame side? Is that where it is?

(KF): No. You know where Cut Mountain is?

Yeah.

(KF): Well, just past Cut Mountain, is the Olowalu dump. There's a sign there, and you'll see trucks coming out of there.

What about old stories? Did you hear stories when you were younger?

(KF): Nothing. Like I said, that was purposefully kept from us. They made sure we didn't learn it.

And your friends – the kids never…

(KF): Never did too.

So, what was life like at that time?

(KF): Well, like I said, it was plantation town. Right there at Campbell Park, there was a basketball court. What I remember there is that the plantation and the different camps – everybody would – all the different camps would create their own basketball teams. It was a real big deal to have a basketball tournament down there at Campbell Park. And this was done in the evenings, night time, after, you know, pau hana. And it was a big deal. And whoever won a championship – that camp was a real big deal! That I remember very clearly because it was close to where I lived so I was able to go see most of those games being played. I was real young at that time, of course. And then when I went to Kamehameha III school, played basketball right there, at Campbell Park. And then I went to Lahainaluna and did the same thing up there. So, involved in athletics. We did a lot of diving. Surfing was not a big deal at all. Very few people surfed, if at all. What we did was, we would make tin boats. Take the corrugated iron and make a little boat out of it, and hand paddle. And we'd go up and down the coastline with the tin boat, and even bamboo, and catch some fish. But surfing – I didn't start surfing until, actually, when I went to college. So that was in the fifties, 1950s. But you look in the 1940s, nobody surfed. But everybody went fishing. And my dad was also a hunter. I loved to go hunting and I loved to go fishing. And I still do. I still go every weekend, hunting.

What do you hunt?

(KF): Right now, it's bird season. So I have hunting dogs so we go hunting for pheasants and stuff like that. After that it's deer season. Later on, I'll show you my collection of my feather leis and stuff. I have a story I can share with you on those feather leis. When I came back to Maui – on Oahu, I lived there for twenty-one years. I didn't do any hunting, but when I came back to Maui, I started hunting again. And I collect the feather pelts from the pheasants that I was hunting. So one year I was in New Mexico, hunting for elk, with some friends from the Big Island, and I asked them if they knew of any lady, or somebody that could make feather leis. And they said, "Oh yeah, we know a very good person." So she made contact, and I went to see this person. First by phone, I talked to her. She says, "Well when you come, bring your pelts. I want to look at your pelts first." So she was very critical. If the pelts didn't meet a certain standard, she wasn't going to touch them. So when she looked at my pelts, she said, "Oh, you did a good job, okay. I'll make you a lei." When my dad passed on, he left me – oh, I'll show you in there – I think it's about five feather leis. So I took them with me to show her, because I didn't want her to duplicate what I already had. So she looked at the leis and whatnot, and she made me a lei. And in a short period of time, she finished the lei, a beautiful lei. I'll show you which one it is. And then, so it went on like this for a few years. I'd give her all the pelts that I had accumulated for the year. She'd make me one lei and she could keep the pelts and make more leis from them. That was our agreement. Then a few years had gone by and then I had – I was reading this brochure about this old cowboy who had retired from Parker Ranch. He was a Japanese guy. His name was Yutaka Kimura. And in reading this retirement article, he talks about an old Hawaiian

woman coming to live with one of the foremen of the Parker Ranch in the 1930's. And he learned how to make feather leis from this old Hawaiian woman. He later on taught his sister to make feather leis. And his sister is this lady who is now making me my leis. Now she's taken it to a much higher level in her skill. She's not only prolific at making the leis real fast, but she's fantastic as far as matching the feathers and coming up with these beautiful leis. She's also, from what I understand, one of the National Treasures of the Smithsonian Institute, for her skill in making feather leis. And her name is Tsugi Kimura. No. That's her maiden name. Her married name is Kiyama, so Tsugi Kiyama is her married name. A few years went by, and like I said, I was reading this thing about this retired cowboy. But reading this article, it talks about this foreman that this old Hawaiian woman came to live with, and this foreman is my uncle! And in the 1930's, this has got to be my grandmother who went to live with her oldest daughter, who was married to the foreman at Parker Ranch. So I go back to Tsugi the following year, and I said, "Tsugi, I read about your brother's retirement, and you realize that your brother learned how to make feather leis from my grandmother!" She looks at me and she says, "Oh yeah, the old lady was Freeland, and your Freeland, but I didn't put you two together." She says, "Next time you come back, bring back those old leis that you first brought with you. I want to look at them again." And from those old leis, all but one, she said, was made by my grandmother. So she could tell by the stitching, that those were made by my grandmother. So now that we have this tie, I don't want anyone else making me leis except her, because she learned by a roundabout way from my grandmother. About a year later, she died. And when she died, she was making me a lei. And I didn't want to go to the family and say, "Where's my lei?" you know. So I went to the funeral and all that – pau, went home. But then I found out that Tsugi had been teaching one of her nieces how to make feather leis. And so I made contact with her – went to see her. And then she says, "You know, when Tsugi passed away, there's a feather lei that she finished but we don't know who it belongs to." And she says, "It's unusual because this feather lei has some Velcro on it." I said, "That's my lei, because all my leis have Velcro on them." Because, when I worked at Lahaina Restoration Foundation, depending on what color shirt I had, I would change the lei to match the shirt. And that's why I have Velcro, so it's easy to change the lei. So all my leis have Velcro on them. So I got the last lei that Tsugi made.

Ah, cool. Did you know that the cowboy was Larry Kimura's – I think it was his father or his grandfather, or something like that.

(KF): I don't know. I don't know what relation Larry is with Yutaka.

I just interviewed his niece, and she told me the story about her grandfather being the cowboy at Parker Ranch.

(KF): Oh, you talked to Kimura.

Yeah. That's amazing. So your grandmother – and she didn't pass it on to her children?

(KF): Nobody. Nobody made feather leis.

What was this grandmother's name?

(KF): Amabelle Kahuhu was her maiden name. So she's Amabelle Kahuhu Freeland.

So she was married to…

(KF): George. Now, my grandfather, George Freeland, was six foot-eight, weighed over three hundred pounds. And grandmother, four foot-ten, not even one hundred pounds. [laughter] I never knew any of them. She passed away in the thirties. He passed away in 1925. But I was born in 1939, so I never knew any of them.

Sad. And then your family didn't talk about – your father didn't talk about his parents?

(KF): No. What I'm telling you now, that he was six foot-eight, three hundred pounds, and Grandma was four foot-ten, under a hundred pounds – that's all I know.

I could just see him riding a horse.

(KF): Now my sister is twelve years older than me, and as I was learning all these things, I said, "How come I didn't know about this stuff when I was a kid growing up?" She says, "You don't understand, you grew up in the plantation period and – they were protecting you." "What do you mean protecting me? I don't need protection." But, from what I understand, and now I do understand, they were trying to protect us both, career-wise and social-wise. As I was – well listen, I came back as an engineer, worked in the sugar plantations. And I worked from the bottom, I worked my way up, all the way up to the position of manager. But as I was moving to higher and higher positions, every now and then, I would get this comment of, "You know, if you were around here, twenty, thirty years ago, you would not be able to do this." I didn't know what they were talking about. And it's because I'm part Hawaiian. Twenty, thirty years earlier, I would not be able to move up the ranks. And then – but I guess my parents did such a good job, that I was moving along, that people didn't look at me as being a Hawaiian person. Although, you know, I feel like everybody was my friend. And when I worked in the plantation, I took my knowledge of what I learned in school, my engineering stuff, and incorporated it in the different fields that I was working in, to make it easier for people doing their work. If it was easier for them, they would be more productive. If they were more productive, it was better for the plantation. So everybody was winning. So guys would come to me all the time and say, "Hey Boss, how do you do this?" I said, "Ah, maybe we ought to do it a different way. Let's figure it out." So you know what, and that's the reason why I was quite successful in moving on. People were willing to work with me, all the way up, and we were far more productive and we broke all kinds of records along the way. But, I did that because I really didn't know that there was a class system. I was just there to do a good job, and to make it better for everybody. I don't care who it was. Whether it was the field hand or the supervisor, make it easier for everybody.

So where were all the fields when you were working there? Where did the fields end? Where were the boundaries?

(KF): There wasn't any boundary. Lahaina virtually had every square foot of land – okay go back to Moku‘ula now. This is what I learned. Also, I didn't know anything about this. Moku‘ula, as you know, the ponds and whatnot, which was virtually a sixteen acre pond with a one acre island inside of it. And, what was it? 1928? I can't remember the date that they filled in the pond. Growing up, they had moved the capitol from Lahaina to Honolulu by then. About 1850. I can't remember the exact date either. But about 1850, move the capital to Honolulu. By 1928, Lahaina is now a bustling plantation town. Virtually every square foot of land either has sugar cane on it, or a house on it. And my grandfather was a good friend of the plantation manager at that time, by the name Harry Weinzeimer. And they were talking one day, and Mr.

Weinzeimer was saying, “You know, with all the people and whatnot, I think we ought to have a place where people can play ball. Where do you think we can do that?” Well, by then, from 1850 to 1928 – could be 1918 – I’m not sure the exact date. But anyway, roughly fifty years had gone by. Moku‘ula was not kept up. It was by then overgrown with weeds, and generating mosquitoes like crazy. So, “Why don’t we just fill in this pond, and put a ballpark there.” So that’s what they did. They railed in the dirt from Honokowai, and they literally dropped the dirt in and leveled the surface. They did not disturb anything that was there. So when they did the archaeological survey, they not only found the walls to the island, they found Kamehameha’s pier that’s still intact. And knowing how the plantations were, and the dump that was right next, over there, if they didn’t fill in the pond, the place, the way it is now, probably all of it would have been destroyed. The mausoleum under third base right now would probably not exist. Kamehameha’s pier, the island, the walls, and whatever else might be there, that can tell us more about the history of Hawai‘i, probably would have been lost forever, if they didn’t fill in the pond like the way they did. And that goes back to another thing, like I said, how much I did not know. When I was considering going with the Lahaina Restoration Foundation, there was a joke going around town. Guys would come up to me and say, “Hey Keoki, your grandfather was the son-of-a-bitch that filled in the pond, it’s gonna be your job to undo it.” I didn’t know what they were talking about. I had no idea. Until, I went to the foundation, and I found out what had transpired later on. And so that part, of the filling in of the pond, is what I learned after 1995. And the archaeological survey, what they found is everything is so well preserved because of the way they dumped the dirt in there. So he’s no longer the son-of-a-bitch. [laughter]

He restored his good name.

(KF): He preserved it.

Yeah.

(KF): And you know, that’s archaeological-wise, that’s probably one of the better ways of preserving things, is to fill it in. Then it’s well protected. Now, the spring water continues to flow through underground over there, and that’s why Kamehmeha’s pier is still there. Because the water – instead of the wood rotting underground, it’s underwater there. And that’s why it’s preserved.

Where is the spring? Whereabouts?

(KF): It’s coming from mauka. It’s just running right down there. If you were to go below Moku‘ula, out there in the ocean, you could feel the spring water coming up.

Oh, I see what you mean.

(KF): If you look at the old maps, there’s all kinds of waterways through there. Not only over there, but all the way through Burger King. You know, below Burger King, look at the name of that street right there. It’s called Canal Street.

Really.

(KF): Because it was a canal. Whalers used to bring their boats up that canal and do their trading, right up there by where Burger King is. But the waterways were all connected all through there.

What about the ponds and the so-called swampy areas?

(KF): That's the waterways I'm talking about – those ponds. There're the ponds, well the sixteen acre pond where Moku‘ula is, but if you look at the old maps, there's more ponds like that, going towards the Lahaina direction.

Okay, towards Lahaina. What about towards where 505 Front Street is?

(KF): Yeah! Oh, that was all pond there. 505 Front Street – when the electricity shuts down, their parking garage in the basement, floods.

I can see why.

(KF): Because the spring water is coming through there. And it's constantly, pumping it out. If you walk on the ocean side, you see the water coming out.

Why would they build there, if that was the case?

(KF): I know, but back in those days, you see, the people, they didn't think of that.

Yeah.

(KF): 505 and Lahaina Shores, both were – I remember, you come down –what's the name of that – Shaw Street. At the bottom of Shaw Street, there was a house right on the ocean there, and that's where the Shaw's lived. But on both sides of that, the 505 side and the Lahaina Shores side, were ponds.

Did you guys fish there at all?

(KF): Nah, there was not much fish in there. It wasn't, you know, it wasn't a fishpond that was cultivated when I was growing up. It was just, like I said, overgrown with weeds and mosquitoes.

Was Mrs. Shaw still alive then?

(KF): Yeah.

What was she like?

(KF): Well, she was a beautiful old Hawaiian lady.

She knew your family then.

(KF): Yeah. You know, she might have died when I was about ten years old.

So who were the other people that lived all around that whole area? Do you know?

(KF): There wasn't much people that lived there at all. Because if you go the Lahaina direction from the 505, there was nothing until you hit the Episcopal Church. Okay, so that was all open area, and part of it was the pond. Until you hit the Episcopal Church, and then it was the Kamehameha III School. Right there on Prison Street, on the Olowalu side of Prison Street, was the fire station. From there, in the Olowalu direction, was nothing – nothing but ponds and kiawe trees. So, the Prison Street parking lot right now, was pond area. You know, back where all those kiawe trees are, you can see there's remnants of ponds there. All of that should eventually go to Friends of Moku‘ula.

Really? Wow. When was the prison built? It was probably in the…

(KF): 1859 I think it was. Now the prison, see right where the Hui o Waa Kaulua is, you know, the canoe people, was Kauikeaoli's [Kamehameha III's] palace. He had a palace that was made of cut coral and stuff, but he never ever lived in it. He always lived on Moku‘ula. So, but like I said, he abandoned the place around 1850, and somewhere along the line, the palace got damage from the Kaua‘ula wind. And so, they used the material from the palace to build the prison, the cut coral and stuff like that.

Interesting. So you're still involved with the…

(KF): I retired last year. I'm helping, you know, when they have some problems, they will give me a call and we'll talk about it but one project I still am connected on with them, is the restoration of the smoke stack at Pioneer Mill. I started that project so I said I would stick around as part of the committee. But the foundation runs the whole thing.

Yeah, cause I remember when – I had two actually – Waihe‘e projects of Pioneer Mill, and people that I interviewed were really against demolishing the smokestack.

(KF): Right. Well, you know, I can't remember what year it was, but they whacked off the top fifteen feet for safety reasons. And of course, there was a big uproar. And so Lahaina Restoration Foundation's mission is restore and maintain Lahaina during the period of the monarchy. So that stack is out of our mission statement, but nobody was doing anything. So I went to our board and said, "Do we want to get involved in this and save the stack?" So they said, "Yes. Do it." So I went to the cultural resource commission, made a pitch that if we could get a decent lease, Lahaina Restoration Foundation will restore the stack and make kind of like a living museum out it – more like an interpretive museum. So that's been our mission. But it's been over four years now, I've been working on it – pushing five now. Getting the permits is just unbelievably slow. So maybe March, we're gonna start work on the stack. And we'll not only restore the stack to the way it looked, it's over 225 feet tall, replace the top fifteen feet that was whacked out, but reinforce and restore the whole thing, all the way to the ground and make an interpretive museum around it, on the bottom, with bricks and stuff, and interpretive plaques. The outfit that will be doing the work on the stack, are professional chimney restorers from Chicago. Those guys, they really know their stuff. And they're ready to go. It's just a matter of getting the permits. It's been so slow on getting them. Good thing the stack hasn't fallen down already.

Yeah. What's happened to all the archival documents for Pioneer Mill?

(KF): Okay, so because I was a manager at Pioneer Mill, I was very familiar with all of the documents, so, as I said, I left Pioneer Mill in 1995. In 1999, they decided to close the place down. So, I knew what was there. So, in an effort to try and save it, I wrote a letter – the guy is still here, he's with Kaanapali Development Corporation.

The guy that used to live on Molokai at one time?

(KF): No. This guy's a haole guy. He's from the mainland. Lovelette! Lovelette is his name. I wrote him three letters, three different times, offering to take all this material that's in the main office, especially that stuff in the basement and take it up to Hale Pa‘i, where we store our archaeological materials. And what we would do with all that material, is that we would not only store it, but we would copy it, and put it into a computer system to preserve the information. If they ever wanted the material back, we could have it back. But, from what I could see, they

really had no plans. So in an effort to save it, I wrote this letter. And again, this was in part, was approved by my board that we would do this. He never ever answered us. So, meanwhile the stuff is in the building and nobody is in it. And then one day, we had a big rain storm. And you know, that building has a square roof. You go up there and it kinda looks like a swimming pool. Well, it filled up with water and rotted away, and collapsed. Went on down, damaged a lot of the interior of the building. So they just got rid of the material. Some of it went to Bishop Museum, but very little. I cannot tell you how much, because I don't know. But a lot of it was just damaged and tossed. When I had already left the plantation, the plantation was still in operation, my nephew, Kimo Faulkner, was the Ag department head there at the time, and so there were these lawyers from Chicago. They were checking out paperwork in the office. Like I said, I had already left there. And they were digging around and dumping stuff into the dumpster, so Kimo, one day after they left, went through the dumpster and started looking at what they were throwing away. He found – I guess you could call it a lease it was an agreement, a hand-written agreement by Kamehameha III, on a portion of land that he had signed and was part of the agreement. They thought it was of no importance, so they just tossed it. But that's what happened to the material. I mean, it's gone! Homeless people moved in there for a period of time. They probably used it for toilet paper. Plus the damage from when the roof collapsed and all of that. So most of it is gone. Some of it is with Bishop Museum, but most of it is gone.

Yeah. They had the best annual reports. It was incredible. They had the best maps and everything else – all this information. I begged them, in fact, at the time, to use them, to see some of their – because I was doing a project for them.

(KF): They had maps of all the irrigation systems, all hand-drawn, every house they built, which was in the hundreds, all in blueprints. All of Lahaina! Everywhere – everything they had was down there in the basement. And that's why we offered to save it, but never got to first base. It's gone.

That is such a tragedy.

(KF): Like I said, I was the manager then. There were things in the office, which was all monkeypod wood and stuff, and a big desk and whatnot. And like I said, all the reports were in this wall over here. But there's a button [laughter] at the basement of where all these reports are. And you push this button and the table – counter kinda goes down, and a table comes up with bottles of whiskey and stuff. At the end of the day, you can have your drink. It was all hand-made by the plantation, but nobody knew it was there, unless you knew where the button was. And I knew where it was.

Yeah, they had such amazing history with all the different managers that were there. Yeah, I had so much fun researching, cause, ??? like Hamilton has some. But then there's a cutoff, and so I knew that there was other stuff.

(KF): Right. Oh, there was plenty. Like I said, all these blueprints, just tons of it! all downstairs.

They had the most incredible – I saw the map of Puukolii.

(KF): Yeah. Pu‘ukoli‘i Camp. Yeah. But you had more than Pu‘ukoli‘i Camp. You had – you know – Lahaina had – Yeah! Thirty-something camps.

Really?

(KF): Yeah. You go from Ukumehame all the way to Kahana. As a matter of fact, I have someplace – Sammy Kadotani was in charge of the 1987, of the Great Lahaina Restoration, which is kind of like a carnival thing, but he has a map of all the camps, where they were located. It's amazing! When I was a kid growing up, there wasn't that many camps, but I mean, he goes way back in time. Olowalu and Ukumehame, those plantations were gone when I was growing up. It was part of Pioneer Mill by then.

I interviewed him today and he only – he did remember some, from Olowalu. Olowalu, Wainee Village, Lahaina Pump and Kaua‘ula Camp, Lunaville Camp, Kilauea…

(KF): I think I can find the map. Do you want me to go look for it?

Yeah.

[Break]

[looking at map of camps] *Oh, and then Makila. I remember Makila. That's Waine‘e, Kaua‘ula, Hopkee – I remember somebody talking about that once a long time ago. Lunaville – is there any way to get a copy of that – of this?*

(KF): You want to borrow it? You can go Xerox it.

Okay, you think you could do that and then get it back to me?

(KF): I'm going to be in Lahaina all week next week. You can just come by the office.

Oh, okay.

(KF): I'll be staying at 505.

[pointing at map] *This is the – can't read that. Something – what is that? Harushi or something else?*

(KF): Iarushi, I don't know.

The other part of it is missing.

(KF): Yeah. It's not there.

I wonder where the original is.

(KF): That, I cannot tell you. I don't kow.

And then, this one too. I don't know what that is [pointing to crease in map] *So there's a lot that we don't know. And Otani – I know where Pu‘ukoli‘i is.*

(KF): You know where Crater Village is? That's the one, I said was above Canoes.

So, what's Kaanapali Village? Was that a camp too?

(KF): Mmm-hmm

Oh.

(KF): By the landing over here.

Yeah, okay – cause that's where Sammy was born.

[Break]

…okay, from Napili is pineapple. Cause now Mahinahina is pineapple

(KF): Right. Right.

Cause I did the Pulelehua project.

(KF): When I was at the plantation, Honokowai Valley, Lahaina side, was sugar. But Honokowai Valley, out towards Honolua direction was all pineapple by then. And then they put the airport in.

So were you knowledgeable too about all of the irrigation systems and types?

(KF): Basically, all the mountain water, every valley on West Maui, they collected water for irrigation. If you go up every valley now, you will find coffee growing in there. And the reason why there's coffee there was because of the ditch men who lived up there. They grew their own coffee, and made their own coffee. And that's why you find coffee in every valley up there in the West Maui Mountains. Now, that water that came out of the valleys irrigated virtually all of the mauka portion of all the plantation. The makai portions were irrigated, primarily by well water, where they drill wells and pumped it up. But it's very costly to pump it uphill, so it was used with low-lift pumps just to irrigate the makai fields. The mauka fields was all by gravity, out of the valleys.

So the water that came from Kaua‘ula, Waine‘e, and all that – so it used to fill up all the ponds and stuff. So what happened to that?

(KF): The way that the water was run, the plantation had all the lands there, and you have different land holders. Kamehameha Schools, for instance, owns a big portion of land underneath the 'L'. Okay. That water was being irrigated from Kaua‘ula – came out of the valley and irrigated those mauka fields there. Right now, Kamehameha Schools has no water because they have no rights to Kaua‘ula Valley. So they're wondering how the hell they can get water. Well, I said, "Why don't you run it the way the plantation did?" and this is what the plantation did – do you know where the swimming pool is right now?

Yeah yeah.

(KF): Just mauka of that was what we call 'Pump Camp'. There's wells there with pumps that are not running right now. Water was pumped from there, and as I said, it was used to irrigate the lower fields. Actually, the water went all the way out to Makila, to irrigate all of that. The water from Kaua‘ula was diverted and went into all this area that's Kamehameha School's area. Right now the Kaua‘ula water is going towards the Makila direction. Because that's part of the Makila lands – the valley is. So I said to Kamehameha Schools, I said, "Why don't you make a deal? You take the water out of Kaua‘ula, let's say a two million gallon flow, then you pump two million gallons water from Pump Camp to Makila. That's the way the plantation ran it. Do the

same thing. At your cost, you pump it to Makila, but you got water coming out of Kaua‘ula. You can irrigate all your lands up there, just like the plantation did.” Well, you got different people talking and they can’t come to an agreement. But when you have the plantation to run it all, you can do that. And that’s what they did. So you got these pumps right now, just sitting there doing nothing.

Doing nothing – yeah. And what about Piilani auwai? What was that irrigating?

(KF): I don’t know. Piilani auwai…

Cause it’s still running up there above where Ke‘eamoku[Kapu] folks have their place.

(KF): That – okay, like I said, there’s a big siphon that goes to the area below the ‘L’, but some of it went makai towards that direction and irrigated some of the more mauka portions of Makila, where the pump ditch – Eddie Hussey knows how those ditches run real well. I’m not that expert. But the water that I said, that was pumped towards Makila, was not able to irrigate all the Makila area. Some of it had to come out of Kaua‘ula. So there was water coming out of Kaua‘ula. I think that’s what you’re talking about. That’s just kind of running down there right now. There also was a hydro in there, where they made electricity from the water running down. There was hydros all over the place too. Olowalu had hydros – Kahoma, Kaua‘ula, and I think more out in the Honolua direction, they had hydros out there too. So you didn’t have Maui Electric. They didn’t exist. Plantation made all the electricity. So they make electricity when they burn the beggasse at the mill, but you also made electricity from these hydros, where the water was coming out of the mountains.

Is it – I forgot the name. It’s the place you know where, Kaua‘ula Ditch is this way, on the Olowalu side of Kaua‘ula Ditch – Puehuehu? I can’t pronounce the ahupua‘a name.

(KF): No. I don’t know. I can’t remember.

…all these ahupua‘a – was that all cane too? All the way to Ukumehame right?

(KF): Oh, yeah.

How did they get water?

(KF): Mostly from the valleys. I don’t remember any wells from Pump Camp in the Olowalu direction. I don’t remember any wells. From that direction on – Laniupoko, Olowalu, Ukumehame, was all mountain water irrigated. I don’t remember any wells. Oh! There is! I’m wrong. There is a well at Ukumehame. It actually had hot water coming up.

Hot water?

(KF): Volcanic, yeah.

That must have been pretty deep.

(KF): Yeah. It’s above Teen Challenge area. And in Olowalu Valley, there was a well there too, a pretty good size one. That’s right, I forgot about those too. We never ran those wells when I was there. That’s why I forgot about them.

Cause there’s a still, I guess there’s a reservoir too up in Launiopoko. Right below the valley.

(KF): Yeah. It’s a cut stone reservoir, I mean nicely aligned cut stone.

I guess water was important, and so that's why – would you folks have the maps? I have the maps of all the mahele and kuleana lands and stuff like that, because it looks like they had just so many kuleana. Where everybody had their own patches.

(KF): Oh, kuleanas were all over the place, but when the plantation was running it, I mean, that didn't exist. The plantation ran the water wherever they wanted to. There is a book that was written by Bert Hatton, he was a civil engineer for AMFAC about the water systems at Pioneer Mill, and it's called '*Watermania'*.

Oh, I should get a hold of that. I wonder if it's still in print.

(KF): I don't know if it's still in print, but I know Peter Martin has a copy. Kaanapali Development should have a copy.

Cause the only one I ever saw was the one that – I think it was Carol Waters or something?

(KF): Oh, I know who you mean. Carol…

Wilcox?

(KF): Wilcox. Yeah, she had a lot of good information there. But the one that Burt Hatton did, is complete of how all the water worked in the 1960s.

Okay, I'll try and look for that one. It's B-U-R-K-E?

(KF): Bert. B-E-R-T

Okay. Bert Hatton.

(KF): *'Watermania'* is the name of the book.

That sounds really cool. Okay, let's see. Oh, so, by the time that you were on the sugar cane lands that came down towards Moku‘ula *were already gone. The houses were there?*

(KF): Yeah. Houses were there already. Well, of course you've got the graveyard up above.

Yeah. What's that one called? That's the ahupua‘a that I was thinking of. I know it starts with a 'P'.

(KF): I don't know.

'P'-'U'. and 'huihui' was the last part. Do you remember that one? [Puehuehunui Cemetery] The cemetery that's right on the highway? Just as your coming into…

(KF) Oh, I don't. That's where the relatives are buried.

Really?

(KF): Yeah. Queen – what do they call her – what's her name?

I know Keopuolani is buried at Waiola – Waiola Cemetary.

(KF): Well, okay, I'm talking about Waiola.

Okay, no, this one was the one the mauka side of the highway.

(KF): On the mauka side – okay that was – plantation…plantation people in there.

Cause Opunui's used to own that they said.

(KF): Now, if you go up Shaw Street, you got the graveyard on the Kaanapali side, but everything on the Olowalu side, that was all sugar cane because the highway wasn't built until the 1950s sometime. Front Street was the only road in and out of Lahaina. And Front Street went right through Puamana is right now and comes out by where the ironwood trees are, that park over there.

Puamana Beach Park.

(KF): Yeah, Puamana Beach Park. That's where Front Street came out over there.

Oh okay.

(KF): Now, Puamana of course, was the plantation managers house, and they called it what – Uapaupili.

Puapaupili

(KF): The rain stops here.

Interesting.

(KF): Uapaupili!

'Ua', okay, 'ua' yeah. So do you remember the names of the families that were from that area?

(KF): Well, all that area, from which is Puamana now – like I said, Puamana was the plantation manager's house – was there by itself. Then you come to, in the Lahaina direction, and you see those green and white houses, right off of Front Street there. Those were all plantation houses. And that whole area there was called Haole Camp. So the management people and the supervisors all lived from there towards Lahaina, until you get to where the Fardens live.

So, Ed Lindsay folks house, was once the Haole Camp.

(KF): Yeah.

Oh, okay.

(KF): Yeah definitely. But you come to – like I said, you come all the way to where the Farden's house is, which that house is gone right now, but it was right next door to where I lived when I was the manager. And where I lived, that house is gone now, so it's a vacant lot – big stone wall.

So where the Fardens lived, what's there now?

(KF): That's where Joe Fidel lives. It's a modern day house there with a big wall in front of it. All the old stuff is gone.

And then who was next to Farden's?

(KF): Was the field superintendents house, which, when they got rid of the manager's house at Puamana, they made the field superintendent's house the manager's house. And that's where I stayed. I was the last one to live in there.

Oh, okay. And then next to your house was who?

(KF): Well then it went on down. There was the Brights, Gideon Bright's parents lived there. Then there was the Greigs – Jiimy Greig's parents lived right across the street. Oh, it just keeps on going on down.

So where 505 is now, what was there?

(KF): Well that was – like I said, it was two ponds and the Shaw's house in the middle.

Okay, so this was before or after the Farden's house?

(KF): That was during the time the Farden's house was there. The Farden's house was sold – that probably was sold in the 1960s.

Okay.

(KF): And this guy, Joe Fidel, ended up tearing down the Farden's house and building what you see there now. But all, you know, from Kam III School, all the way down – well the 505 all the way down actually, was all plantation houses, Haole Camp. It doesn't show on here as Haole Camp. [laughter] Yeah, no more. No more. What this shows is the real working-class peoples' camps. Not the management area, which is where I say Haole Camp was.

Anything else you want to share?

(KF): I don't know. Like I said, there's a lot of Lahaina's history and culture that was kept from me, that I didn't know about. And I only learned since 1995.

So do you know of anybody who would be really knowledgeable about the history?

(KF): Stanly Raymond would be good. He lives up here someplace. I mean he's in his eighties now.

I don't know why that name sounds familiar.

(KF): But he lived in one of the houses down Haole Camp. He was the employee relations director for Pioneer Mill. He also was at Lahainaluna School, he was the Ag teacher there. His first wife was Sarah Ann Dunn. Doctor Dunn was the plantation doctor

I know where I heard that name now. I interviewed…

(KF): Keopi

Keopi

(KF): His son.

Oh that was his son, yeah, so he talked about living in Lahaina. So he's married to Lisa…

(KF): Right, Shatenberg

Yeah, cause I asked him about the name, Dunn. I thought it was related to Barbara Dunn and he said, "No."

(KF): No. Doctor Dunn was the plantation doctor. He was a big man.

I thought, "Stanly Raymond, where have I heard that name? It's just recently too." Okay, so he would…

(KF): He would – like I said, he worked at Lahainaluna School. He worked on the plantation. He lived down there in Haole Camp. He would have some information for you.

I should talk to, maybe the second batch we can do that – get a hold of him. Cause they have Hawaiian in them. I don't know if it's the Stanly Raymond part or…

(KF): It's on Stanly's side.

It is on Stanly's side.

(KF): Cause the mother Dunn, I mean she was blonde – blue-eyed blond. [laughter]

That's right. Yeah, he even told me who the Hawaiian family was.

(KF): Actually, who else would be around – everybody dead already. I can't think of anybody else. You already talked to Sammy.

Yeah. The guy who worked for Kapalua Park, he was the manager there for – it became Maui Land and Pine – for years. And then he was at Hailiimaile. Hel lives up here too in Kapalua. I'm drawing a blank on the name.

(KF): A Japanese guy?

No, Haole.

(KF): Oh. McCleur.

Yep. Doug McCleur. But I don't know what the extent of his knowledge would be in the Lahaina area.

(KF): He would be more recent times. He wasn't out there, like when I was out working in the pineapple fields. Okay, I can't think of anything else.

Well, thank you very, very much.

C.3 Formal Interview with Mrs. Roselle Bailey

Authorization and Release Form

Cultural Surveys Hawai‘i (CSH) is grateful for the generosity of the Kūpuna and Kama‘aina who have willingly shared their knowledge and experiences for the preparation of a Cultural Impact Assessment that is being drafted for the Mokuhinia Ecosystem Restoration Project, Lower Waine‘e Ahupua‘a, Lahaina District, Maui Island, TMK (2) 4-6-007; 001; 035-038.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our assessment. Here are the procedures we promise to follow:

1. You will have the opportunity to review the written transcription of our interview with you. At that time, you may make any additions, deletions, or corrections you wish.
2. You will be given a copy of the interview transcript you have approved for your records.

For our records and yours, we humbly request your confirmation that:

1. You were given the opportunity to review the transcript of the interview.
2. You consent to the use of the interview with any revisions specified by you for historic documentation and academic purposes.
3. You consent to the interview being made available to the public.

I, Roselle F.K. Bailey, agree to the procedures outlined above and by my
(Please print your name)

signature, given my consent and release for this interview to be used for historic documentation and academic purposes.

Additional Comments and Clarifications:

Roselle F.K. Bailey
(Signature)

28 February 2013
(Date)

Recording Date	December 21 2012
Transcription Date	January 9, 2013 to January 10, 2013
Participants	Roselle Bailey (RB) Colleen Medeiros (CM)

Roselle Bailey, Lahaina kama‘āina, Lahaina, Maui.

Ms. Bailey was born and raised in Lahaina, near what was once Mokuhinia Pond. Her grandfather, Charles Robert Lindsay, and her father, Edwin Robert Nalelehua Linday were both part of the Lahaina Police Department. She remembers her Lahaina neighborhood as being inhabited by close-knit families whose genealogies were all intertwined.

Colleen Medeiros (CM): Hi. It is December 21, and I am here with Roselle Bailey.

Roselle Bailey (RB): The end of the world.

(CM): The world hasn't ended yet, and hopefully I'll get a nice interview in with Roselle before it ends. So we're talking about Mokuhinia and Moku‘ula, and the area. So, you know, whatever your thoughts are. I know you are familiar with the project. You've been to all these meetings already that the Army Corps had.

(RB): And I voiced my opinions there.

(CM): And I have read them. I do have the minutes.

(RB): Okay.

(CM): But, just so you know, we don't like to include that stuff –

(RB) That's good.

(CM) - unless we have permission. So that's why I kinda went back to try to contact everybody from those meetings, to get your permission to use that or do something like this.

(RB): Okay.

(CM): So, you grew up in Lahaina.

(RB): I think I would prefer using something like this than at the meeting, but you can use – at the meeting too as long as it's not manipulative.

(CM): Well you tell me.

(RB): Yeah.

(CM): Okay. (laughter) So you grew up in Lahaina.

(RB): In Lahaina, right.

(CM): Can you just start by kind of an introduction of yourself?

(RB): Yeah. My grandfather was the deputy sheriff of Lahaina and they did own property close to and around Mokuhinia but that is not really why you are here. But it does introduce that we are keiki o ka aina and are very ma‘a with that place.

(CM): Right, you are from there.

(RB): Yes. And the place was filled up already by the time we were born, and there…

(CM): And it was a ballpark.

(RB): It was a ballpark. And it was a WWII area to go to, to – you know, air raid warnings?

(CM): Oh, okay.

(RB): Yeah. It was one place we went. And the other place was behind the Episcopal Church cemetery, where there were trenches for us to get in.

(CM): Wow. (laughter)

(RB): Just to set the time period.

(CM): So what year was this?

(RB): WWII, 1944.

(CM): Okay.

(RB): Yeah. I guess so.

(CM): How old were you then?

(RB): Four years old.

(CM): Okay.

(RB): Yeah.

(CM): And what was your father’s name?

(RB): Edwin Robert Naleilehua Lindsay, my father. And my grandfather was Charles Robert Lindsay. Yeah, my father was on the police department at that time. And our families that lived around there were all close-knit families. And that would be the Shaws, which would be the Richardsons, the Hoapili’s. If you look into geneology, all of these people are related. Mokuhinia was a pond. We referred to it as a pond, but it was a navigable pond when it was still a pond.

(CM): So, when you were a youngster, the area was still referred to as Mokuhinia?

(RB): Mokuhinia Pond.

(CM): Even though it was filled in.

(RB): Even though it was covered up. Yeah.

(CM): Oh, okay.

(RB): Yeah, so we grew up with that concept of the place, and Canal Street was still known to us as where the pond exited into the ocean. So in their plans, it’s not going to Canal Street.

(CM): Yeah.

(RB): So it makes us wonder, “Okay, why are you doing this?” But at any rate, it doesn’t really matter, does it?

(CM): Well, is that something you would prefer?

(RB): I would prefer if they’re going to – if they’re going to rejuvenate Mokuhinia, then they should rejuvenate Canal Street, because that’s the normal…

(CM): Exit of the pond.

(RB): Yes, of the pond. So they must have ulterior motives. That’s how we think.

(CM): Okay.

(RB): Yeah. And the bodies that were buried there, as far as we know, when we were growing up, were all removed – the bones.

(CM): Buried where?

(RB): At Moku‘ula.

(CM): Oh okay.

(RB): Which is in Mokuhinia.

(CM): Okay.

(RB): Were removed and the kapu broken, or dissolved, not broken. The kapus were dissolved.

(CM): Okay.

(RB): And today, there are some people who want to reinstate some kapu. And how do we know it’s the same kapu that was reinstated when the people were using Moku‘ula at that time? Because there’s nobody who are practitioners. That is too far.

(CM): There’s nobody alive today, who was alive then.

(RB): That’s right. Yes, the last one’s were Aunty Ka‘ae [Alice Ka‘ehukai Shaw] and those people, who are now gone. And we have only stories of what happened there and who are all connected to that island, Moku‘ula and Mokuhinia. They go hand in hand. So to say to do one thing for the pond, then you have to do the same thing for the island. They’re connected. You cannot disconnect that.

(CM): I mean, is that something that you would or would not like to see?

(RB): It all depends on their motives. I know our parents wanted it to be revived, but not with any kapus, but as a historical place to educate people on our history, and our morès. But we who are now the only ones left of that generation. In our family – I’m not going to speak for the other families – are going against our parents because of what is happening in the area now with peoples’ ideas.

(CM): Okay. You mentioned people who were connected to this area. Who were those people?

(RB): The Shaws, who are Auntie Ka‘ae, who was a Richardson, who’s also connected to Hoapili and right next to, across the street from 505, is a Hoapili descendent.

(CM): You mean buried? Or living?

(RB): No, living!

(CM): Next to 505?

(RB): Across the street, at the corner, that’s Hoapili.

(CM): So, who is that?

(RB): Eileen. And she’s a Wagner but Hoapili is her line. Auntie Alice Hoapili was there. So, I say, we are all interconnected. And they had no qualms about Moku‘ula being covered up, or Mokuhinia being covered up because everything that had mana and kapu with it were removed. So why do we want to do that again, put kapus in there, as the plan for Moku‘ula was? And with the way development is going on in Lahaina, where is the water coming from?

(CM): The Army Corps did try to explain that to me, of course, knowing that I would be talking to people, and what they explained is that it would be ground water.

(RB): And what is ground water? You know, they use terms – ground water, surface water, subterranean water. So what is ground water in their definition? Surface water, I’m assuming is on the surface that runs from streams. So ground water, could it be springs or?

(CM): Well, I do know that they kind of, they went away from saying that they were going to resuscitate springs, cause that was my understanding at first. They said “No, we don’t quite know where the springs are.” So they did some testing and monitoring of the ground water, which would be like the water table, which is pretty much, that’s where rain and mountain water collects, and underground runs out to the ocean.

(RB): Yeah. We all know that. It’s where we come from.

(CM): Yeah. So…

(RB): 505 needs to run a pump all the time. So…

(CM): Yeah, So, these I asked. I said, I thought that there was gonna be an outlet to the ocean and I didn’t know where the water was coming from either, and they told me ground water, and it would seep from the sides. So it’s just all the water that is already there that they have to pump out that would collect there.

(RB): Which is not much when you think of a pond as large as Mokuhinia.

(CM): And also, another part of their plan is that it would be approximately just two feet deep. It’s not, you know, I don’t know. Do you know how deep this pond…

(RB): It was deep enough to take a double hull canoe.

(CM): Okay. So their plan is two feet.

(RB): I don’t know about that.

(CM): And, you know, another thing that they did explain to me was that, you know, the Army Corps has a very specific purpose.

(RB): Yes.

(CM): And they have to abide by that in order to do a job.

(RB): Federal laws.

(CM): Right. So theirs is providing habitat for endangered Hawaiian water birds. That’s how they would be able to do this, under that reason. And so then they have to create habitat for these birds, and the best habitat for those birds, is shallow water with very gently sloping sides.

(RB): So it’s not really the creation of the pond. It’s the recreation of a habitat. No. A partial recreation of a habitat for birds and whatever comes off the mountain. Cause there’s nowhere…

(CM): That is how it was explained to me.

(RB): But when you live in Lahaina, you know what happens, when there’s a heavy rain.

(CM): Yeah, I lived there for a little while.

(RB): Yeah, and it happened to 505’s garage and maybe ten or so years ago, they got flooded. Their pump couldn’t take care of it. And that can happen. And all around there, not only at Mokuhinia, was potential wetlands. And with heavy rains, they all became inundated with water, as wet lands, and the ground was very powdery when you have wetlands that go dry, and you have all that salt. It was very powdery, so actually I’m not really in favor of it until they, meaning the feds, the state, and the county, are honest and above board with all of us.

(CM): So, springs in the area…

(RB): Yes, and they’re not running. Very little is running for 505 to empty its garage of the water, which was a fishpond at one time.

(CM): What fishpond?

(RB): We refer to it as Auntie Ka‘ae’s fishpond. I don’t really know the name of it, and I have not been able to find old photographs of that, even going to, what is it, ‘G’ ‘S’ ‘D’ ‘A’ or whatever?

(CM): The geological survey?

(RB): Geological survey. But I did get information and I haven’t gone back to that. They said 1920s, maybe you can get some photographs of the area where the fishpond was, which is where the garage is.

(CM): So, an inland fishpond.

(RB): It’s called a pu‘uone fishpond, a sand banked fishpond, and there’s a song related to it.

(CM): What’s the song?

(RB): *Kananaka*.

(CM): Oh.

(RB): So when we sing or dance *Kananaka*, that's the image that comes in our mind. And as a child, we grew up with that fishpond. And rails! There were rails – a bird (moho or mohoea) that, the bird guy, Fern [Duvall], says, "They're extinct. You could not have seen any rails." Don't tell us what we saw and didn't see when we were growing up. They were extinct before that – no they weren't. So you know, I need to have all three government agencies to be above board with us who lived there, and not pit Hawaiian against Hawaiian, community against community, because many in the community don't even know the history of the place and even we don't know past what our kupuna and parents have told us. We can read and become experts.

(CM): Yeah.

(RB): So much for reading – it's not life's experiences and it's life experiences that take a people in their culture to develop what is good and proper for their area. I just made a statement to several people the other day, that the Hawaiian concept of ahupua‘a does not work with a democratic society. It's at logger's heads with each other, because when you define a community, it's not defined in an ahupua‘a system, but in the larger community. If you look at all the studies, it's the larger community. It's not really the people who lived there. Thirty years doesn't make you knowledgeable in the area because in thirty years, they are filling land. That's why I'm cynical.

(CM): So growing up there, I mean, was anyone going to Mokuhinia to…

(RB): To do what? Play ball games?

(CM): Ceremonies?

(RB): No. (laughter) We played there.

(CM): Okay.

(RB): No ceremonies were conducted there in my lifetime and I'm 75.

(CM): Okay.

(RB) That's why I say, "Well, read up and then you can become an expert. Not only what's written there, but other books."

(CM): Right.

(RB): The only ceremony is escaping in case we're bombed in the second World War. (laughter)

(CM): Tonight we'll all end up there.

(RB): Maybe!

(CM): Escaping. Did you learn – who did you learn your hula from?

(RB): Auntie Emma was my first teacher. Then both my parents were my teacher after Auntie Emma. And then when we moved – I got married and moved to Hilo. Then I learned from Auntie Edith. And then when we moved to Kaua‘i, then Auntie Kau‘i opened up her traditional classes to the public. So I flew from Kaua‘i to Oahu once a week. It was an overnight stay.

(CM): Oh, wow. And are you still teaching?

(RB): Semi-retired. I teach in Europe.

(CM): Oh, how nice.

(RB): And I help out our daughter, who teaches here. And our other daughter in American Samoa is too far away for me to help out.

(CM): Oh, okay.

(RB): But we can talk on the phone. They grew up in the traditions, and I had a great-grand uncle who was a dancer.

(CM): Who was that?

(RB): John Keli‘iwaiwaiole Keolewa.

(CM): Was he from Maui?

(RB): No. He was from Kona.

(CM): Oh.

(RB): And that’s a misconception!

(CM): What’s that.

(RB): If you’re not from Maui, you’re not native. But you know, all our songs say “One hanau” “our birth sands”, wherever you were born, that’s where you’re from, but our ancestors moved up and down the chain, for DNA crossing, which they knew way before they know now. That’s why we didn’t have too many – what shall I say – genes that would cause the Habsburg Chin or the blood…

(CM): Problem.

(RB): Yes, because they understood DNA. Maybe not in that language, but it was their science and understanding. And horticulture – Dampier was amazed at what they were doing – cross-pollinating so…

(CM): Yeah.

(RB): I have to, again I, when I go to some hearings and it’s in conflict with science, then I tell them, “I approve of that. Your science is proving our science.” just the science of life. And you go, “science of navigation”, and you go. “aaah” (laughter)

(CM): We were kinda good at that!

(RB): Yeah. We were, and now they’ve made us feel stupid!

(CM): I think they knew what they were doing, and still do.

(RB): Yeah. You know, they’re so silly. Anyway…

(CM): Well, so as far as Mokuhinia goes, I mean, what would you like to see, you know, if you could have it just your way, what would you like to see in a restoration project?

(RB): Just my way?

(CM): Yeah. You know, in a perfect world.

(laughter)

(RB): And not to be used as adding to their way? Do you understand what I'm saying? In *my* way?

(CM): Yeah.

(RB): Okay, restore it so it is higher water level than two feet, and it drains out of Canal Street. And Moku‘ula is in place, not that so-called heiau there.

(CM): Okay.

(RB): It doesn't belong there.

(CM): The more recent construction.

(RB): Yeah.

(CM): Type ahu type place.

(RB): Yeah.

(CM): Okay.

(RB): Doesn't belong there, so if you're going to do something, then do it right. You go to Jamestown and all these other places in Europe and the Asian countries, they do it right. But somehow Hawaiian archaeological sites don't rate the importance.

(CM): Well what, when you say do it right, what would be there?

(RB): Moku‘ula Island, and there would be a bridge and water. It was a pond and all those springs were running. And all the streams – well I have to take that back now – were diverted for a long time. And I notice Kaua‘ula Stream is running again. Ukumehame Stream is running. Olowalu Stream is running. So what's happening? Why are they running? They all want us to think just on one thing, and not see the broad scope of cause and effect on everything, what's going on. I know they are planning on developing more "communities" at Wainee and Kauula. What is going on? What is the manipulation?

(CM): Yeah.

(RB): That's the concentration. Just concentrate on this.

(CM): Yeah, and you know I think that's just a result of how our government functions and…

(RB): It's a result of brainwashing. (laughter)

(CM): Yeah, I mean, I do personally, I do believe that things are beginning to be integrated better.

(RB): Better but not good enough.

(CM): Better, but definitely not, you know.

(RB): Cause we're still repeating the same patterns, as occurred in Jamestown and all the other places, and patterns on Oahu. Everybody on Maui and Kaua‘i said, "We don't want to be like Oahu." Well guess what, we are. Just because of how we are managed to look at things, and I don't agree with that.

(CM): Oh all right, well.

(RB): I hope this hasn’t been a waste of your time.

(CM): Oh of course not! No. Thank you for meeting. I always prefer meeting in person.

(RB): So do I.

(CM): Sometimes well, sometimes not everybody wants to meet me in person.

(RB): Well, old Hawaiian proverb, yeah? Come down and talk eyeball to eyeball, so we can see each other and can see what’s going on in you and you in me.

(CM): Yeah. I agree. All right, well.

(RB): So, it’s basically, No.

(CM): Okay.

(RB) First, second, until that time that all government agencies can be honest and tell us the truth of why they want to do it, and how they’re going to do it, and if they’re going to do restoration work, then restore it to its original and intended use.

(CM): All right.

(RB): Yeah, original sites and intentions. In Hawai‘i we’re supposed to be open. We have such a wonderful place, but there’s more and more restrictions being placed upon us, especially upon Hawaiians, and that’s not right.

(CM): What do you mean? What kind of restrictions?

(RB): Well, Hawaiians are being pushed with more of our natural resources being taken or mismanaged. And, therefore, life is more difficult for the Hawaiians.

(CM): You mean like socioeconomically?

(RB): Socioeconomically and what do they like to say? Social capitalism. Social capital. Where it’s good for capital and a certain kind of society can live there in agreement with that capital. It’s good. But Hawaiian capital isn’t looked at as good. And Hawaiian capital is based on the elements, and they primarily lived with the elements.

(CM): Right.

(RB): So until that can happen, we’ll go down this same path that’s been repeated and repeated and repeated.

(CM): Would you like to, you know with, I don’t really know what the Army Corp. has in store for additional meetings and whatnot.

C.4 Friends of Moku‘ula Interview with Mr. Sam Ahia

Authorization and Release Form

Cultural Surveys Hawai‘i (CSH) is grateful for the generosity of the Kūpuna and Kama‘aina who have willingly shared their knowledge and experiences for the preparation of a Cultural Impact Assessment that is being drafted for the Mokuhinia Ecosystem Restoration Project, Lower Waine‘e Ahupua‘a, Lahaina District, Maui Island, TMK (2) 4-6-007; 001; 035-038.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our assessment. Here are the procedures we promise to follow:

1. You will have the opportunity to review the written transcription of our interview with you. At that time, you may make any additions, deletions, or corrections you wish.
2. You will be given a copy of the interview transcript you have approved for your records.

For our records and yours, we humbly request your confirmation that:

1. You were given the opportunity to review the transcript of the interview.
2. You consent to the use of the interview with any revisions specified by you for historic documentation and academic purposes.
3. You consent to the interview being made available to the public.

I, Sam Ahia, agree to the procedures outlined above and by my
(Please print your name)

signature, given my consent and release for this interview to be used for historic documentation and academic purposes.

Additional Comments and Clarifications:

Sam Ahia
(Signature)

Feb 4, 2013
(Date)

Recording Date February 11, 2010

Transcription Date December 20, 2012 to December 26, 2012

Participants Sam Ahia (SA); Mrs. Ahia (MA); *Interviewer*

Sam Ahia (SA): Okay.

Interviewer: *So you can talk into the camera if you like.*

(SA): Okay. My name is Sam Ahia. I was born way back in 1939, July 29, in Honolulu, Hawaii. I grew up in a little town, Kalihi. And I grew up in a family of five: Mom and Dad, and one brother, and one sister. And my dad worked at the naval shipyard, Pearl Harbor. And my early schooling, all the kids come from actually small family, but big ohana, on a big piece of land. So, there were a lot of us kids and we all went to St. Anthony School in Kalihi, and then some of us went elsewhere. I went to St. Louis, and my brother to Maryknoll, my sister to St. Francis. I ended up at my last year, graduating from Farington High School. Then I went to University of Hawai‘i for one year, met my wife-to-be shortly after that. Worked in the lab at the Libby McNeil [pineapple] cannery for a year, I think, then we moved to the mainland. And we lived there for about fourteen years in California. And I went there to work as a musician, and it didn’t turn out as well as I had hoped, but we were living in San Francisco for a year. Then we moved inland to Sacramento. And my brother and I formed a group with another young guy from Kalihi and we ended up living in Sacramento for seven years. And we worked quite often. And while we were there, we used to travel to the city, San Francisco to work. We got our first job in San Francisco through Kui Lee. We had our first job, actually, at a pretty nice place called Skipper Kents. We had worked at smaller venues, but this was our big break, because while we were there, someone hired us to do a contract in Lake Tahoe. So then we started working in the casinos in Las Vegas. We did that for a number of years. All told, I lived on the mainland about thirteen, fourteen years. Came back to Hawai‘i in the fall of ‘73’. And let’s see – by that time, we had four children. Actually, we have 2 boys and 2 girls. My oldest is Conrad. He was born in 1960. My daughter, Sina, was born in ‘62’. My son, Howard, was born in ‘64’. And my daughter, Lisa, was born in ‘66’. And two of them live here, and two on the mainland, right now. I work in music, yeah, I’ve worked in music all my life. And I lived in Honolulu from ‘73’ to ‘82’. And during that span of time, I played with everybody. I think my first great record I was on was with Don Ho. And then, after that, I worked with, I don’t know Loyal Garner, Jimmy Borges, whoever you can name, I worked with them, Gabe Baltazar and a whole lot of people.

What instrument do you play?

(SA): Guitar. And then we lived in Hawai‘i Kai, Kalama Valley for – jeez, I can’t remember how long we lived there but we moved from Kalama Valley in 1982, so I guess we lived there for

maybe about six, seven years, something like that. Then we moved to Maui. And I went to work right away at the hotels there. And basically that's all I've ever done is play music, and live right here in Maui.

What hotels did you work at?

(SA): I worked at the – the first hotel I worked at was The Royal Lahaina. Then I worked at the Hyatt, and then the Westin, and after that, every other hotel. But I was pretty fortunate because where ever I went to work, I stayed there a long time. Like, I worked at the Westin for ten years.

Wow.

(SA): And then, this job that I have now, I work at Kimo's in Lahaina on Front Street. And I've been there now for about twelve years. So, I've been blessed. That's about all I can say for now.

What is your knowledge, background of Lahaina? Stories or anything? People?

Mrs. Ahia (MA): [quietly] Remember the first time we came?

(SA): Well, I did – being a musician I was always asked to help this person or that person. Actually, one of the first people I met was Manu Kahaialii. We became really good friends because he was always asking me "Hey come on. We gotta go play for the senior citizens. And we gotta go play for these people. We gotta go Molokai." All this kind of stuff. Anyway, we were really, really good friends, really good friends. Manu – I used to like to just listen to him and his wife sing, and play, so good. But things that I remember about Lahaina is that what I could grasp from Dr. Kanahele. He would come to the KBH, where my wife was working, and he would give talks on ancient Hawai‘i. He would give talks on the Hawai‘i of his day and I like the way he projected the lifestyle in Hawai‘i, into the future. And some of the things he said way back when, have happened already. So in that sense, he was real prophetic in his words that spoke of the future that was coming, you know? And so, basically he would tell us about the disappearance of the cane fields, and the pineapple fields, you know, talk about water issues. So I thought he was a real visionary, just a bright man. And he gave me a book. I think it was called *Ku Kanaka* – very good – really enjoyed it. All of the ways I learned about Lahaina, was just by living here. There was so many little places where I could go early in the morning, drink coffee and whatever. For a lot of time, it was me and my daughter because, well, Rini was working mornings and my daughter and I would go walk down to Front Street and just hang out at some of the coffee places. Yeah? And I really got to like Lahaina, love Lahaina, and little by little, I learned by talking to people who had family here. Learned a little bit about the Chinese people that lived here once upon a time and about how life was in the camps, you know. What it was like to different nationalities. A friend of mine, Keoki Lindsey, would tell me about how it was in the days when he grew up. I'm just a few years older than he, but he would tell me what it was like in those days in Lahaina. It was, of course, way different than today. But for me I guess I could say that Lahaina has been just one big blessing cause when I left Honolulu, things weren't going so well for me. And probably nobody's fault but my own, but when we came here it was just like a whole new breath of fresh air, and things began to work out over here. When we were here, we started going to a church in Kahului, and I've been with the same church this whole time, for 25 years. And I'm on the staff right now – have been for a number of years. I was a member of the executive board for a year or two, I'm not sure. But my whole thing about whatever I was doing, it was always in music. So I played a lot of music and went to different

islands to teach the young kids who were playing music in church – teach them how to play. A few years ago, we recorded the Hawaiian choir from our church and I was able to play with them and we won the Hoku award! [laughter]

Wow!

(SA): Yeah, great choir. So anyway, like I said, most of my experience here on Maui is music, and of course, along the way I met people who took me to Waiola Church, and I remember some things I had learned years ago and from books and what not. And of course, actually, I used to travel around. My wife and I used to go to Hana. We used to drive to Hana every Sunday morning. Go over there, teach Sunday school, teach the kids how to play ukulele, and do all that stuff, sometimes preach the gospel. And we did that for a while. Yeah?

(MA): Right, five years.

(SA): And so I got to know a little bit about the Hawaiian people in Hana and a little bit about the history, and of course working in Lahaina on Front Street, I got to learn a lot about the area, mostly through my wife and other Hawaiian people that I used to work with. [to Mrs. Ahia] And what's Malihini's last name?

(MA): Malihini?

(SA): Malihini.

(MA): She's married to…

(SA): Keahi ya? Keahi family. So she used to dance with us and – I learned a lot of things about the history of Lahaina just through second hand, or reading.

Can you tell us some of that history that you learned?

(SA): Well, for instance, one of the Hawaiian kids, I remember I used to pick him up, give him a ride every once in a while. He used to tell me about all the fish that used to run from Lahaina to Canoe Beach and stuff. And he used to tell me all the different fish and how today they're you know – well that was, this was fifteen years ago. It was gone by then, you know. And that kind of stuff, and then about Moku‘ula, about how it was. The, I think the ali‘i lived there. The ali‘i lived at the Moku‘ula and…

(MA): There was a pond.

(SA): There was a big pond there. Yeah?

(MA): Yes.

(SA): I'm trying to think of some…oh! I used to go and play every once in a while at Puamana. So I got to learn about the early days at Puamana and the house that's there now was the manager's house. Yeah? At the time.

(MA): Yeah.

(SA): Yeah. Anyways, one of our daughters had their wedding over there. Yeah? Was it Cina?

(MA): [nodding]

(SA): Yeah, so basically all our time on Maui has been spent working. But it's been great.

What’s your father’s name?

(SA): Sam.

Sam Ahia too?

(SA): Yeah.

Is he Senior?

(SA): Yeah.

(MA): And he’s Junior.

(SA): Yeah, my dad had – there was seven brothers. And all of them went to Kamehameha. The oldest one went to St. Louis, I think. My dad’s father, my grandfather has quite a history in Hawa‘i. His name was William Ahia and he was one of the early builders of Hawa‘i. He served in the old territorial government. He served in different positions but his last one was Senator. And he was also part of the Wilcox Rebels that tried to restore the queen back to power again. Of course, they were defeated, more than once. But I would say that, just reading his story, and knowing my dad, has always given me something for the underdog. He’s always ready to support them or defend them. You know? Well, that’s the way it is when I grew up anyway, in Honolulu. We lived in our district. Yeah? If we go to your district, we’ll be real quiet, and you know, real polite, and make no noise because that’s not our district. But that’s the way we grew up.

Where did your dad come from?

(SA): My dad grew up in a place called – [to Mrs. Ahia] Waikahalulu?

(MA): Yeah. It’s by Nu‘uanu.

(SA): By Waikahalulu Stream.

(MA): His father had a big house there.

(SA): Well, my grandfather had a lot of tenant houses over there. And my uncle would collect the rent. And then after he stopped doing that, then my dad would go and collect the rent from, the tenants were mostly Chinese, and some down closer to town. So I guess that’s how my brother and sister and I, we got to, actually we got to know a lot about Chinatown, because my dad would take us to eat Chinese food every Friday, without fail. He knew the cook in fact, cause he spent a lot of time over there with the Chinese people, collecting the rent, playing chess, doing all kinds of stuff.

Who was your mom?

(SA): My mom, her name was Ella. My mom’s dad was Hawaiian, and her mother was Portuguese. And so her family, definitely, you could see the line drawn right down the middle. The Hawaiian side was, pretty much, quiet people. And my grandmother was very outspoken and forceful, no fear kind of person.

What was her maiden name?

(SA): Souza.

Ella Souza?

(SA): Oh no, my mom’s name? My mom’s maiden name was Ella Makue. M-A-K-U-E.

And she was from what part of Oahu?

(SA): She was from Kalihi.

Kalihi?

(SA): Yeah.

So did you learn about any, from all your friends here in Lahaina, any stories about Moku‘ula area?

(SA): It’s really hard to remember, it really is.

Are there any songs about Moku‘ula?

(SA): No. I don’t…

(MA): Well, in your CD, remember you…

(SA): Oh! Well actually, you know, I wrote this album several years ago, and actually, the theme of the album was Ukumehame. And my sister is a librarian in Oahu. At the time, she was working part of the UH system. She gave me all of the material I needed on Lahaina and Olowalu so that I could get lyrics that were pertinent to the songs that I was writing. Yeah, so I would say that any information that would talk about Maui was pretty accurate because of the source that I got it from. And I never knew that they grew sandalwood – sandalwood forests at Olowalu was plentiful. And of course they’re not there anymore but one of the lines in the song that I wrote was ‘*Olowalu cannot build her hale. All the trees that once were there, are gone. And then, whenever I hear the wind blowing through the mountain, I know that spring is not too far away*.’ The reason why I wrote that line was, it seems as though every year, or whenever we get the strong wind – we were living in Lahaina at that time – that for some reason the wind would blow right through that area where we lived.

(MA): Kauaula wind.

(SA): Kauaula wind – well, I don’t know if it was the Kauaula wind but it was strong enough to blow down two of our big trees.

Do you remember the year?

(SA): Yeah. That was…[to MA] we moved here in ‘73’, yeah?

(MA): Yeah.

(SA): So that was about – it was soon after we moved here. No, not ‘73’ we moved here in ‘82’. It was in ‘86’. ‘85’ or ‘86’.

So where did you live when you were down there?

(SA): I lived at – some people call it Kaua‘ula Camp, or something. Actually, my neighbors were…

(MA): They called it the haole camp. That was the haole camp.

Oh by Puamana?

(MA): By Puamana.

Okay.

(MA): Yeah, that’s where we were.

(SA): I lived between two well-known people in Lahaina…

Part II

…get off the horse at Launiupoko

(MA): Yeah, and walk the boys all the way past, all the way past that whole area for the royal family. And then you can get back. And even the canoe, if you’re paddling a canoe, you cannot be on the reef side. You have to be in the blue water side to paddle your canoe to go all the way past that whole area of Lahaina. I think they called it something else at the time. You know, cause now you have Front Street and all that. But, it was a place where the royal family would come. I just, you know, there are times when I’m down there at Olowalu, I mean, at the church, the Waiola church. In fact we were just there about two weeks ago. And I’m looking at this whole area, and I was thinking, how, you know, the river used to come, where they have kind of deterred the water out to Puamana now, but it used to come down – and lo‘is. There were lo‘is all along side that whole area of Lahaina. And they used to have plant taro, bananas and ulu, because Lahaina was the best place to plant ulu, bananas, and taro. It was so rich, the soil. And then, the sun seemed to sit here, you know, longer. And even the word ‘Lahaina’ means, you know, the sun takes a little longer to set. And I was fascinated with that. You know, I used to go to that church and stand there and say, “Wow, what it must have been like to see that.” you know, all the hillside of green, you know, with all the plantation they had. And they say that water used to come and kind of case out that whole area. So it was kinda really beautiful. And that’s why they say, whenever it rains in Lahaina, you can see how the water just built up in that area, and it just gets really high, the water. And so they said, that’s how it is. It was so rich, the soil. You can plant taro, banana, and you can plant all the sweet potato, you know, tapioca, and all that good stuff. You know, and that was like – I see that, in my own – you know, when I’m looking out in the mountain in that area, I thought how beautiful it was then. And to see how, you know, when the canoes come in, you know where the school is now. I think that’s all where sand, you know, and all the canoes used to come up in those areas – just come. I should have it painted. [laughter] But, I have quite an imagination. But when Dr. Kanahele kinda opened up all that, and see how it was before, cause he went with us down there, and he showed us all those areas. You know, so he was very touched. He said, “Time has changed.” And he said to us, “There’s more changes coming.” He said, “Don’t think that you’re all set now you’ve got your sugar cane.” He said “That will all change too.” And sure enough, I didn’t believe it when he said it but…

Were you folks living here already when they started the highway? Honoapiilani Highway?

(SA and MA): No.

(SA): When we lived here, the highway was already here. All I remember is there was only a couple traffic lights.

(MA): There was only one traffic light when we came. When we first moved to Maui, there was one traffic light at Lahainaluna.

Right, right, right.

(MA): And that was the only one. Everything else was courtesy kine. You know like, “hi, okay, you can go” It was such a, you know, a relaxed – that’s what I loved about it. That’s why I wanted to move to Lahaina when we first came. And I thought, “wow!, what a nice place to live.” You know, not the hustle and bustle of Honolulu. But I loved it here because of that reason. Everybody was so nice, friendly. The atmosphere was good. I mean, people loved each other. It’s not like how it is now. It’s a totally different world. I know, I’m trying to remember some of the things – The first time we came to Lahaina, was because his friend called him to come and play for this art gallery he was opening. And Sam used to work for him in Honolulu cause he owned all these cruise boats.

(SA): Ships.

(MA): Ships – big ones, I mean. And so the guy decided to move to Lahaina and open up a gallery and a business, and he was very successful at it too.

What was his name?

(SA): Chuck Clark.

(MA): Yeah, and he came and he played for that. And it was on Prison Street, was it? No, Dickenson, yeah?

(SA): I’m not sure.

(MA): Dickenson and Lower King.

(SA): Oh yeah.

(MA): And everything was so nice too. It was still quiet in Lahaina. It wasn’t how it is now.

(SA): See what happen when you bring in TV? [laughter]

(MA): So, slowly, we see the change come. All the traffic lights slowly went up. And more stores, you know more shopping centers. You know, because I thought, “Oh, they’re not going to put up any more there.” But they did.

You have to work today?

(SA): Uh, no actually is today what? Thursday? I’m off today.

(MA): Yeah, you’re off.

(SA): But I have to still work. [laughter]

Well we really appreciate you doing this for us.

(SA): Oh, I feel so inadequate, I mean, cause most of the information I guess I have would probably be from Honolulu or from traveling overseas and stuff like that.

Did you ever ask your friend why the mo‘o – it’s called Ahia?

(SA): No.

(MA): He said that’s part of the aumakua for Lahaina. Cause you can see it.

Right, I never knew it had a name though.

(MA): And so he told us at that time, he said, “That’s your aumakua.” You know, and so I just looked at Sam and said, “Isn’t it funny that we are living here in this place and how, you know, we bought this piece of property up here, and our house is right down from where that mo‘o is?” So I said to him, “They’re watching over you.” [laughter]

So your father was Chinese-Hawaiian?

(SA): My dad, yeah.

I’m just trying to figure out where I put your…okay, so Sam Ahia…

(SA): He was Hawaiian-Chinese. My mom was Hawaiian-Portuguese.

(MA): But your grandfather was married to – your dad’s mom – you didn’t know her but she was Chinese-Hawaiian?…

(SA): No, no, you’re getting into a whole new thing there.

So your father was Sam Ahia Sr. Your mother was Ella Makue.

(SA): Yes.

Great. And so Sam Ahia’s father was William Ahia.

(SA): Yep.

But I didn’t have…

(SA): And his mother was Theresa Palakiko.

And where was she from?

(SA): She was from Oahu.

The Kalihi area too?

(SA): No. I think she was from the country.

So was she pure Hawaiian?

(SA): No. She was Hawaiian-Chinese.

Oh, also, okay. So, Palakiko, I’m trying to figure out where the genealogy goes.

(SA): You know, I have quite a lot of knowledge for Ahia but Palakiko, I don’t.

So, William Ahia, who was his father?

(SA): You know, his father – the only thing we could come up with – his father, his name was known as Captain Ahia, because he was a captain on a ship that used to sail between the islands. You know, in those days, they had the Humuula.

Right.

(SA): Yeah, he – that's about all we know about him.

So he was also Hawaiian-Chinese then?

(SA): You know, I couldn't tell you for sure but…

(MA): Your genealogy – that's your…

(SA): I know, but that doesn't cover Captain Ahia, not much information on him.

So then, William Ahia's mother, do you remember who she is?

(SA): Let's see – no.

(MA): She was the…

(SA): No, you're getting your facts mixed up.

(MA): Well, I'm just trying to tell you how, you know, your genealogy, remember, she was the daughter of the man that was Kamehameha's, you know, he used to build all the canoes.

(SA): The superintendent of canoes. His name was Kaha.

(MA): Yeah.

Kaha.

(MA): His daughter was, wasn't his daughter your grandfather's…

(SA): His daughter, her name was Milaina Ahia and she became high chiefess. She was adopted by Kaahumanu. And she married – see, she is not my grandfather's mom. She's not.

(MA): Oh. I thought that's how…

Probably a relative.

(SA): Same line, cause when we look up the names, a lot of first names are all the same. Even the middle name, like the middle name, Malulani, you know, that's my grandfather's name, but there was another man in her line that had a different first name, but he had the same middle name.

Oh, interesting. Genealogy is so fascinating. Peoples' history…

(SA): We related closely to the Beckley family.

Beckley, oh, from Kohala side?

(SA): Yeah.

(MA): Yeah, cause I think you're name is supposed to be that, huh?

(SA): No, come on – plenty of me is Ahia, huh?

(MA): It's just that when I see their line, it's just all so interconnected.

I forgot who Beckley was married to.

(SA): Oh, actually Beckley, well, now I get it. Beckley, the progenitor of the Beckley line, his name was Captain George Beckley. And he married High Chiefess Ahia. And then they started a line. Yeah, that's the way it was.

So, High Chiefess Ahia was a sister to your line?

(SA): You know, I really can't say. My cousin would be able to tell you the whole thing but …

(MA): She kinda, you know, told you all about that, but I'm sure you forgot some of it.

Cause I did a project in Nipo, and so I had to learn about the history of the Beckleys, you know, cause they're land was around there too.

(SA): Oh yeah? When I look at the whole thing, I was under the impression that somehow, like Samoan tradition, if the woman's family has the title to the land, the guy who married her, he takes her name, the family name.

(MA): The family name becomes very important

(SA): Because I look at the Beckleys, and all of the sudden I see Ahias coming out of the Beckleys. And I'm just wondering if that's what happened, if they were actually supposed to be Beckley but now they were taking the name Ahia. I don't know.

Some people did that though, like even siblings didn't want to take the same name. So some might have taken the Beckley name and some might have taken the mother's name. You know, and the same thing with like Papa Auwai and their family. The brothers decided they didn't all want Auwai so some went by Molokini. Because that was the area they were from, so they took Molokini, but it's not like they were descended from Molokini. But they were supposed to be Auwais.

(SA): Cause we were told, well, it could be that there was, Ahia had moved, or somehow there was Ahia from Kohala and Ahia from all the way on this side, Mountainview. And one from Nahiku, or not Nahiku, but the back side of Maui…

Kaupo?

(SA): Kaupo. His name was Kale.

Kale, right.

(SA): And so, in fact, my niece, who is writing her thesis right now, she's got this book that is so eye-opening. And it goes quite a ways back. In fact, her name is Cameron. She's married now, but she's an Ahia girl. But she lives – been here about a year now. Yeah?

(MA): Yeah. She works at the Strarbucks.

(SA): She's writing her thesis on – what's it?

I just went there this morning.

(MA): You did?

(SA): She's the tall, real fair looking girl. You'd know she was Hawaiian if you see her. She's such a sweet girl, but she's married to a European guy.

She took my order.

(SA): Aah, sweet girl,

(MA): She’s very knowledgeable.

(SA): In fact, she asked me several months ago, “Uncle, can you play for me? I’m gonna sing for Kealii Tau‘a at the Wailea – they doing the Maui Chamber of Commerce or something, and you know, the governor gonna be there and all this.” And she said, “If my dad was here, I’d ask him but…” so anyways, I went over there and played for her and I could see her hunger to be Hawaiian because she was born on the mainland, did all her school on the mainland, and now she’s just totally dropped everything and she dances hula now. She’s part of Keali‘i Reichel’s halau, her and her sister. And her sister is an acupuncturist in Wailuku. But they so wanna know about Hawaiiana so I introduce them to as many people as I can.

Is Keali‘i out of the hospital?

(SA): I’m not sure. I didn’t know he was in the hospital.

Yeah, he had surgery. He went in for an ulcer and then they found tumors so removed it and then something happened again cause his haumana just told me cause he wanted to go to the Hana taro festival. Do you guys ever go to that?

(SA): We used to go to it all the time.

(MA): We used to because we were going to Hana, for five years we were going. And so we got to know everybody down there.

(SA): In fact, we played at the taro festival.

You did? Yeah, I started it when I lived in Hana.

(SA): No kidding! It used to be right across the school right?

Yeah, it’s still in the ballpark. So this is our eighteenth year.

(SA): Oh wow! We used to …

(MA): My daughter used to live down there too, my daughter, Lisa. She married this haole guy though, from Arkansas. So now she lives in Arkansas. But she used to live in Hana and work at the hotel.

My husband used to be the GM.

(SA): Oh, you know what – wow, cause my daughter, she lived down there a while.

C.5 Friends of Moku‘ula Interview with Mr. Sam Ahia

Authorization and Release Form

Cultural Surveys Hawai‘i (CSH) is grateful for the generosity of the Kūpuna and Kama‘aina who have willingly shared their knowledge and experiences for the preparation of a Cultural Impact Assessment that is being drafted for the Mokuhinia Ecosystem Restoration Project, Lower Waine‘e Ahupua‘a, Lahaina District, Maui Island, TMK (2) 4-6-007; 001; 035-038.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our assessment. Here are the procedures we promise to follow:

1. You will have the opportunity to review the written transcription of our interview with you. At that time, you may make any additions, deletions, or corrections you wish.
2. You will be given a copy of the interview transcript you have approved for your records.

For our records and yours, we humbly request your confirmation that:

1. You were given the opportunity to review the transcript of the interview.
2. You consent to the use of the interview with any revisions specified by you for historic documentation and academic purposes.
3. You consent to the interview being made available to the public.

I, Sammy KAJOTANI, agree to the procedures outlined above and by my
(Please print your name)

signature, given my consent and release for this interview to be used for historic documentation and academic purposes.

Additional Comments and Clarifications:

S. Kajotani
(Signature)

2-28-13
(Date)

Recording Date	February 11, 2010
Transcription Date	December 27, 2012 to January 3, 2013
Participants	Sammy Kadotani (SK); *Interviewer*

Part I

Interviewer: *Let's see, all that you need to do is say your name, when you were born, where you were born and raised, where you went to school, you know, that same kind of thing. So you can start.*

Sam Kadotani (SK): You want all that at the beginning?

Yeah, at the beginning.

(SK): Okay. Are we ready?

Yeah.

(SK): Okay, my name is Sam. My Japanese name is Sueo S-U-E-O Kadotani. I was born in Kaanapali Landing, September 25th 1923.

So you grew up in Kaanapali?

(SK): Yeah, I did grow up in Kaanapali, and then we moved to Lahaina. Where I am being interviewed right now, is where we moved to.

Really?!

(SK): Yeah, right in Moku‘ula area. And then I grew up til, lets see…1926, 27, somewhere around there. And this is where when I was a kid, we had a lot of activities here, right in Moku‘ula because we went to the King Kamehameha III school from here. And I went to a Japanese school here, right across from Malu ‘ulu o lele Park, and that was our Japanese school. And we had a Japanese temple there, Lahaina Hongwanji Mission, and that was our temple.

Where it is today?

(SK): Yeah, it's still here at the same place, same area yeah.

So your house was located right in here? Or where exactly?

(SK): Well, to be exact, we lived right next to the Farden's. And the Fardens were an old, old, old timer here. And so, where we stayed, as I said, was right next to the Farden's and it was only about, oh fifty or sixty yards away from Lahaina Shores, which is here.

So you went to Kamehameha III School?

(SK): Kamehameha III School, yeah.

And then after that? After Kamehameha III?

(SK): We all went to Lahainaluna High School because those days we didn't have any intermediate school. From Kam III, from 8th grade, we would go, after we finish 8th grade you would go direct up to Lahainaluna. That's a freshman, you would start 9th grade up there. Yeah.

After high school, what did you do?

(SK): After high school? Since my dad run the fish market from over here, we moved to Front Street and my dad was able to acquire a Front Street area to run the fish market and I stayed there until I finished high school. And then from the fish market, the fish market was called Kadotani Fish Market. And then my dad gave up the business and the fish market was operated by my oldest sister. They took over the market. And then so we moved to Pu‘unoa. That's further down north. And then after I'd finished high school, I didn't continue my education, because I had to help in the fish market. And then in 1940… ‘41', ‘42'…when the war broke out in ‘41' I did volunteer but I wasn't accepted because I lost my trigger finger in the Boy Scouts, it got chopped off, so I was not accepted. But in 1945, I got caught in the draft and I did serve, I went in the service and I stayed for one year in the service, and then we all got discharged. Then at that time, I was working at Pioneer Mill Sugar Company. And then I was still in Scouting, of course, and then I was employed in the Pioneer Mill Office. And then I was transferred to the Pioneer Mill Hospital to administer the hospital. And then the hospital closed down and Maui Medical Group came in the picture, and then took over the Pioneer Mill Dispensary. Then I was hired, the entire staff moved into Maui Medical Group, and things didn't go too well. So, Pioneer Mill got hold of the Kaiser Foundation, the Kaiser Hospital. So we all went to Kaiser. So I started Kaiser on Maui actually, and we took over the health program from Pioneer Mill and we operated the Kaiser Lahaina Clinic. That was one year before Wailuku started, and Kaiser wanted me to manage the one in Wailuku, but I said "No. I would rather stay put in Lahaina." And then so I worked until 1985, ‘86' was it? And then I took an early retirement because of my mother's condition. And then yeah, I took an early retirement.

What are your parents' names?

(SK): My dad is K-U-I-C-H-I, Kuichi. My mother is Harou H-A-R-O-U.

What was your mom's maiden name?

(SK): Um….Matsuoka, M-A-T-S-U-O-K-A. And they were all from Hiroshima.

Oh, both of them.

(SK): Yeah both of them from Hiroshima. And when my dad came to Hawai‘i, he went straight to Kaanapali, Kaanapali Landing, and that's where we grew up. Yeah? And then, all ten of us, we were all born at Kaanapali. No electricity. My mother really suffered. [asked for the next sentence to not be printed]

Part II

You folks raised pigs

(SK): Yeah, and we have to go get that kiawe beans…[asked for the next part to not be printed]

Part III

…when you left Kaanapali?

(SK): 1923, 1924,…That’s when I was born, ‘23’. Yeah? Six or seven years old I think. We moved here. Yeah?

So what was it like here when you were growing up?

(SK): Okay, let me ask you this though. Where is Moku‘ula? What area does it cover?

I think the ballpark, behind the Salvation Army, and then even across the street too I think.

(SK): Yeah, yeah, across the street?

Yeah, I think. You know where the…

(SK): Lahaina Shores?

Yeah, I don’t know where the Lahaina Shores is.

(SK): Yeah, but you know why I hesitated in trying to talk about Moku‘ula is because I’m very close to Akoni. He and I became real friends. Okay, now, not too many people know about this area, because they all gone. You know? Okay, coming down Shaw Street, all the way down Shaw Street til you hit Front Street, right across where Lahaina Shores is now, okay, that was a huge pond, you know.

Right, right, right.

(SK): The pond was in the parking lot of Lahaina Shores. You folks know that?

I knew it was across the street, there had a pond too.

(SK): Yeah, across was swamp.

Swamp, okay.

(SK): Because I feel that if I brought this thing up, what’s gonna happen to Lahaina Shores? If you folks were really, really strict about bringing back Moku‘ula, will the pond be considered? Or you just gonna, don’t say anything?

It’s going to be part of the history. But I think right now, the only restoration is where the island was, and the moat that went around it. They know that there’s fishponds. I think that there was at least two fishponds, but…

(SK): Because, you know what? When we living here, we used to fish right in big pond, you know. And this why I didn’t want to say anything. If Moku‘ula gonna come up, they say, “We gonna develop the whole Moku‘ula.” Then Lahaina Store, Lahaina Church… gonna lose their parking lot. Cause it’s right smack, right on the parking lot. Because when we live here and we used to go to Japanese school, we have to go in the swamp. Do you know Erngard Aluli?

Mmm-hmm.

(SK): Okay, she and I, real close. And when she came back before she died, she called me over to have – she told me “Hey you Buggah, come over, let’s have breakfast.” So we went over at Luana’s place. Okay, her niece, you know who Luana is eh? Luana McKinney. They live right diagonal from my house, that way see [pointing] – I went over, and she started to talk about our old age, she and I. We used to go in the swamp and we used to go catch the dragonflies. Okay, you know what’s a dragonfly?

Mmm-hmm.

(SK): Okay, can you identify the male and the female? Okay, the male dragonfly, the tail is blue. The female is yellow. Okay, so we used to go catch the female. We used to tie on a thread. We used to let em go. The male will fsshh! [making grabbing motion] Yeah! So that’s how we used to catch all the dragonfly. And the first thing she told me, “Hey, you remember we took…” and we used to call that ‘pipi tombo’ because these two pipi. [laughter] So, she tell me, “Eh Sammy, you remember.” I said “Oh, you bring all the stories up!” and she tell me “Well, that’s how we grew up!” You know?

Right, right, right.

(SK): And then after that, she left for Honolulu and after one year, I found out that she passed away. Old Ermgard Aluli. Cause I knew the father real well because we were right next door. And the youngest, Buddy Farden, we were together in Boy Scout, and I used to go play at the Farden’s all the time. Yeah. And Emma Sharp? She’s a Farden girl. She was my first grade school teacher at Kam III school.

Really.

(SK): Yeah. So! And when 1987, when I was the chairman for the Greater Lahaina Reunion, we drew over 8,000 people came from all over the world – Lahaina! When they heard about that, we having our reunion, they all came back, 8,000 of them! And we had the celebration at Malu‘ulu o lele ball park you know, and we had the luau there and we had all the camp reunions, every camp on this side, they held their own reunion. And at that time I wanted to have one of the activity, a chicken fight. I really wanted to push that because Lahaina was noted for their chicken fight. Oh god! Every camp, especially at Lahain pump, the winding village up there?

Yeah?

(SK): Yeah! And I went to see the captain, the police department. I said “Hey, Captain Long. You know the reunion, I wanna make a chicken fight.” He tell me, “Okay, you wait right here.” He called the sergeant, “Put Sammy in the jail. He’s gonna run chicken fight.” [laughter] He said, “No way Sammy, you cannot do that.” I said “Oh Captain, come on! That’s Lahaina!” He says, “I know, I know, but no.” Because, you know, we were so close, the Lahaina people with the Fire Department, the Police Department. And you know, this is why Lahaina is Lahaina. In fact, when my dad had a fish market, and they used to catch the fish late in the night, during the war days, you know, all the cars, the headlight were all black out except right in the middle. It makes it so that at least the cars, oncoming cars, know that there’s another car. And then when we got through late in the evening, we had to call the police department to come and really escort

us coming back, because the fish were caught out at Honokowai, we had to come in all the way. Yeah. [Asked for following part to not be printed]

…Yeah, tell me about that.

(SK): Okay, let me start by saying this, that when we had our big scouting banquet – this was the Silver Beaver. That's the highest award for adult. Okay? The boys highest award is Eagle Scout. But the staff, the adult, to earn a Silver Beaver was the highest award. And after I got mine or fifteen years, I always wanted to bring that Silver Beaver annual dinner to Lahaina. Okay? And that's how I insist, let's have it in Lahaina. And then they said "Okay, would you be willing to chair that?" I said, "Oh yeah, I'd be willing to chair that." And so I had it at the – used to be Maui Surf at that time, and I wrote to all the past Silver Beaver's to come, don't forget. And it just so happened that the national boy scout of America scout executive, he happened to be on his way home from Japan, I think. He was on his way home, and we were told he was going to visit Hawai‘i. He's going to make his stop and then he'll go back to Washington. So I insisted that he drop in for our banquet, which he did! And I'll never, never forget one of his statement that he made. That, "you can forget your second grade school teacher, your first grade school teacher, but you will never forget the name of your scout master," which is true. All these years, today, I'm 75 years in scouting. I never forget my scout master. His name was John Nedermeyer. Yeah, he worked for Pioneer Mill. He was my scout master, John Nedermeyer. And then, at that time, scouting – a boy can join in the Boy Scout – he has to be twelve years old, those days. But I was only eleven, but I was attending. And he insisted that, "You come! I don't care if your eleven years old. You come." And he invited me to every activity, camping and everything, swimming. And so, I was in scouting from eleven years old. And then when I was twelve years old, I lost my finger, my index finger, in scouting. We had this event called a Water Boiling Contest, and that's a team, you know, that's two scouts. One would chop the wood. The other one would get the chopped wood, you go make shaving, you know, and that's how you, you have to boil the salt water in a can. The thing goes, you boil it over – then you yell, "Over!" Then they would time you and they'd say, "Okay, you guys took first place." And what happened was, I just happened to grab the little wood that was chopped, I went for the wood, and my partner came down with the hatchet. After we finished high school, he went to college. He became a surgeon! The one that chopped my finger off! Of course he retired now. He practiced in Modesto, California. He's still living, and I do call him every once in a while. And then he happened to buy a room at the Kaanapali – condominium, I think he bought. And so he used to come back every year. As soon as he'd come, he'd drop in at my house, just to check on me, and how's my health, and whatnot. Last week we celebrated. The Boy Scout of America celebrated a hundred years celebration. The Boy Scout Movement is a hundred years old today. And we just had a celebration last week, over on the other side. And because of my age and whatnot, they asked me to say a few words. And I wasn't on the program. I was shocked when Judge Boyd Mossman – he and I good friends, you know, when he saw me he tell me, "Hey you Buggah, I'm gonna call on you to say a few words." I said "Oh Boy!" "Yeah, I want you to come up." So first thing I said was, because I was a Silver Beaver, and then I wrote a letter to every Silver Beaver, "Please attend this function." And I double my letter. I wrote, "Once a scout, always a scout." And we had very good turn out, so I ask, "Will all the Silver Beavers please rise?" And

there were about 60 of them, they stood up, and everybody clapped for them, you know. And because I wasn't on the program, I had to keep my, whatever I was going to say, real short. And I just told them, "Silver Beavers, don't forget, once a scout, you're always a scout." After I got home, I thought, "Shucks! I should have mentioned about my finger!" [laughter] But one of my highlights was in 1960. I took the Maui scouts to the National Jamboree. And there were 37 boys, and I had three assistant leaders, and they were the best leaders I have ever worked with. One of them, he wasn't that young, okay, and he was my assistant, and he knew all the craftwork, and we took bags of those kukui nut, and the boys all made kukui lei, whatnot, you know. The Jamboree was at Colorado Springs. At that Jamboree, at that time, the President of the United States was President Eisenhower, and he attended. And then we also had, I don't know if you remember, the four sisters, The Lenin Sisters? You remember them?

Yeah!

(SK): Yeah, they came to the Jamboree and they sang. They were really good, National known. And so, when I heard they were coming, I called home, I told my wife, "Make sure get lei." To sell it, okay? And I made sure that I was gonna present to one of them! Yeah, to the Lenin Sisters, ah shucks, yeah, it was real funny. And then, also, we flew on Pan-American. Of course today there is no Pan-American. And then we went to Los Angeles. We stayed at a YMCA and we took the train. We went to Nevada, to Las Vegas. And everything was all set. In the book, I have to turn the page and then, the boys stayed with the Las Vegas home of each boy scout. And us adults, we stayed in a casino! [laughter] So our executive told us, "Make sure you bring aloha shirt with you." So that when you go in, you go gamble and whatnot, that you change clothes. Then from Las Vegas, we took a train and then we all the way to Colorado. Oh no, no, no, the train was from California to Nevada, then we took a bus from Colorado. We went all the way up to San Francisco. And then we came home on President Cleveland – the ship. Yeah? President Cleveland. And it just so happened there was a Girl Scout troop that was coming to Hawai‘i, and we were on the same ship. And every night, the boys got their ukulele and played. And there was a nurse that accompanied the Girl Scouts. She and I became…[whistles]…we were friendly. [laughter] I didn't tell my wife that. [laughter] but I told *her* that from the Big Island – they went to Big Island. See? They supposed to go back to Honolulu. So I said, "Try and arrange so that you can come back to Maui and visit Maui. We can be host for you, just for the day," but they said, "Oh, they doubt if they can do that." Already the schedule was too hard. Yeah? So that was one of my highlights, a National Jamboree, highlight with a nurse!

Rascal…

(SK): And we did have the boys, 37 of them, everyone all had a ukulele and they all played real well, and so we went to Los Angeles – in Nevada at Las Vegas, and we would visit the hotels. The first thing what we did was, I told the boys, "Okay, everybody get your uke, we're gonna to go in the lobby of the hotel." And had a bucket there, you know, everybody to tip in there! [laughter]

That's good. Did you make any money?

(SK): We did right and we did wrong things, but all the money that we collected, because you know why – every morning we had hash brown. The boys got tired of hash brown already, so I had to go buy rice for them. So we had rice in the morning and whatnot. But that was a good trip.

And I lost all of my three assistant. They all gone now. We had Steven Okata, Geroge Ricket, and Steve Nako. They all gone already. They all died. And I'm the oldest, and I'm still surviving. Yeah, so scouting is a really big thing for me. When I came back from the service, and I started to golf, you know. So every Sunday, I used to golf. And scouting, you spell scouting S-C-O-U-T-I-N-G. If you take out 'S' and 'C', what do you get? Outing. If you cannot take the boys camping or whatnot – don't! You get out. Cause you're not doing justice to the boys. I came out of the service, I took one year leave, and you know what I did? I told my wife, "I want to try Big Brothers." So I had two boys. They were really small. And do you know in Lahaina Shores, Pam Sylva?

I'm not sure.

(SK): She's the Demello girl? I took her two sons, you know. They were this small. Today, they're – wow! [putting hand in air to show how tall] They're real adults already. They're married, and you know, they get kids. And then my two boys said, "What you doing Dad? Why are you going into Big Brothers? You know, scouting is in you already." So, I left Big Brothers. I went back to scouting, yeah.

So tell me what it was like, more stuff about growing up here, when you were young, growing up in this area. What was the place like, other than the fishpond?

(SK): Okay, Malu ‘ulu o lele Park? Was a Mecca for our sports. All the football games, baseball games, were all done at that Malu‘ulu o Lele. So! When I chaired the greater Lahaina reunion, 8,000 people were running around on that thing, and then all of the sudden, Moku‘ula came in the picture, and Akoni said, "You cannot be running around because there is grave there." Ooh! I went for him and I say "Damn you! Why can't you wait?" Because at that time, the county was gonna start their recreation above, you know, so I told Akoni "Why don't you wait? We still need the ballpark. Why don't you wait til that thing is all finished? Then you can do whatever, you can start digging." But he said "No." I don't know whether he blame it on OHA or not, but he said "No. We have to start Moku‘ula." I was kind of disappointed, you know. Because we lost all that ball field. Yeah?

Is the other one pau already?

(SK): Oh yeah! Everything is up there now. And it's a really, really nice county ball field. They have soccer. They have baseball, and everything up there. Yeah, but as I said, the ball field where Moku‘ula is, we used to have track meet, and baseball, football. All the sports event were there. In fact, we even had, when it was a political year, we used to have all the politicians there with the stage. And they used to do their campaign right on Moku‘ula, in fact, right where they found the grave down there too, some bones. Yeah?

So when you were growing up, people didn't know about Moku‘ula?

(SK): No, I don't think so. I don't think so. Oh, and then another thing too, is that we started – we, our family, we started the Kaanapali Resort, you know, because below Black Rock, there was a Japanese cemetery there. Our family was asked to dig all the graves out, you know. And then where Maui Surf was, where Hilton, and what's the other one, the …

The Westin?

(SK): Yeah, Westin. They were all kiawe trees there. But that was a battlefield. And then when they bulldozed, started that resort, the bulldozers dug up all the bones and we have to go and get all the bones. Why we were hired, is because my brother-in-law was Albert Nakamura. He had that Nakamura funeral parlor, the mortuary.

Right.

(SK): So they ask him, and since he was my brother-in-law, he took the contract and he hired our relatives to go and do – we had to go and pick up all the bones.

You were the one that was telling me, that you put it all in a wheelbarrow and stuff.

(SK): Yeah.

I couldn't remember who was the one who told me about that. So do you know where they took the bones?

(SK): Well, the one on – the Japanese cemetery, yeah, some of them – you know, in the cemetery, they have that boat, and then the Japanese, they…[making writing motion]… the one that we can identify, we had a family. But the rest, we just put it in a box and we put it all away. The one from Pioneer Mill was Douglas Smith, I think. He was in charge of the project, and everything went into the Central Power Station. Central Power Station, today, is where the Kaanapali Railroad, where the train goes to Honokowai. Yeah, that was Central Power Station. Everything went into their warehouse. From there – I don't know. They must have cremated all those bones. And that's why we don't know where it went after that.

Both the Japanese and the Hawaiian ones?

(SK): Yeah.

So what about the fishpond over here, and that's all you caught was the dragonflies? No fish in there?

(SK): The dragonfly was more the swamp.

The swamp.

(SK): That's where the Salvation Army is today. Yeah, all that area going up. But the pond was right where the parking lot is of the Lahaina Shores. And then below that, of course, was all kiawe trees. And old lady Shaw was living there. She used to scold us, we were fishing in there, "Hey you kids get out of there!" She used to yell at us. [laughter]

What kind of fish did you catch in the pond?

(SK): Oh it was…Hawaiians call that O‘opu, mostly O‘opu. Yeah? And a few aholehole, because it was a brackish water too, you know, get salt too.

So where did the water come from, to the pond?

(SK): There must have been a culvert underneath, all the way from mauka. And being close to the ocean, I think there must have been somewhere along the kiawe trees, there again went highway, and you know salt water was coming in. And of course, we had the Armory Hall where the Kahekili Park is now. And then old man Earnest Napaipai, he was the Armory Hall caretaker.

He was living there. And I think somebody, maybe one of the family passed away, must have been buried where he lived, because there was a fence around, you know.

Not there now?

(SK): Oh no. Boy, that Armory Hall, that's where we held our dances. Also, at Armory Hall, we played. We had our basketball games in there also. And then, they had weddings, birthday parties in there. And then, of course, where the Holy Innocents, the Episcopal Church, and then Kam III School. Yeah? And then going that way, was more the plantation, the supervisors, they had their homes there. And going all the way to the manager's home, Puamana.

So the managers all lived in Puamana?

(SK): Yeah.

So, okay, let's make a map here.[drawing a map in a notebook] If this is your house, Kadotani House, who was, going that way, who was next?

(SK): Coming this way, we had the Fardens.

Okay, the Fardens.

(SK): And then we had – gee, one I know for sure was, Yap. Y-A-P. And then we had the assistant manager's home, and that changes, you know, that's just the managers. And then, coming down, we had Mrs. Hattie. H-A-T-T-I-E. She was the Kam III School principal. And then we had Brown, B-R-O-W-N. He was the plantation superintendent. And then, Puamana, I think. But there was some in between.

Lindsay's Where did Lindsay's live?

(SK): Lindsay? Yeah, Lindsey came in the picture. Lindsey is between here already, [pointing on map between Mrs. Hattie and Brown] old Ned Lindsay, he's a police department. [laughter]

Oh yeah? And then, across the street…

(SK): Across the street? Well, you know the mango stand? The famous mango stand? Yeah, it was there. Then we had a couple homes.

Where did the Shaw's live?

(SK): Shaw was on the ocean side.

Okay, so this is all on the mauka side of the road. And the Shaw's lived…

(SK): Where the pond here, Then the Shaw's lived here.

So the pond was over here, and then the Shaw's [drawing]

(SK): Yeah, the Shaw's lived here.

And then, the Armory was next to the Shaw's?

(SK): The Armory Hall, yeah, because we had a lot of kiawe trees. Yeah? And then, the Armory Hall. And then you had, below the tennis court, there was some plantation homes, and then the Episcopal Church. Write the Holy Innocents Church. Yeah?

So then if we going, if this is Front Street…

(SK): Here. [pointing]

Yeah, and then this is Shaw Street here, and so right now you have a parking lot here. What was over there?

(SK): Okay, Shaw Street, going up, okay, then the pond is here, and then the swamp was all here. That's where the Salvation Army is today. The swamp was all here.

And then the parking lot across the street too, was all swamp?

(SK): Yeah, right.

So this is all swamp [drawing]

(SK): And then as you go further up, then this is all kiawe trees. And then the Malu‘ulu o Lele. And then, above that, you got the Waiola Church up here. Then you get Lahaina Hongwanji, the Buddhist church here. Yeah.

So the cemetery is over here.

(SK): Yeah, and then, on this side, it was all cane field already. All sugar cane, yeah.

So, on the opposite of the swamp, on Shaw Street, what was over here?

(SK): Gee, the Wagners live there now. Yeah? There were home here, right on the corner, but above that, was all sugar cane.

Above this is sugar cane.

(SK): Yeah, all sugar cane. And then here, you have the mango stand. Then there were homes here. These are all residence. There's one family that I know of, is the Kaluakini family, live here. That's right on Front Street. And there's another one, Seong, S-E-O-N-G. Yeah, Seong lived here. They were the old timers.

And so, on the other side of the swamp, what was over here? Or did the park go all the way up a different street?

(SK): They were all, I don't know whether you would call that part of Malu‘ulu o lele. We're right next to it here. Right now there's a basketball court, there's a tennis court. That is considered all Malu‘ulu o lele, I think.

Was there at one time, a pathway that went from where the swamp was, to Waiola Church? Was there a pathway?

(SK): Yeah. There must be, yeah.

So then, your house – so if this is the pond, [pauses to turn over cassette tape]

(SK): This is the pond yeah? Okay, right across the mango – this the mango stand?

Mango stand, yes.

(SK): Okay, so it should be right around here. And then the Fardens. Yeah?

Okay, I got it now.

(SK): You get the Farden's and then go down.

Yep, and then all those other people…

(SK): That's all on your other map.

I'll have to redo this map. So, those were the only families that lived in this area when you were growing up?

(SK): Yeah. Right.

What did the Shaws do?

(SK): What did they do?

Yeah.

(SK): She was alone. She already was really old already, you know.

What did the Farden's do?

(SK): Well, Mr. Farden work Pioneer Mill. And I remember he used to come over – those days, the superintendent rode horse.

So he rode a horse.

(SK): Yeah.

Where did they keep the horse then? In their yard?

(SK): Yeah.

Okay, and they would graze the horse in the yard too?

(SK): Yeah.

So all these yards went all the way to the ocean?

(SK): Ocean. This all ocean already. [pointing on map]

So your backyard was your ocean?

(SK): Yeah.

Wow, so would you guys go fishing a lot too from there?

(SK): Well, no. I was too little then, yeah. But where I live now, I just have to cross the street, and the ocean is right there. So I go all the time. All the time, I go get Pipipi.

Oh really?

(SK): You know what is Pipipi?

Yep. We used to get it when we were kids – with a pin. [laughter]

(SK): Yeah! I call it the TV dinner. You get needle and…

Take it out, yeah. Did you go for limu too?

(SK): Yeah!

What kind of limu?

(SK): Wai‘wai‘ole, ogo,… but today you cannot – that department of, what you call it? That dumb S-H-I-T department? [laughter] D-L-N-R whatever?

Yeah. DLNR.

(SK): They not allowing us, you know, to tell you the truth, they're not allowing us to go fishing anymore.

Really?

(SK): We used to go catch, you know, those *papio*? This size. [holding hands about six inches apart] Moi? Wana? We used to fry that crispy. We used to eat. Today, you know [holding hands about one foot apart]

Yeah, you have to have it real big now.

(SK): You gotta measure from head to the tail. Gotta be ten inches or whatever. B.S.!

Did you guys also get Oama?

(SK): Oama? Yeah. And you know what? At our age yeah? We twelve, thirteen, whatever, we used to build what we call a tin boat. You know those corrugated things? I still have mine, you know.

Really!

(SK) I have three of em yet. I build for my two grandchildren because I wanted them to get to know what we were doing. I still have em, you know? And I used to go ride, and Aunty Pua – Marry Ellen? She used to see me "Eh! Come on let me ride." I said, "No way. You gonna sink the damn boat, you buggah." She's big, yeah, Marry Ellen.

That was fun to do that.

(SK): Oh yeah.

What did the Yaps do?

(SK): Mr. Yap? He work at the Baldwin Packers. He was a pineapple man. And his children, they grew up here, but then as soon as they became age, they left. They gone. There's only one left, I think, Harriet. And Harriet's wife is Susan Yap. Do you know Susan Yap? She's at Lahainaluna. She handles more the [muffled] I think. You're not a Lahaina girl?

Hum-mm.

(SK): [waving hand dismissively]

Oh, Mrs. Hattie. What was she?

(SK): She was the school principal.

Oh, that's right. Mrs. Hattie, school principal.

(SK): Oh, they all gone already.

And then Brown? He was the plantation…

(SK): Yeah, he was the superintendent, in charge of construction, I think it was.

Okay, so from where the – just beyond the swamp, it was all cane field, you said? From where Salvation Army is, all that was all cane field?

(SK): All cane field.

They didn't have the road. Yeah?

(SK): No, no. There's Front Street, you go all the way, and then there's the bridge there, Yeah? when you go into Puamana. But there was a bridge there. And then you pass the bridge and where Puamana Park is now – Yeah? Where all the pine trees, and you know all the surfers go there. We had only one road at that time. Yeah? It go all the way down, you know. And that Pine Tree was kinda very, very well-known, very, very popular place. That's where the high schools, they used to get their picnic and whatnot, Pine Tree. So, whenever they get something, "Hey where you guys going tonight?" "Oh, well, we going to Pine Tree." And they all know already where it is. A lot of outings were there, Pine Tree.

Was there any Hawaiian sites, when you were growing up, that you know of? Like heiau and stuff like that?

(SK): No.

Okay, tell me about all the camps. Where were all the camps located?

(SK): All the camps? Okay. We can start from Olowalu. Yeah?

Okay.

(SK): Olowalu would be the first one. And then, coming in, going north, coming in this way now, Waine‘e Village by Lahaina Pump Camp, Lahaina Pump. Then we had, further up the mountain, was Koaula Camp. Then, coming down, we had Lunaville Camp. Then we had Kilauea Camp, coming down, Kohua Camp. We had Kapunakea. Kiawe Camp. We had Mala Camp. We didn't have Waikole or Flemming Camp. No. Then going out, further north, Puakolii Camp, that was a big one, Puakoli. Then, Mahinahina Camp, Honokowai Camp, Kahana Camp. That's about it. Then the rest is pineapple. Yeah?

Okay, so tell me who lived there. Like, Olowalu was – if they were Japanese camp, Hawaiian camp, or something like that. So what was Olowalu? Who lived there?

(SK): Olowalu? Olowalu was mixed now. Yeah. We had Japanese, Hawaiian, yeah. And Olowalu, you know, they had the petroglyph. Yeah?

Right.

(SK): And also, Olowalu had their own plantation. You know?

No, no.

(SK): Yeah. Because my brother worked there. He was the accountant for the Olowalu plantation. That's where he met his… [whistles]

His wife.

(SK): You didn't hear, but that's why we found out. We were small. He brought her home. [moving hand over his stomach to show pregnancy]

Oh, okay.

(SK): Big belly, naughty man. [laughter]

Okay, so Waine‘e Village and Lahaina Pump Camp? Who lived there?

(SK): Oh, that was all mixed, yeah. That was a wild camp. Had gambling and everything – chicken fight – a regular casino. I used to go sell fish, all in the camp. I got some gross stories, I cannot tell you.

The Kaua‘ula Camp, who lived there?

(SK): That was more Japanese. Because, they – there were only a few homes. They were in charge of all the irrigation pumps up there. Yeah?

And the Lunaville Camp?

(SK): Lunaville was mixed also. We had some haoles up there.

And Kilauea Camp?

(SK): All mixed, Kohua, Kilauea, they all mixed: Filipinos, Japanese, Portuguese.

So where exactly was Kilauea Camp located? Between what streets, or what areas?

(SK): Oh, that’s really hard. Really hard. I don’t know where the boundary is.

Do you know if it was by Dickinson? Or by Shaw?

(SK): It was – all I can tell you is, Lahainaluna Road, on the left side as you go up. You have Kohua, Kilauea. Yeah. Right above Pioneer Mill.

And then Kapunakea is on that side too.

(SK): Right. Yeah.

And Kiawe Camp?

(SK): Kiawe Camp and Kapunakea, they were above Baldwin Packers Cannery. They were in back of it.

And they were mixed camp too?

(SK): Right yeah, all mixed. Although they were in back of Baldwin Packers Cannery, they were all Pioneer Mill employees. The housing was all Pioneer Mill.

And Mala Camp was more…

(SK): Mala Camp was on Front Street. Their employees, there were a lot of fishermen there too.

Was that mostly Hawaiian or mixed?

(SK): Mixed. Yeah.

Hawaiian and mixed.

(SK): Yeah.

So when did Waikole and Flemming Camp come? At the time, you said they weren’t there yet.

(SK): Yeah. Maybe, early 40s or late 30s, I think.

And I know where Puakoli is.

(SK): Puakoli goes way back, since Pioneer Mill days, you know, when they started. And that was all mixed because they had everything up there: church, playground, school. Puakoli Camp was the biggest camp in the state. They had over 2,000 people. Yeah. Gee, how do I know all these things?

Yeah, you're smart! And Mahinahina was down by the airport.

(SK): Mahinahina was way up, way above the airport now, you know. There were only about four homes. They were all Japanese. They were also in charge of the irrigation, because Pioneer Mill did have sugar cane up there.

So they were like the water people.

(SK): Yeah. They were in charge of the water.

And Honokowai Camp, was that inside the valley? Or outside?

(SK): No, on the highway – of course, those days we only had one main road going out. And Honokowai was on that road. That was all mixed also. Mixed race, we had a lot of Hawaiians though there. We had a school building there, Honokowai School. That's where my brother and my sisters used to go.

And Kahana was down…

(SK): Yeah, Kahana was a little further out from there.

That was mixed too.

(SK): Oh yeah. They were all mixed, yeah.

So where did you deliver fish? And what time did you deliver fish? How old were you when you started to deliver fish?

(SK): When I got my license, fourteen years old.

Wow!

(SK): Yeah, I used to go out and sell fish, mostly to – I never did go up Puakoli to sell fish, because there was a fish market up there, so I stayed out of it. But I used to go more on Honolua.

Oh, that's way up there. We had a fisherman too up there.

(SK): Yeah, I used to drive all the way up to Honolua Camp, where they had Japanese camp and a Filipino camp. And they had another place called Kawiki. I used to go there and sell fish. But along the way, I never did stop. I went straight up there. And there were not that many people, so you get to know them. And, you know, as soon as you go there, you start ringing your bell. They say, "Hey! Kadotani Fish Market came." [laughter]

What did your truck…you had a truck?

(SK):Yeah. A regular fish truck. A small little pickup truck.

What kind of fish did you sell?

(SK): Aku, Akule, ‘Opelu – see like ‘Opelu, Akule, you just scale. But the Aku, you know, it’s big. So my mother used to order it, she had to fillet it. And mullet, the price was already known, you know.

So was it mostly for sashimi?

(SK): Oh, I don’t know how they did. Heck, even the Aku, even the bones – they all loved that.

So, only you did the fish delivery? Or did other brothers?

(SK): No. That was all my job. [laughter] My job, after school, and Saturday and Sunday. This is why, when my dad was thinking about retiring, he wanted me to take over. I said “No way.” I used to play ball a lot, every Saturday and Sunday. I used to sacrifice my baseball. I used to kick the dumb fish tub. I say “what, am I doing this? I gotta go play ball.” But, I could have owned the Front Street.

Really.

(SK): Millions of dollars.

So what happened there?

(SK): So! My two boys, that runs the Take Home Maui? He said, “Dad! You mean, you dummy, you people owned that Front Street, and you gave that up?” I said “Yeah.”

So which part of Front Street did you move from here to where now? Where is it now? Oh, you still have it on Front Street?

(SK): It’s, you know where Moose Mcgillycuddy’s? It’s right across. It’s a concrete building, and we used to live in the back. And I used to go and dry fish on the top of the roof. And in the back we had a little wall sticking out, and I used to dry fish all over there. That was my job, to dry the fish. Oh, I work hard you know!

Did you folks ever go diving?

(SK): Oh yeah! Oh gosh, we used to go torching. Oh, a lot of fish behind! Gosh! All kind: moi, papio, mullet. Oh gosh. We used to catch this kind of size [holding hands about six inches apart] Today you can’t even touch those now. Gosh.

So, moi, papio, mullet.

(SK): Yeah.

Did you go diving and looking for things?

(SK): [nodding]

Yeah? What did you guys find?

(SK): All kind – Limu. But today, nothing. Yeah? You know, on top of where we had the market, Pioneer Mill, their waste water was coming down. Right next to us was a service station. So, underneath there, they had a culvert going to the ocean. So, with that water that was coming down from Pioneer Mill, there must have something in there that attract all the moi and the mullet, some kind of feed, I think. Anyway, mullet, they love that brackish water too. Yeah? And you know where Bubba Gump is?

Yeah.

(SK): A lot of people don’t know, you know, that used to be a little pond there, you know. And that’s where all the fish gather there too. So it’s not far from our fish market, so we used to go torching all along side, gosh!

Any sharks?

(SK): Oh yeah! Sharks used to come in. Yeah. You bet. I used to catch it. [laughter]

So, were the whales still a lot? Like the…

(SK): Outside.

Just outside – did anybody go and…

(SK): No.

Was there tourism at that time?

(SK): Hardly.

I know the resort didn’t start til the 60s.

(SK): Hardly. The only guests outside, the tourists were all at the Pioneer Inn. Yeah? Pioneer Hotel. They used to get, at the pier.

I remember coming here in, ‘66’ or ‘67’ I came.

(SK): Those days, they were popular. Do you remember Banyan Inn? You heard about that?

Yeah.

(SK): That’s where the Lahaina people always gather, especially on weekends. Banyan Inn used to hold weddings. I had my reception there when I got married. Yeah, the Banyan Inn. Oh in fact, oh shucks, we used to go drink every weekend down there at the Banyan Inn, all the golfers.

What about stories or legends of Lahaina? Do you remember any?

(SK): Probably only my legend, but I don’t want to tell you. Nothing good, so [laughter] I cannot tell you my whole life, you know. A lot of times, you know, that’s why I tell my wife, good thing I’m not running for any politics. They going through my dirty closet and then…

They’d find all your stuff.

(SK): Yeah right! There’re too many! Oh, that damn Sammy with the Police Department – that’s all they do, gamble and – but ah, we had fun though, a lot of fun.

Do you remember the Kaua‘ula winds and things like that?

(SK): Yes. Kaua‘ula wind, I was working the Pioneer Mill those days. And especially the warehouse, that roof was built – well, those days, the Pioneer Mill homes were all corrugated iron. Yeah? And those corrugated iron flew from the factory, came all the way down to Front Street, flying around. Dangerous! I saw one, it hit a coconut tree halfway into the big stump. And we had how many telephone poles down, on the Kaua‘ula wind.

Really?

(SK): Yeah. Gosh, even the concrete pole, all down, you know.

How often did that wind come?

(SK): All I know was only once, the big one, Kaua‘ula wind.

Do you remember the year?

(SK): Oh no. I cannot remember the year.

Any other kind of storms and things like that?

(SK): Well, the one I can really remember is Waiola Church. Waiola Church, you know, there's three things that the community suffers: wind, fire and flood. Right? There's three. Waiola Church was hit three times with that, wind, Kaua‘ula wind, they had a fire, and they got flooded. The original Waiola Church was beautiful church. And gosh, it got taken down. They build. They got hit. They build. They got hit. Waiola Church.

Sounds like they're getting louder. [dance music playing in the background]

(SK): Whoa, this is a long interview.

Well, I wanted to get a lot of your stories and stuff, especially growing up around here. So when you were growing up in here in this area, who else did you used to play with other than Erngard?

(SK): Well, baseball was a big thing for us. I had Saiichi Sasaki. He lived next to – oh! Not next to. Where we lived, that's where, they bought that place, next to the Farden's. They bought that place, and they sold it for you know how much? I think it was almost two million dollars.

When was this?

(SK): It's about two years ago. [shaking his head]

So right next to the Farden house? That's where he was?

(SK): See how much I lost in money? My father!

It reminds me of our situation. We're just as bad.

(SK): Well, but, things turned out good, you know. Money can't buy everything, right? It cannot buy your health. And I had another good friend who was the minister's son. He used to play ball with us. And I think he's off on the mainland someplace, I think. He's gone. And then the one that chopped my finger. He's gone. He's in the wind.

What's his name? The one that became a surgeon? Your partner?

(SK): Maybe I shouldn't say.

Okay.

(SK): Because, might come out. Yeah?

So, the Sasaki family bought your folks' house.

(SK): Yeah. But they didn't buy it from me. They bought it from the people that lived there after me.

Oh, after you guys. You don't remember who that was?

(SK): I cannot remember.

Anything else you want to share?

(SK): Well, I – it so happened that this Sunday, at church, I'm supposed to be the speaker. Our church, Hongwanji, just made a hundred and fifth. We had our celebration, and then two weeks ago, our minister told me, she said, "You know, Sammy san, I want you to tell your hundred fifth with the church. I said, "Okay, I'll be willing to." So at that time, I started my message to the congregation. I said "Reverend Nishiyama asked me to say a hundred and five, but I'm eighty-seven so I'm going to tell you what eighty-seven years, with the same lady, married for sixty-two years…" So, I started that, you know. And then I told them about my life with the church. And so, I made all of them laugh. So, this been three weeks now. So she asked me to say continuation, this Sunday. So I told the MC that, okay, you introduce me as the speaker for today is going to be Sammy Kadotani, "recollection and memories." That's my title, okay, "Chapter two." [laughter] so I'm gonna tell them about the continuation of what all the projects that I got involved with at the church. And also, about my, a little more personal life, that I know I'm really blessed with what my wife gave me, the two boys that she gave me, my two sons.

What's your wife's name?

(SK): Hatsumi, H-A-T-S-U-M-I.

And her maiden name?

(SK): Fuji.

And where was she born and raised?

(SK): She was born in Wailuku, but raised in Lahaina. She's the daughter of the only tailor shop in Lahaina.

Her father and mother were tailors?

(SK): Yeah. And my daughter-in-law blessed me with the two most wonderful grandchildren, Leia and Galen. Leia was the valedictorian at high school. She also the valedictorian at University of San Francisco. But she refused that position. But she was a summa cum laude at Lahainaluna, summa cum laude at San Francisco. A brilliant girl, Leia Kadotani. And I knew she was going to be the valedictorian at Lahainaluna, something told me that. So, with my closeness with the governor, my girlfriend, Linda Lingle, Okay? I told Linda, "Hey you! I want you to come up for the Lahainaluna graduation. We had never ,never have any governor or anything at Lahainaluna. She said "Hey Sammy, I'm not the governor yet." This was November, okay? 2002 or 3. And I caught her at one of her outings at Kahalui. So she tell me, "You call me November 7th after the election." She won. I called her. "Hey, you're coming up you know." She said, "Okay, I will put you down." She came up. And I still have the tape that I made of her speech to the graduating class. And I play that, even today, I play that over and over. Her speech was unbelievable. Yeah.

What are your sons' names?

(SK): Raymond and Owen. Raymond owns that shop called “Take Home Maui,” and Owen help him. They run the shop.

Yeah, I think I met both of them there one time.

(SK): Yeah, and the boy, Galen, he’s trying to be one attorney. He going into law school. Yeah. The top law school, he’s equivalent to Harvard, and whatever. He’s Hastings. He just finished his exam and he didn’t have enough points to go to Hastings, I think, but he’s making his application, he already did. And after he finish college, not law school, but at USF, there was a lady that really, really like him, and she help him, really a lot. And so he got a job in one of the huge law firm in San Francisco, and he still working there. And so, he’s making his application to Hastings, University of San Francisco Law School, Golden Gate, and to Santa Clara.

Not Loyola?

(SK): No. Not Loyola.

My uncle went there.

(SK): Oh yeah? My Leia had an application to go to Loyola, you know. And I was the only one that really wanted her – but the rest of the family said “No! Not Loyola, it’s too far.” Oh, so he finished law school there?

Yeah.

(SK): And where is he?

Well he was actually killed very early on because somebody crossed the road and hit him head on, and he lived for a little bit in the hospital. But then he died.

(SK): He didn’t make it?

No. It’s so sad. He was one of my favorites. I used to live with him when I was going to school on Oahu.

(SK): Oh! And how young was he?

He was, he had his three children already, but they were all little. So he was probably in his late thirties, early forty something.

(SK): Gosh! Wow.

Yeah. It was very sad.

(SK): His name is Galen. He has a hard time because he has a girlfriend now, and they both living together, and she also has a job also in the law firm. And so, if he goes to Santa Clara to law school – too far. So! If he cannot get into USF, Golden Gate is right close by. And I think that there’s no problem to get into Golden Gate Law School. The mother was thinking about UH, you know. But no, because he cannot leave her.

Oh, the girlfriend.

(SK): Yeah.

My daughter went to Richardsons Law School at UH.

(SK): And Richardsons is well known. Yeah? They talk highly of UH law school. Yeah?

Yeah, so she went there.

(SK): And where is she now?

She works at District Court.

(SK): Oh, the District Court.

She's trying to figure out what she wants to do.

(SK): So they all in law firm, huh?

Anything else?

(SK): But they get to be attorney too. Yeah? There's too many out there today.

Yep.

(SK): And you, sometimes they say, oh, when they hungry, they try to get any kind of case too. Yeah? Boy, this guy Ed…who's the guy that federal…now he got appointed? To be the judge?

Oh yeah.

(SK): Ed Cuo. Boy, they went into his dirty closet too.

Oh yeah. I think they just…

(SK): Just one incident! Yeah? God!

You want to go into public offices or something like that, forget it. You have to be squeaky clean.

(SK): Yeah, Ed Cuo, God. So, when people tell you about me, they say, "Oh yeah, that guy, Sammy, he got too much in his dirty closet." There's a guy, not a guy, but he's got one name of John Headstrong. You know, the brother, Todd…

APPENDIX E

Cost Appendix

APPENDIX F
MOKUHINIA/MOKU'ULA ECOSYSTEM RESTORATION FEASIBILITY
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MOKUHINIA/MOKU'ULA ECOSYSTEM RESTORATION FEASIBILITY
REQUIRED PROJECT NOTES

Cost Narrative (Revised
23 Jul 13)

1. **Project Description**:

The feasibility estimate consists of costs to restore an aquatic ecosystem at Mokuhinia/ Moku'ula in the town of Lahaina, Island of Maui. The project location is currently a county park with recreational courts (tennis and basketball), remnants of baseball field (baseball field was relocated to another location), comfort station (CMU bathroom), parking lot and Salvation Army buildings (Thrift Store, Church, House).

Alternatives:

Three alternatives were estimated at a 10% level of detail with major quantities provided by CH2MHILL. The main differences were in the excavation depth/quantity and water circulation. All three alternatives included costs to demolish the Salvation Army structures, comfort station, baseball fences, recreational courts, parking lot, associated utilities (water and sewer) and various trees and shrubs. The alternatives also include cost for post-construction monitoring for ten (10) years or 5 events (year 1, 3, 5, 7, 10) after construction are completed.

Tentatively Selected Plan (TSP):

This estimate for the tentatively selected plan design was based on the 35% design level and quantities provided by CH2MHILL, cost and schedule were refined.

The primary features for the tentatively selected plan include shallow lift excavation, landscaping with native Hawaiian plants, a drilled well with pump to supplement the pond water, outlet to existing culvert, galvanized chain link fence with two gates and a maintenance road. The existing area has been filled in with overlying sediments and currently has baseball fields (which has been relocated to another location), tennis courts, basketball courts, bathroom facility (CMU building), parking lot, and three Salvation Army buildings (to be relocated) consisting of a Thrift Shop (Wood frame building with composition roof & wooden pier foundation), house (wooden building with metal roof and slab on grade foundation), Church (wood building with metal roof and slab on grade foundation) and some trees/shrubs. Utilities (water, sewer, electrical) impacting the project will be removed and capped.

The bottom of the pond will be graded with undulating micro-topography and the edge of the ponds will be sloped and vegetated with native Hawaiian plants.

The water for the pond will be from one new drilled well and electric powered pump. Underground piping will deliver the water to the pump and the pond outflow will be by underground piping with stop logs and trash grate connected to the existing culvert. The area will have an access road for maintenance with chain link fencing around the area and two gates.

Archeological surveys revealed cultural artifacts in the stratum. Therefore, excavation is assumed to occur in 6" depths until the required depths of the pond is reached. During excavation, an archeologist will be on-site to monitor for any cultural artifacts found.

During the Planning Engineering & Design Phase (PED) conditional permits for the Section 401 Water Quality (WQ) Certification Permit from the Department of Health (DOH), State of Hawaii and the water use/pump permit from the State of Hawaii Commission on Water Resource Management (CWRM) will be obtained. It is estimated that each permit will require 2 years to obtain. Therefore, the PED phase is anticipated to take 2.5 years.

During Construction it is assumed that the Special Management Area Use Permit (SMA), Construction/ Pump Installation permit and grading permit (County of Maui) will be required. The cost also assumes archeological and biological monitoring as required by the Endangered Species Act (ESA) and by the National Historic Preservation Act (NHPA) with consultations by a third party contractor will be conducted.

The cost includes post-construction monitoring performed under a separate contract one, three, five, seven and 10 years after construction is complete.

2. **Basis of Estimate**:

This estimate is based on the Feasibility Report April 2013(Draft). (Final Report, Oct 2013), Effective Price Level is 1 Oct 14 for Alternatives 4, 8A & 8B & 1 Oct 2014 for TSP, both escalated to Program Year 2015.

3. **Estimated Design and Construction Schedule**:

The contractor shall commence work under this contract within 14 calendar days of receiving the notice to proceed anticipated 1 Feb 2017; prosecute said work diligently; and complete the entire work ready for use, within the anticipated time frame below:

	Screening (10% Level of Detail)			35% Design
	Alt 4	Alt 8A	Alt 8B	TSP
Real Estate Acquisition	Aug 2015 to Dec 2016	Aug 2015 to Dec 2016	Aug 2015 to Dec 2016	Aug 2015 to Dec 2016
PED Phase	Oct 2014 to Sep 2016	Oct 2014 to Sep 2016	Oct 2014 to Sep 2016	Oct 2014 to Sep 2016
Construction duration (Months)	9.4	10.8	10.8	14.3
Rain Delay (days)	5	12	12	16
Construction End	Nov 2017	Dec 2017	Dec 2017	Apr 2018
Post Construction Monitoring	Nov 2018 to Nov 2023	Dec 2018 to Dec 2023	Dec 2018 to Dec 2023	Apr 2018 to Apr 2029

a. Typical construction crew (1 shift) working 8 hr/day and X 5 day weeks.
b. An overall Production Efficiency Rate of 90% which is based on anticipated project difficulty, method of construction, labor availability, supervision, job conditions, weather and expected delays.

CONSTRUCTION WINDOWS OVERTIME
This estimate contains no overtime to complete the project.

4. Quantities

The estimate is based on the Quantities provided by CH2MHILL. The estimated project quantities are listed in the table below.

	Screening (10% Level of Detail) Assumptions			35% Design Assumptions
Quantity	Alt 4	Alt 8A	Alt 8B	TSP
Excavation (CY)	39,803	36,584	28,599	34,500
Disposal (Assume Clean Material)	50% rocks & dirt > 6” @ 1.34 tons/cy	50% rocks & dirt > 6” @ 1.34 tons/cy	50% rocks & dirt > 6” @ 1.34 tons/cy	50% rocks & dirt > 6” @ 1.34 tons/cy
Dewatering	6 weeks; 2’ water depth	6 weeks; 1.5’ water depth	6 weeks; 0.5’ water depth	6 weeks; 1.5’ water depth
Clay Liner (CY)	None	None	4,940	None
Surface Aerator	Yes, HP TBD	No	No	None
Revetment around Moku’ula Island	5 ft high, 1,100 LF	4.5 ft high, 1,100 LF	3.5 ft high, 1,100 LF	None
Chain Link Perimeter Fence around Pond, LF	4 ft high, 2,775 LF	4 ft high, 2,775 LF	4 ft high, 2,775 LF	4’H, 2,775 LF
Well Pump	No	7.5HP/ 4’’/ 100 GPM (Solar)	5 HP/ 4”/ 50 GPM (Solar)	5 HP/ 5” / 85 GPM (Electric)
Well depth	None	100 VLF	50 VLF	150 VLF
Wetland Inlet (LF)	None	400’ / 4” HDPE	400 LF/ 3” HDPE	720 LF/ 4” HDPE / 48” Manhole Inlet Structure w/ Riprap
Wetland Outlet (LF)	50 LF / 30” HDPE	50 LF / 30” HDPE	50 LF/30” HDPE	300LF / 12” HDPE
Outlet Structure	30”X36” Hydrogate SS Slide Gate	30”X36” Hydrogate SS Slide Gate	30”X36” Hydrogate SS Slide Gate	Reinforced Conc Box w/ Stoplogs
Maintenance Road	400’ X 12’ / 12” gravel on geotextile	400’ X 12’ / 12” gravel on geotextile	400’ X 12’ / 12” gravel on geotextile	380’ X 10’ / 8” Gravel on geotextile
Landscaping (Acres / No. of Plants)	2.0 AC/ 21,780 EA	1.7 AC/ 18,513 EA	0.9 AC / 9,802 EA	20,807 EA

Each viable alternative in the viable array assumed a concrete rubble wall perimeter fence around the pond with a 2,775 ft long, 4 foot high chain link fence, concrete rubble revetment with buried footing around the perimeter of Moku’ula island (1,100 ft), gravel maintenance access road with geotextile material and one vehicle access gate on each end of the access road (total 2 gates).

The following plants for the viable array of alternatives are assumed spread equally across the planting area:

kaluha (Bolboschoenus maritimus)
makaloa (Cyperus laevigatus)
ahuawa (Cyperus javanicus)
akulikuli (Sesuvium portulacastrum)
ae'ae (Bacopa monnieri)

The following plants for TSP are assumed spread equally across the planting area:

kaluha (Bolboschoenus maritimus)
makaloa (Cyperus laevigatus)
ahuawa (Cyperus javanicus)
akulikuli (Sesuvium portulacastrum)
ae'ae (Bacopa monnieri)
akiaki (Sporobolus virginicus)
ohelo kai (Lycium sandwicense)

5. **Acquisition Plan**

The estimates (Alternatives and TSP) are based on a single contract being awarded to a Small Business Prime Contractor from Oahu providing oversight with multiple sub contractors from Oahu and Maui.

Assume the following sub-contractors:

Sitework (from Oahu)
Boring (from Oahu)
Landsaping (from Maui)
Well Drilling (from Oahu)
Hauling (from Maui)
Electrical (from Oahu)
Landfill (on Maui)
Environmental Testing (from Oahu)
Surveyor (from Oahu)
Pump (from Oahu)
AE (Architect Engineer) (from Oahu)
Airfare (Hawaiian Airlines)
Archeologist (From Oahu)

6. **Project Construction**

a. Mob, Demob & Preparatory Work

It is assumed that the Prime Contractor will be from Oahu. The Sitework, Boring, Well drilling, Electrical, Environmental, Testing and Geohydologist sub-contractor will mob/demob the equipment and highly skilled staff from Oahu to Maui. Other construction equipment and skilled labor are assumed to be available in the Lahaina area.

Assumed Equipment for Mobilization at Standby Cost:

75,000 GVW Truck w/ Lowboy 75 Ton), 3 Axle Towing
1CY wheeled loader/backhoe
Single Power Scraper, 21-31 CY
Crawler Dozer
Soil Compactor, Vibratory roller
Articulated Grader
17 Teeth Articulated Motor Grader.
Scraper
Wheeled Tractor with Harrow

Assume the hauling Sub will transport the equipment using 3 Laborers & 2 Heavy equipment operators to assist loading equipment on to the trucks.

Travel It is assumed the Prime and Site-Work Contractor are allowed travel to and from Oahu 2 times a month, and the sub-contractors on Maui on short term basis allowed travel at the beginning and end of their work.

Lodging: Assume rental of house for the Prime and sub. Sub contractors will be there on a short term basis, so assume short term lodging (hotel) to include subsistence & travel to/from Oahu.

Temporary Facilities: Assume water is available at the rate of $3.20/Gal; electricity $0.32/kwH. The cost includes office trailer for the Prime Contractor and Government. The electricity will be supplemented by diesel generator. Temporary toilets are included in the estimate.

b. Surveys: Assume site pre-construction survey and layout, survey during construction, installation of three benchmarks (as required by a similar project); geohydrological survey (for the well).

c. Disposal: Maui Demolition & Construction Landfill, ~ 32 miles round trip from Mokuhinia to Maalaea, or about 1 hr round trip. Estimate assumes disposed and excavated material is considered clean for the purposes of disposal.

d. Features & discussion:

SITE ACCESS

The project site is located on the Island of Maui in the town of Lahaina, about 23 miles (40 minutes) from Kahului, Island of Maui and is in a historical district one block from the central tourist area of Lahaina. The Island of Maui is about 120 miles from the Island of Oahu, or about 45 minutes by air from Honolulu International Airport. There are regular barging services between islands for large equipment or materials.

BORROW AREAS

The project does not require borrow for the pond. Minimal borrow is assumed for any pipe trenching. Borrow areas are assumed from commercial sources on the island of Maui.

POST CONSTRUCTION MONITORING:

Post- Construction Monitoring includes Hydrologic monitoring, water quality monitoring, vegetation monitoring, predator monitoring, analysis and reporting. It also includes adaptive management such as adjusting the pumping (as applicable Alt 8A, Alt 8B & TSP) schedule to improve water circulation. The estimated level of effort per monitoring event was provided by CH2MHILL and includes:

Monitoring:

1. Water Quality Monitoring: Assume 1 person; 4 days/monitoring event. Assumes AE has water quality equipment.

2. Vegetation Monitoring: Assume 2 people; 2 days per monitoring event

3. Predator monitoring: Assume 1 person; 2 days per monitoring event.

4. Other monitoring (photo locations): Assume 1 person; 1 day per monitoring event.

Adaptive Management:

1. Adjust pumping schedule to improve water depths or flooding regime (Alt 8A, 8B, TSP):

2. Adjust aerator schedule to improve circulation (Alt 4).

3. Adjust Predator trap locations (Alt 4, 8A, 8B, TSP).

CONSTRUCTION METHODOLOGY

The estimate assumes that the first 2' of excavation is dry and will be hauled directly to the landfill. Rocks >6" will be sorted out and delivered to the landfill separately. After excavating the 2' of dry soil below existing ground, wet soil is assumed to be encountered down to ~4.5'. The wet soil is assumed to be excavated in 6" lifts. The wet soil will be dried and stones over 6" will be sorted out. All material will be hauled to the Maui County Landfill. 50% of the total excavation quantity is assumed to contain rocks over 6" diameter for the Viable array of Alternatives. There is no cost for landfill disposal for clean (not contaminated) rocks/dirt < 6."

UNUSUAL CONDITIONS (Soil, Water, Weather)

The project is expected to encounter groundwater, as the presence of shallow groundwater provides the basic premise for restoration of the wetland. The assumptions we provided relative to the groundwater levels are based on the groundwater monitoring data that was presented in the Hydro geologic Assessment (Oceanic, 2009).

UNIQUE TECHNIQUES OF CONSTRUCTION: None

EQUIPMENT AND LABOR AVAILABILITY & DISTANCE TRAVELED

The cost assumes equipment and labor are readily available. The distance traveled is about 120 miles by air from the Island of Oahu, then 23 miles by vehicle from Kahului Airport to Lahaina town on the Island of Maui. It is assumed the contractors will use privately owned vehicles.

ENVIRONMENTAL CONCERNS
This estimate has provisions for Monthly Anticipated Adverse Weather Delays based on the construction performance period.

7. **Contingencies by Feature or Sub-Feature**

Abbreviated Cost and Schedule Risk Analysis (ACSRA) was used for each viable alternative as well as for the TSP to determine the contingency for each account. The results are included in this appendix. The PDT developed the risk register and ratings for each feature of costs. For the viable array, the Project Manager and designer provided input into the risk register. ACSRA was performed for the TSP with the construction account broken further down to evaluate further risks. Various disciplines (Engineering, Construction, Designer and Project Manager) provided input into the risk register and a consensus among the participants determined the risk rating in order to refine the contingencies for the TSP.

Civil Works Break Down Structure	Alt 4	Alt 8A	Alt 8B	TSP
06 Fish & Wildlife Fac.	18.17%	18.07%	17.99%	16.36%
*01 Lands & Damages	18.37%	18.37%	18.37%	18.37%
30 Planning,	19.56%	24.35%	24.35%	20.57%

Engorge & Design				
31 Construction Management	19.56%	17.74%	19.56%	17.56%

*Contingency for Acct 01 Lands & Damages is from Appendix J, Real Estate Planning Report (REPR) dated 27 Dec 12, page 7 & 8, Para 9.

8. **Cost Estimate**

EFFECTIVE DATES FOR LABOR, EQUIPMENT, MATERIAL PRICING

a. The construction cost estimate was developed using MCASES 2nod Generation estimating software in accordance with EF 1110-2-1302, Civil Works Cost Engineering, 15 Sep 2008; UFC 3-740-05, Handbook: Construction Cost Estimating, 8 November 2010, Change 1, June 2011. The construction cost estimate was prepared using MII Version 4.1, 2010 English Cost Book, 2010 Equipment Library (Region 10).

The labor rates used are from Davis Bacon Wage Rates for the General Decision Number: HI30001 effective until September 2013 for the State of Hawaii for Building, Heavy (Heavy and Dredging), Highway and Residential Construction Types for all counties in Hawaii Statewide.
The base estimate has been updated with the following fuel prices: $4.25/gal for off-road diesel, $4.70 /gal for on-road diesel and $4.60/gal for gasoline for the Kahului, Island of Maui area. The estimate has been updated with current quoted material prices, production rates and specialty equipment costs.

Labor and Equipment Productivity:

No overtime is expected. The estimate includes an overall Production Index of 90% which is based on anticipated project difficulty, method of construction, labor availability, supervision, job conditions, weather and expected delays.

b. Project markups

Escalation: Escalation has been calculated within the Total Project Cost Summary Sheet. Price levels have been escalated from the effective price levels of the construction cost estimate of 31 May 13 to the midpoint of construction. The appropriate escalation cost factors were obtained from EM 1110-2-1304 Civil works Construction Cost Index System dated 31 Mar 13 with Amendment #2 dated 31 Mar 13.

Alternative	Mid-Point of Account (Date)			
	01 - Real Estate	30 - PED	06 - Construction	06 Post-Construction Management
Alt 4	April 2016	Oct 2015	Jun 2017	Nov 2023
Alt 8A	April 2016	Oct 2015	Jul 2017	Dec 2023
Alt 8B	April 2016	Oct 2015	Jul 2017	Dec 2023
TSP	April 2016	Oct 2015	Sep 2017	Apr 2024

c. Functional Costs:
Functional costs associated with this work:

1) 01 Account – Lands and Damages: This account covers costs Lands and Damages for Construction. The Real Estate Cost was obtained from the Real Estate Planning Report.

2) 30 Account – Planning , Engineering and Design: This account covers Planning and Environmental Costs, Engineering & Design, Technical Reviews, Internal Technical Review, Value Engineering, Contracting and Reprographics, Section 106 Coordination and Archeological Monitoring. Costs for this account were estimated based on fee quotes requested by the Project Manager.

3. 31 Account - Construction Management: This account covers construction management during the construction. The Construction Management cost was determined by the field office based on fee quotes requested by the Project Manager. This includes project oversight (Construction and Project Management).

d. Total Project Cost Summary

The Total Project Cost Summary Sheet (TPCS) includes the construction costs from the MCASES estimate, project markups, as well as costs for Lands and Damages, Planning, Engineering & Design, and Construction Management. Feasibility study (CAP studies) Costs Spent thru 31 May 13 was provided by the Program Analyst. The following table summarizes the TPCS.

	Estimated Cost (EPL 1 Oct 12)	First Cost (EPL 1 Oct 14)	Total Project Cost (Fully Funded)
TSP	$9,064(K)	$9,443(K)	$11,465 (K)
Alternatives:			
Alt 4	$8,162(K)	$8,505 (K)	$10,160 (K)
Alt 8A	$8,138(K)	$8,481 (K)	$10,134 (K)
Alt 8B	$9,609 (K)	$10,009 (K)	$11,777 (K)

Total Project Cost spent thru 31 May 13 is $1,236 (K) for all alternatives. Total Project cost spent thru 23 Jul 13 for the TSP is $1,510(K) plus $10,000 for the Preliminary Restoration Plan (PR).

Based on 1 Oct 2014 price levels, the estimated project first cost is $9,443,000 which includes monitoring and adaptive management costs of $75,000. The Fully Funded Total Project Cost is over the Federal Statutory Limit for Section 206 Studies/Projects under the Continuing Authorities Program (CAP) of $5M, therefore 65%/35% Fed/ Non-Fed does not apply. The Non-Federal Sponsor share is the cost above the Federal CAP Limit.

In accordance with the cost share provisions in Section 103(c) of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S.C. 2213(c)), the Federal Share of the Total Project Cost (Fully Funded) is estimated to be $5,000,000 of the Total Project Cost (Fully Funded). The non-Federal share is estimated to be $6,465,000 (Fully Funded). The non-Federal costs include the value of lands, easements, rights-of-way, relocations (LERRD) estimated to be $1,787,000.

-END OF PROJECT NOTES-

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Mokuhinia Ecosystem Restoration Section 206**
PROJECT NO: **129955**
LOCATION: **Lahaina, Maui**

DISTRICT: **Honolulu District**
PREPARED: **7/24/2013**
POC: **CHIEF, COST ENGINEERING, Gary F. Yamauchi**

This Estimate reflects the scope and schedule in report; Feasibility Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 10/1/2012 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
06	FISH & WILDLIFE FACILITIES	$5,034	$824	16%	$5,858	3.9%	$5,232	$856	$6,088			$5,511	$902	$6,412
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$62	$10	16%	$72	3.9%	$64	$11	$75			$77	$13	$90
	CONSTRUCTION ESTIMATE TOTALS:	$5,096	$834		$5,930	3.9%	$5,296	$866	$6,163			$5,588	$914	$6,502
01	LANDS AND DAMAGES	$1,412	$259	18%	$1,671	3.9%	$1,467	$270	$1,737			$1,510	$277	$1,787
21	RECONNAISSANCE									$10				$10
22	FEASIBILITY STUDY (CAP studies)									$1,510				$1,510
30	PLANNING, ENGINEERING & DESIGN	$758	$156	21%	$914	5.5%	$799	$164	$964			$835	$172	$1,007
31	CONSTRUCTION MANAGEMENT	$467	$82	18%	$549	5.5%	$493	$86	$579			$552	$97	$649
	PROJECT COST TOTALS:	$7,733	$1,331	17%	$9,064		$8,056	$1,387	**$9,443**	$1,520		$8,485	$1,460	$11,465

CHIEF, COST ENGINEERING, Gary F. Yamauchi

PROJECT MANAGER, Athline Clark

CHIEF, REAL ESTATE, Stephen N. Cayetano

CHIEF, PP-P, Roxane Iseri

	($K)
*ESTIMATED FEDERAL COST:	**$5,000**
*ESTIMATED NON-FEDERAL COST:	**$6,465**

*Project is over the Federal CAP Limit of $5M, therefore 65%/35% Fed/ Non-Fed does not apply. Non-Fed Sponsor share is the amount over the Federal CAP Limit.

ESTIMATED TOTAL PROJECT COST: $11,465

Filename: FINAL Mokuhinia-TSP(23Jul13)CAP_TPCS_Mar2013 r4-jgn.xlsx
TPCS

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Mokuhinia Ecosystem Restoration Section 206
LOCATION: Lahaina, Maui
This Estimate reflects the scope and schedule in report; Feasibility Study

DISTRICT: Honolulu District
POC: CHIEF, COST ENGINEERING, Gary F. Yamauchi
PREPARED: 7/24/2013

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 6/7/2013 Effective Price Level: 10/1/2012				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$5,034	$824	16.4%	$5,858	3.9%	$5,232	$856	$6,088	2017Q4	5.3%	$5,511	$902	$6,412
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$62	$10	16.4%	$72	3.9%	$64	$11	$75	2024Q3	19.6%	$77	$13	$90
	CONSTRUCTION ESTIMATE TOTALS:	$5,096	$834	16.4%	**$5,930**		$5,296	$866	$6,163			$5,588	$914	$6,502
01	LANDS AND DAMAGES	$1,412	$259	18.4%	$1,671	3.9%	$1,467	$270	$1,737	2016Q3	2.9%	$1,510	$277	$1,787
30	PLANNING, ENGINEERING & DESIGN													
1.47%	Project Management	$75	$15	20.6%	$90	5.5%	$79	$16	$95	2016Q1	4.2%	$82	$17	$99
5.00%	Planning & Environmental Compliance	$255	$52	20.6%	$307	5.5%	$269	$55	$324	2016Q1	4.2%	$280	$58	$338
5.55%	Engineering & Design	$283	$58	20.6%	$341	5.5%	$298	$61	$360	2016Q1	4.2%	$311	$64	$375
1.67%	Engineering Tech Review ITR & VE	$85	$17	20.6%	$102	5.5%	$90	$18	$108	2016Q1	4.2%	$93	$19	$113
0.69%	Contracting & Reprographics	$35	$7	20.6%	$42	5.5%	$37	$8	$45	2016Q1	4.2%	$38	$8	$46
	Engineering During Construction			20.6%										
0.49%	Planning During Construction	$25	$5	20.6%	$30	5.5%	$26	$5	$32	2017Q3	11.0%	$29	$6	$35
	Project Operations			20.6%										
31	CONSTRUCTION MANAGEMENT													
8.18%	Construction Management	$417	$73	17.6%	$490	5.5%	$440	$77	$517	2017Q4	12.1%	$493	$87	$580
	Project Operation:			17.6%										
0.98%	Project Management	$50	$9	17.6%	$59	5.5%	$53	$9	$62	2017Q3	12.1%	$59	$10	$70
	CONTRACT COST TOTALS:	$7,733	$1,331		**$9,064**		$8,056	$1,387	$9,443			$8,485	$1,460	**$9,945**

Mokuhinia TSPrev(19Jun13)

Estimated by	T. Kazunaga
Designed by	CHM2MHILL, 35%
Prepared by	Tracy Kazunaga
Preparation Date	6/20/2013
Effective Date of Pricing	6/20/2013
Estimated Construction Time	Days

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Description	ContractCost
Contract Cost Summ (ECC)	**5,096,456.15**
06 Fish and Wildlife Facilities	**5,096,456.15**
0603 Wildlife Facilities & Sanctuary	**5,096,456.15**
Mob, Demob, Demo & Preparatory Work	**790,254.26**
060309 Buildings, Project Operations	**7,059.64**
060337 Water Wells	**468,141.91**
060371 Fences	**289,402.82**
060373 Habitat and Feeding Facilities	**3,468,193.41**
Post-Construction Monitoring	**61,801.58**
060372 Signs	**11,602.54**

TSP QTO

Site Prep					
staging Area	40,289.00	SF		0.92	ac
Constr Fence	2,750.00	LF			
Dust Barrier					
Constr. Entrance	1.00	EA			
Erosion Control	2,750.00	LF			
Moku'ula Exclusion Fence around perimeter (buffer)	1,250.00	LF			
Archeologist (on-site during Construction)	3.00	mo			
Demo:					
Clear & Grub					
FOM parking lot (entire)	34,500.00		sq ft	3,833.33	SY
Baseball Backstop (fence)	120.00		LF		
Basketball court	6,400.00		sq ft		
Tennis Ct	30,250.00		SF		
Bathroom	850.00		sq ft		
Total Parking Demo	34,500.00	sf			
Total Tennis & BB Ct Demo	36,650.00	SF			
	877.52	CY		1,886.66	tons
2 Wooden Bldg w/ Mtl Roof & Conc Foundation (TMK 2-4-6-37)	2,388.00	SF			
Wood Frame Bldg w/ Composition roof & Wooden Pier Foundation (TMK 2-4-6-7-38)	1,116.00	SF			
Cut/Cap, Remove Utilities					
Water	3.00	EA			
Sewer	3.00	EA			
U/G Power (park bathroom, tennis courts, par	3	EA			
Misc (Court Fences, BB Fences, Lights, Misc utility boxes)	1.00	LS			

Disposal:	Assume	5,000 tons			
Excavation					
Total Excavation	34,500.00	CY			
Material w/ Rocks (50%)	17,250.00	CY			
	SF	SY			
Wetland Bottom	120,200.00		13,355.56		
Wetland Slope	146,500.00		16,277.78		
			29,633.33	Total	

Assumptions:

*1st 2' of excavation is dry, therefore don't need to dry the soil, then after going 2' down, then the soil will be wet down to ~4.5' down.
* After the 1st 2' of excavation, do in 1 lift, then after 2' excavation, then do the 6" lift.
*Dewatering would occur after the 2' excavation happens, w/ max dewatering when the pond bottom is reached.
* Use Wetland Bottom SF

		Min (ft)	Max (ft)	Total Depth Exc Avg (ft)
Avg Depth of Excavation (total depth)	3.4'-4.5'	3.40	4.50	3.95

*6" lifts below 2' excavation depth

Excavation Depth	Lifts	CY/lift	# lifts	
3.95-1.95	2' depth	8,904.00	1	2' lift
1.94 to 4.5' (Assume wet)	6" depth	2,226.00	12	6" lift

Check Tot CY		Moisture	% Qty Soil of Total
	8,904.00	Dry	26%
	26,712.00	Wet	74%
	35,616.00	ok	

	Qty (QY)	Soil w/o Rocks (CY)	Soil w/ Rocks (CY)	Expansion Fact.
Dry Material (1st 2' depth)	8,904.00	4,452.00	4,452.00	1.30
Wet Material to dry	25,596.00	12,798.00	12,798.00	1.3
	34,500.00	**17,250.00**	**17,250.00**	

	Wet Mat'l after Dried LCY	Haul 2 Landfill (lds, 17 cy truck)	1.5h R/T (hrs)
	11,575.20	681.00	1,021.50
	33,274.80	1,958.00	2,937.00
	17,149.32	**23,676.30**	

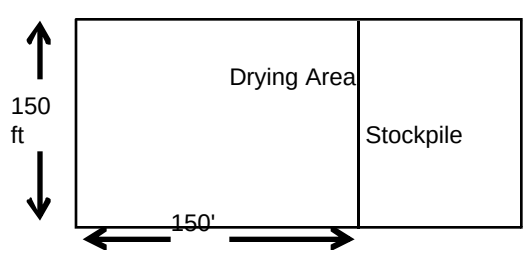
Haul to dry soil to Landfill	CY	cy/ton	ton	LCY
1st Disposal of dry material	8,904.00			11,575.20
w/o Rocks	4,452.00	1.34	5,965.68	
W/ Rock	4,452.00	1.85	8,236.20	

Lds (17 CY/LD)	Trips (1.5 h/rt)
681.00	1,021.50

De-Watering (Drying) Area:

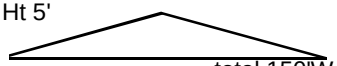
Rough area (for ConstructionStaging Area)	76,000	SF		
Qty soil to dry:	25,596	CY	691092	CF

	L (ft)	W (ft)
Say de-watering area	175	150
Assume keep max ht to 5'		



V=0.2618 C D^2 X h

Max Ht 5'



total 150'W

Capacity of drying area

29452.5	CF
23.46462949	# times to dry

					CY	
				Stockpile Capacity		818.125
Assume	3	days to dry				
Time to Dry	23	times to dry		563.1511077	Hrs	
Total Drying Time	70	drying days		2.32	months	
Hauling to stockpile every 7 days						
Mix Soil once a day	70	days		70.39388846	hr	
Excavation	CY	Expansion Factor		LCY	Lds	
Wet (6" lift)	25,596		1.1	28155.6		1656.211765
Dry (2' lift)	8,904		1.3		Hrs	
						2484.317647
Avg distance excavation site to stockpile ~ 500' (measured from drawings)	15	mph		500	ft	
					Hr one way - Site to drying	
				0.006313131	area	
Wet Soil	Hauling site to drying area					
Say load 17 CY truck	17	LCY/LD		1657	total loads	
Assume using 3 CY Hyd Ex w/ 6" lifts				X		20.92171717
					hr total r/t	
Excavation of Wet material						
Hyd Excavator w/ 3 CY Bucket	25,596	CY Excavated (wet)				
75% Full	11,376	cycles				
	1	min/cycle		11,376.00	min	
Eff wk day	6	hr / dy		135.00	CY/ HR	
Excavation of Wet material	**32**	**day**		**189.60**	**hr total**	
				w/ 3 CY bkt		
				135.00		
Excavation of Dry Material						
Hyd Excavator w/ 3 CY Bucket	8,904	CY Excavated (dry)				
90% Full	3,298	cycles				
	1	min/cycle		3,297.78	min	
Eff wk day	6	hr / dy		162.00	CY/ HR	
Excavation of Dry Material	**9**	**day**		**54.96**	**hr total**	
Total Excavation days	**41**	**days**		w/ 3 CY bkt		
Load dried soil onto 17 cy Truck						
3 CY Ldr	25,596	CY				
75% load	2	CY/LD				
	11,376	Loads				

		1	min/ld		
		190	hr		
	CY		Soil w/o Rocks (CY)		Soil w/ Rocks (CY)
Disposal of Dried Material		25,596		12,798.00	12,798.00
			Tons		Tons
	Factor			1.34	1.85
For Disposal, tons	tons			17149.32	23676.3

BMP's for drying area:						
Sandbags	650	LF			517	EA
Straw Wattle (9"Dia X 20LF, EA)	650	LF			33	EA
Dust Fence, 8'H	650.00	LF				
	CY Total	LCY		LCY/LD		LD
Dispose 50% mat'l w/ rocks	17,250.00		22,425.00		17.00	1,319.12
	Hr (r/t)	Tot Hrs		Ton/CY		Ton
	1.50		1,978.68		1.85	31,912.50
Dispose of Soil w/o rocks (50%)	17,250.00		5,750.00		17.00	338.24
	Hr (r/t)	Tot Hrs		Ton/CY		Ton
	1.50		507.35		1.34	23,115.00

Grading:

Microtopography	13,355.56	SY		
Fine Grading	2.00	wk		
	29,633.33	Fine Grading		
Edge Slope: 3:1				
Dispose				
50% clean materal; free of rocks				
De-Water	6.00	wks @ 1.5'		
Liner:	None			
Revetment:	None			
Grading slopes & edge	FROM AE			
Bottom	146,500.00	SF	16,277.78	sy
			162.78	100 SY
Slope	120,200.00	SF	13,355.56	sy
		Total	29,633.33	SY

Maint Path (grvl rd)					
8" thk Gravel	380.00	LF	0.667	ft D	
			93.87	cy	
10' Wide	103.26	ccy	134.24	lcy	
	2.10	ton/cy	216.85	ton	
	3,800.00	SF	422.22	SY	
Geotextile	4,320.26	SF	480.03	SY	
			528.03	SY (10% Waste)	
Fence					
42'H CLF	2,775.00	LF	Drill, Pour Conc, put post:	days	
Posts	277.50	EA	Say 20 post/day		13.88
Gate	2.00				
Footing	278.00	EA	0.07	CY	
conc	20.59	CY			
Well & Pump					
12" Dia Drill	150.00	VLF			
20' Screen	1.00	EA			

Pump:

Grundfos 85S50-4	85.00	gpm		5,100.00	gph	
Conc pad; 4" thk						
4" Isolation & Check Valve	1.00	EA				
4" Connection Pipe					LF	
4" HDPE	400.00	LF	From C-01			655.00
Trenching						
Electrical (230 V); 1 phase						
5 HP						
L (ft)		W (ft)	thk (ft)		SF	
Conc Pad	6.00		6	0.50		36.00
Conc	0.67	CY		CY		0.67
Form	12.00	SF				
Cure	36.00	SF				
8-1/2" Dia Rebar	44.00	LF		0.67	lf/#	
				0.02	ton	
4" Check Valve	1.00	EA				
4" BFP	2.00	EA				
4" Turbine Flow Meter	1.00	EA				
6" Bollards	4.00	EA				

http://www.grainger.com/Grainger/static/products.html

Assume 200 LF 3/4" Conduit w/ #14 AWG wire

Pump Discharge Line:

4" HDPE, buried	720.00	LF
48" pre-case MH for inlet Structure w/ geotextile & riprap; 1' thk; 10' dia		
From Drawing C-01		
4" HDPE	720.00	LF
4" tee	2.00	EA
4" 1/4 bend	6.00	EA

Road Trenching; Assume 3" AC	1,444.00	LF				
3" AC	Pipe Size (FT)	L (ft)		D (ft w/ 3' cover)	Trench W* (ft)	
	0.33		25.13	3.83	3.00	
		Exc (cy) (L X D X W /27)	10.70	3" AC (cy) (L X W)	S4C (cy) (L X W X .5/27)	
				0.70	1.40	
		Base Course (6") (CY)	1.40	Backfill (cy)	Compact (CY)	
				15.88	17.28	

3" AC	0.77	CCY	1.65	ton
tack coat	56.27	LF	14.07	SF
Prime Coat	75.40	SF		
Base Course	1.40	CY	1.90	ton
S4C	1.40	ton	1.88	ton

Wetland Inlet

C-05				
excavate for pipe	306.64	CY	398.63	LCY
Backfill	297.33	CY	327.06	ccy
Dispose	1.03	CY	1.34	LCY
			1.80	ton
Riprap	4.52	CY	9.72	ton
20% Grout	0.90	CY		
80% stones	3.62	cy	7.78	tons
Geotextile	100.00	SF		
Excavation for MH, 4'X4'X5' D	2.00	EA	2.96	CY
Conc MH Base; 1'	1.86	CY	3.85	LCY
Form	25.13	SF		
6" Gravel	1.78	SY		
Compacted Granular Fill below MH Base; 6"	2.36	CY		

Conc Wall		
6" PBC Sleeve	1.00	LF
Grout (annular Space)	0.11	CY
CIP Walls; 1' thk	4.50	CY
Form Walls (inside & out)	157.08	SF
Backfill	304.57	CY

48" Dia precast MH grate w/ 2" bar grating

Pump Shed (Pre-Fab)

6'X8'	1.00	EA

Wetland Outlet to Culvert below Mokuhinia Wy

*Assume ditch upgrades to existing 10'

	Pipe Size (FT)	L (ft)	D (ft w/ 3' cover)	Trench W* (ft)
Conc Culvert				
Trenching (6" pipe cushion & 3' cover)	1.00	300.00	4.50	3.00

Exc (cy)	S4C (cy)	S4C (ton)	Backfill (cy)
150.00	16.67	22.50	123.84

Compact (SF)	lcy
900	161.00

Restore Road, assume 28' W, 4"	84.00	SF	9.33	SY
6" Base Course				

Slide Gate

Reinf Conc Box w/ removable wodden weir boards (stop logs)
2' W boards;

Trash Rack				EA Total	
Assume 12" H stop logs, 2' W	4.00	EA	2'W X 12" H		4.00
Frame	1.00	EA			1.00

Wetland Inlet (from Pump)

From C-01			Road/Sidewalk (sf)	sy	
12" Dia outlet to Existing Ditch	300.00	LF	900.00		100.00
1/4 Bend	4.00	EA			
*Add 3 MH					
Outlet Intake Structure:	1.00	EA			
Drop Outlet					
*Assume 4'H; 11.5'L					
Form:	201.00	SFCA	201.00	Total	
Cure	201.00	SFCA	201.00		
Conc:	0.81	CY			
#4 @ 12" OC	70.00	LF	0.02	ton	
		Add 50% for rest of walls & base			
			0.04	ton	
			0.04	Ton Total	

Landcaping

Topsoil:	None
Liner:	None

Planting	EA	Native Nursery	Pot Size (in)	Tray Size	
kaluha (Bolboschoenus maritimus	5,634.00	2" Rose Pot	2.00	(17"X17") EA	
makaloa (Cyperus laevigatus)	3,514.00	4" Rose Pot	4.00		
ahuawa (Cyperus javanicus	2,621.00	4" Pot	4.00		
akulikuli (Sesuvium portulacastrum)	2,139.00	2" rose Pot	2.00		
ae'ae (Bacopa monnieri)	2,139.00	2" Rose Pot	2.00		
akiaki (Sporobolus virginicus)	2,139.00	72 Plug (tray)			
ohelo kai (Lycium sandwicense)	2,621.00	4" Pot	4.00		30.00
Total Plants	20,807.00				

	17"X17" Flat Qty (EA)		8'W X 8'H X 20'L Del Truck (trips)	Spacing (AE Dwg)
kaluha (Bolboschoenus maritimus		113	2	3' OC
makaloa (Cyperus laevigatus)		141	2	2' OC
ahuawa (Cyperus javanicus		105	2	3' OC
akulikuli (Sesuvium portulacastrum)		43	1	2' OC
ae'ae (Bacopa monnieri)		43	1	2' OC
akiaki (Sporobolus virginicus)	30.00		1	2' OC
ohelo kai (Lycium sandwicense)		105	2	1 Gal
		580	11	Trips

	Delivery of Plants	2	Hr R/T
		22	Hrs Del
Deilvery 50 2" Pot = 17"X17" Flat	Load/Unload Racks Say 1 hr/truck	11	hrs ld/unload truck
25 4" Pot = 17"X17' flat *Per Ethan, plants are max 12" H	Load/Unload Flat Say 1 min/Flat	10	Hrs

Travel Time - Kula - Lahaina	1.00	Hr		
Planting:				
Hole Prep	1	min/plant		
Planting:	2	min/plant		
Total	3	min/plant	0.05	hr/plant
			20,807.00	Plants
	20,807.00	Plants	1,040.35	Hrs
Assume 6 hr days (down time = lunch, breaks, set-up/layout of plants)	6	hrs/day	173.39	days per crew
		4 men crew	43.35	days
	0.75	day	0.19	days
SAY	44.00	days		
Say Racks: 56"W X 21"D X 82" H (incl Casters)				
48SF seedlings, potted plants & flowers				
~Say 6 racks @ 8 SF				
17"X17" Flat	2.006944444	SF/Flat		
Rack SF	8.166666667	Say 8'		
Truck Interior; Say 6'X18'	108	SF		
	13.5	racks per tuck		
Say	12 racks/truck			
	12	Racks	48	SF/Rack
			576	SF racks/truck

Temp Irrigation

Above Ground w/ suface-drip irrigation w/ 3/4' tubing	3.00	acres (min)

Abbreviated Risk Analysis

Mokuhinia TSP (Revised 19 June 13)
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PDT Members
Note: PDT involvement is commensurate with project size and involvement.

PM / Planner:	Athline Clark, POH
Planner:	Athline Clark, POH
Study Manager:	Athline Clark, POH
Contracting:	-
Real Estate:	
Relocations:	-
Archeologist	Kanalei Shun, POH
Engineering & Design:	James Pennaz, POH
Technical Lead:	
Geotech:	-
Hydrology:	-
Civil:	-
Structural:	-
Mechanical:	-
Electrical:	-
Cost Engineering:	Tracy Kazunaga, POH
Construction:	Glenn Kusaka, POH
Operations:	-
AE	Lisa Kettley, CH2MHILL

Abbreviated Risk Analysis

Project (less than $40M): **Mokuhinia TSP (Revised 19 June 13)**
Project Development Stage: **Feasibility (Recommended Plan)**
Risk Category: **Low Risk: Simple Project-No Life Safety**

Total Construction Contract Cost = $ 5,096,456

	CWWBS	Feature of Work		Contract Cost		% Contingency		$ Contingency		Total
	01 LANDS AND DAMAGES	Real Estate	$	1,412,000		18.37%	$	259,399	$	1,671,398.52
1	06 03 WILDLIFE FACILITIES AND SANCTUARIES	1 Mob, Demob, Demo, Prep Work	$	790,254		16.10%	$	127,265	$	917,518.89
2	06 03 WILDLIFE FACILITIES AND SANCTUARIES	2 Buildings, Proj Operations	$	7,060		18.29%	$	1,291	$	8,351.35
3	06 03 WILDLIFE FACILITIES AND SANCTUARIES	3 Water Wells	$	468,142		23.84%	$	111,606	$	579,748.18
4	06 03 WILDLIFE FACILITIES AND SANCTUARIES	4 Fences	$	289,403		16.80%	$	48,611	$	338,014.42
5	06 03 WILDLIFE FACILITIES AND SANCTUARIES	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	$	100,581		16.00%	$	16,097	$	116,677.97
6	06 03 WILDLIFE FACILITIES AND SANCTUARIES	6 Habitat & Feeding Fac, Site, Maint Road	$	79,186		12.42%	$	9,834	$	89,019.96
7	06 03 WILDLIFE FACILITIES AND SANCTUARIES	7 Habitat & Feeding Fac, Site, Excavation	$	2,559,067		16.08%	$	411,372	$	2,970,439.01
8	06 03 WILDLIFE FACILITIES AND SANCTUARIES	8 Habitat & Feeding Fac, Site, Plantings	$	729,359		13.65%	$	99,578	$	828,936.53
9	06 03 WILDLIFE FACILITIES AND SANCTUARIES	9 Post Construction Monitoring	$	61,802		10.70%	$	6,612	$	68,413.93
10	06 03 WILDLIFE FACILITIES AND SANCTUARIES	10Signs	$	11,602		12.52%	$	1,452	$	13,054.47
11			$	-		0.00%	$	-	$	-
12		Remaining Construction Items	$	-	*0.0%*	0.00%	$	-	$	-
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$	758,000		20.57%	$	155,945	$	913,944.82
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$	467,000		17.56%	$	82,027	$	549,026.63

Totals								
Real Estate	$	1,412,000		18.37%	$	259,399	$	1,671,398.52
Total Construction Estimate	$	5,096,456		16.36%	$	833,719	$	5,930,175
Total Planning, Engineering & Design	$	758,000		20.57%	$	155,945	$	913,945
Total Construction Management	$	467,000		17.56%	$	82,027	$	549,027
Total	$	7,733,456			$	1,331,089	$	9,064,545

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Risk Level

Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth						
					Max Potential Cost Growth	**40%**
PS-1	1 Mob, Demob, Demo, Prep Work	Scope of facilities and utilities for demolition based on survey data.	Estimate based on GIS data, TMK records, and real estate investigation; actual areas may differ, but expected to have marginal impact on overall cost.	Possible	Marginal	**1**
PS-2	2 Buildings, Proj Operations	The conceptual design is based on the well house assumed a prefabricated shed. Scope of the well house could be revised once input from the sponsors / Friends of Moku'ula are consulted.	Because the well house will shelter the motor for the submersible pump, it is assumed that the shelter will be small. The shelter cost would not be a big cost item and is assume a 6'X8' prefabricated shed. It is possible this will be refined in the PED phase, which minimally impact the overall cost and schedule.	Likely	Negligible	**1**
PS-3	3 Water Wells	The conceptual design for the electric powered water well & motor is based on assumed ground water levels.	Adjustments in well depth and/or pumping is not likely to affect general design approach or functionality of wetland, but could require design adjustments. The pump size and or well depth could be revised during the PED phase but is expected to marginally impact the overall schedule or cost because a conservative design was used (depth and pump size) to show the maximum depth.	Possible	Marginal	**1**
PS-4	4 Fences	Scope of fence type/design not well defined.	It is possible the sponsor/partner and or regulating agencies may request special fabricated fencing other than chain link fence and gates which would marginally affect the overall scope of the project since the scope for the fencing is small compared to the overall project scope.	Possible	Marginal	**1**

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
PS-5	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	The scope for the outlet culvert assumes the County of Maui will upgrade their Mokuhinia Way ditch next to the project site, however we do not know what their design will be. Good topography is not available at this stage. We do not know what the flow capacity in the ditch which could back up the water into the pond, therefore the pond level would not be controlled.	The project will require the County to complete the upgrades. Coordination will upgrade during the PED phase.. The project will require the open ditch upgrade as part of the PPA agreement prior to PED Phase. Since the current scope does not know what the future County design will be, there is possibility of scope increase to the Wetland outlet to the County ditch . If a second pump for the outlet is added to the pond to control water flows, this could marginally affect the overall scope of the project.	Possible	Marginal	1
PS-6	6 Habitat & Feeding Fac, Site, Maint Road	The scope of the maint path has an assumed length, depth and width. The scope is not affected to increase.	The scope is not likely to change or increase because it is a standard design. The length was determined based on CADD drawings.	Unlikely	Negligible	0
PS-7	7 Habitat & Feeding Fac, Site, Excavation	The scope could increase if the pump test indicates deeper excavation is required to meet habitat goals. Project boundaries are not well defined, and there could be more excavation.	It is possible for scope increase for excavation depth. There is currently enough historical data to corroborate assumed excavation limits, however the Friends of Moku'ula & the Community could change the boundaries of the Island. The extent of the excavation depth would be refined in the PED Phase which could marginally increase the overall scope since the design assume a buffer around the island..	Possible	Marginal	1
PS-8	8 Habitat & Feeding Fac, Site, Plantings	`The scope of plantings is not expected to change.	The species list was determined by the Community and Fish & Wildlife. The planting areas were based on the grading plans and standard plant spacings were used to calculate the quantity of plants. It is unlikely to increase the scope and affect the scope negligible.	Unlikely	Negligible	0

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
PS-9	9 Post Construction Monitoring	Additional monitoring could be required if performance standards are not met.	It is unlikely after construction would change because the project has incorporated an adaptive management approach outlined in the report. The overall impact would be marginal since the monitoring costs are low.	Unlikely	Marginal	0
PS-10	10Signs	No project sign is currently designed and it will have to meet the current County of Maui Historic District Standards.	The cost assumed a permanent project sign cost (rock wall with bonze plaque). The overall scope is unlikely to change but if it does, the impact would be negligible.	Unlikely	Negligible	0
PS-11	0			Unlikely	Negligible	0
PS-12	Remaining Construction Items	Unsurveyed archeological areas below the existing parking lot and Salvation Army Site could affect the conceptual design and delay the construction schedule. Survey to be completed during final design phase.	Refinements are already planned as part of the design phase. Changes to accommodate archeological survey are expected to be minimal. The Salvation Army and parking lot sites are expected to have similar characteristics as other surveyed portion of Loko o Mokuhinia (with the exception of moku, which is already accounted for in the conceptual design.	Possible	Marginal	1
PS-13	Planning, Engineering, & Design	PED cost may increase.	PDT members provided fee quotes for the design phase. It is possible that the planning and engineering cost could increased base on further requirements discovered during this phase which could significantly impact the PED cost and schedule.	Possible	Significant	2

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
PS-14	Construction Management	Inadvertent archaeological impacts could have impact to overall cost and schedule, requiring additional construction management	Cost estimate already includes arch monitor during all ground disturbing activities; it is possible that arch resources could delay project, but cost impacts are expected to be marginal (arch monitor will already by onsite; may require some modification to project boundary to work around resource)	Possible	Marginal	1

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Acquisition Strategy						
					Max Potential Cost Growth	**30%**
AS-1	1 Mob, Demob, Demo, Prep Work	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-2	2 Buildings, Proj Operations	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-3	3 Water Wells	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-4	4 Fences	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
AS-5	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-6	6 Habitat & Feeding Fac, Site, Maint Road	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-7	7 Habitat & Feeding Fac, Site, Excavation	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Unlikely	Marginal	0

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
AS-8	8 Habitat & Feeding Fac, Site, Plantings	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-9	9 Post Construction Monitoring	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-10	10Signs	Contract acquisition strategy is assumed as Small Business.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-11	0			Unlikely	Negligible	0
AS-12	Remaining Construction Items	Any unidentified construction items could result in cost impacts.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
AS-13	Planning, Engineering, & Design	Any unidentified construction items could result in cost impacts.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-14	Construction Management	Acquisition strategy could change, and impact design and solicitation efforts of the PED.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Construction Elements						
					Max Potential Cost Growth	**15%**
CE-1	1 Mob, Demob, Demo, Prep Work	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-2	2 Buildings, Proj Operations	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-3	3 Water Wells	Insufficient well capacity	It is possible the pump tests during commissioning of the well could reveal insufficient capacity. This would require modification of the well to provide the required water and significantly add cost to the construction and delay the construction schedule.	Possible	Significant	2
CE-4	4 Fences	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-5	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-6	6 Habitat & Feeding Fac, Site, Maint Road	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Marginal	0
CE-7	7 Habitat & Feeding Fac, Site, Excavation	Archeological artifacts could uncovered during construction which could shut down the project and impact the construction cost (shut down) and delay the construction completion.	It is unlikely that archeological artifacts are found because there is good evidence to show what was historically there, however, could significantly affect the construction schedule (stop work) or productivity of the excavation work.	Unlikely	Significant	1

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Risk Level

	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
CE-8	8 Habitat & Feeding Fac, Site, Plantings	Soil areas could be unsuitable for selected plantings.	It is possible the soil conditions could be different than anticipated resulting in loss of plants or inability of plants to grow which could increase the cost of the maintenance period and increase the construction cost by modification significantly.	Possible	Significant	2
CE-9	9 Post Construction Monitoring	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-10	10Signs	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-11	0			Unlikely	Negligible	0
CE-12	Remaining Construction Items	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	Major construction items have been identified. There is minimal risk that any additional features would be added.	Unlikely	Negligible	0
CE-13	Planning, Engineering, & Design	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Major construction items have been identified. While it is possible additonal features could be added during the PED phase, there is minimal risk that any additional features would be added to increase design cost.	Possible	Negligible	0
CE-14	Construction Management	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Limited funding has resulted in incomplete designs on similar district projects. It is likely more engineering involvement during construction would impact significantly impact the cost of construction management.	Likely	Marginal	2

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Quantities for Current Scope						
					Max Potential Cost Growth	**20%**
Q-1	1 Mob, Demob, Demo, Prep Work	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-2	2 Buildings, Proj Operations	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-3	3 Water Wells	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Q-4	4 Fences	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-5	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is likely the quantizes would change based on County upgrades to the existing culvert. The project will require the County to complete the upgrades. Coordination will upgrade during the PED phase.. The project will require the open ditch upgrade as part of the PPA agreement prior to PED Phase. Since the current scope does not know what the future County design will be, there is likelihood of scope increase to the Wetland outlet to the County ditch . If a second pump for the outlet is added to the pond to control water flows, this could marginally affect the overall scope of the project.	Likely	Marginal	2

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Q-6	6 Habitat & Feeding Fac, Site, Maint Road	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. Quantities are unlikely to change or increase because it is a standard design for this project. The length was determined based on CADD drawings. There would be marginal increase in cost for the maintenance road.	Unlikely	Marginal	0
Q-7	7 Habitat & Feeding Fac, Site, Excavation	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible for scope increase for excavation depth. There is currently enough historical data to corroborate assumed excavation limits, however the Friends of Moku'ula & the Community could change the boundaries of the Island. The extent of the excavation depth would be refined in the PED Phase which could significantly increase the overall scope. The quantity for drying of soil is based on average depth that water is expected to be encountered, and it was assumed that it would take 3 days to dry the soil prior to hauling to landfill. It is possible there is more wet soil, there would be minimal impact to overall construction schedule since other work could be performed. This would marginally affect the constructions schedule.	Possible	Marginal	1

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Risk Level

	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Q-8	8 Habitat & Feeding Fac, Site, Plantings	As design evolves quantities on current project scope may change due to refinement.	Quantities were based on conceptual design by the AE and provided to the Gov't. The species list was determined by the Community and Fish & Wildlife. The planting areas were based on the grading plans and standard plant spacings were used to calculate the quantity of plants. It is unlikely to increase the quantity and affects to the cost would be negligible since the major cost is the planting labor.	Unlikely	Marginal	0
Q-9	9 Post Construction Monitoring	As design evolves quantities on current project scope may change due to refinement.	It is unlikely after construction would change because the project has incorporated an adaptive management approach outlined in the report. The overall impact would be marginal since the monitoring costs are low.	Unlikely	Marginal	0
Q-10	10Signs	As design evolves quantities on current project scope may change due to refinement.	The quantity assumed a permanent project sign cost (rock wall with bonze plaque). It is possible the quantity would change based on consultations with the sponsor and interested parties, and compliance with the County's historic district standard but it would be a marginal cost to the overall project cost.	Possible	Marginal	1
Q-11	0			Unlikely	Negligible	0

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Q-12	Remaining Construction Items	As design evolves quantities on current project scope may change due to refinement.	Refinements are already planned as part of the design phase. Changes to accommodate archeological survey are expected to be minimal. The Salvation Army and parking lot sites are expected to have similar characteristics as other surveyed portion of Loko o Mokuhinia (with the exception of moku, which is already accounted for in the conceptual design.	Possible	Marginal	1
Q-13	Planning, Engineering, & Design	As design evolves quantities on current project scope may change due to refinement.	PDT members provided fee quotes for the design phase. It is possible that the planning and engineering cost could increased base on further requirements discovered during this phase which could significantly impact the PED cost and schedule.	Possible	Significant	2
Q-14	Construction Management	As design evolves quantities on current project scope may change due to refinement.	Cost estimate already includes arch monitor during all ground disturbing activities; it is possible that arch resources could delay project, but cost impacts are expected to be marginal (arch monitor will already by onsite; may require some modification to project boundary to work around resource)	Possible	Marginal	1

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Specialty Fabrication or Equipment						
					Max Potential Cost Growth	**50%**
FE-1	1 Mob, Demob, Demo, Prep Work	This alternative is straight forward and most of the work in the site work. The only fabricated items are the fences, pumps & motor.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-2	2 Buildings, Proj Operations	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	The project is relatively straight forward and the pump house design (pre-fabricated structure) could be refined to a non-prefab structure. This would impact the cost and schedule minimally since the size of the shelter is small.	Possible	Marginal	1
FE-3	3 Water Wells	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Pump size and capacity were based on conceptual design by the AE and provided to the Gov't. It is possible the pump size/capacity and well depth would be impacted by additional ground water data during the PED phase which could significantly affect the PED cost and schedule.	Possible	Significant	2
FE-4	4 Fences	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	It is possible the sponsor/partner may request special fabricated fencing other than chain link fence which would marginally affect the overall cost of the project since the quantity of fencing is small and the cost small compared to the overall project cost.	Possible	Marginal	1
FE-5	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-6	6 Habitat & Feeding Fac, Site, Maint Road	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-7	7 Habitat & Feeding Fac, Site, Excavation	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-8	8 Habitat & Feeding Fac, Site, Plantings	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
FE-9	9 Post Construction Monitoring	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-10	10Signs	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-11	0			Unlikely	Negligible	0
FE-12	Remaining Construction Items	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Pump size and capacity were based on conceptual design by the AE and provided to the Gov't. It is possible the pump size/capacity and well depth would be impacted by additional ground water data during the PED phase which marginally affect the PED cost and schedule since it is a small cost relative to the overall project.	Possible	Marginal	1
FE-14	Construction Management	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Cost Estimate Assumptions						
					Max Potential Cost Growth	**25%**
CT-1	1 Mob, Demob, Demo, Prep Work	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-2	2 Buildings, Proj Operations	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-3	3 Water Wells	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
CT-4	4 Fences	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-5	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Significant	2
CT-6	6 Habitat & Feeding Fac, Site, Maint Road	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Significant	2
CT-7	7 Habitat & Feeding Fac, Site, Excavation	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Significant	2

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
CT-8	8 Habitat & Feeding Fac, Site, Plantings	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-9	9 Post Construction Monitoring	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-10	10Signs	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The assumption for a small project sign is reasonable since other civil works projects provide for this. While the sign type has not been determined during this phase, it is likely the sign type will change and marginally affect the overall cost of the project.	Possible	Marginal	1
CT-11	0			Unlikely	Negligible	0

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
CT-12	Remaining Construction Items	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	PDT members provided fee quotes for the design phase. It is possible that planning and engineering cost could increase based on further requirements discovered during this phase which could marginally impact the PED cost and schedule.	Possible	Marginal	1
CT-14	Construction Management	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	Construction management cost was obtained from a fee quote provided from the field office who would manage the project based on duration of the project. While it is possible that the scope of the project could change during the PED phase, since a fee quote was obtained, it is expected to marginally affect the CM cost.	Possible	Marginal	1

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	Negligible	Marginal	Significan	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
External Project Risks						
					Max Potential Cost Growth	**20%**
EX-1	1 Mob, Demob, Demo, Prep Work	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-2	2 Buildings, Proj Operations	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
EX-3	3 Water Wells	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-4	4 Fences	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Possible	Marginal	1
EX-5	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Possible	Negligible	0

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
EX-6	6 Habitat & Feeding Fac, Site, Maint Road	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Possible	Marginal	1
EX-7	7 Habitat & Feeding Fac, Site, Excavation	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Possible	Marginal	1
EX-8	8 Habitat & Feeding Fac, Site, Plantings	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The assumption is that the plants will be obtained from a local nursery and they have adequate supply of the plants. Severe weather (i.e. drought) is possible to impact the availability of the quantity of plant and marginally affect the overall construction schedule. It is assumed that the contractor is able to obtain additional plants from other nurseries locacated on othe Hawaiian Islands.	Possible	Marginal	1

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
EX-9	9 Post Construction Monitoring	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in constructing the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Delays in obtaining permits or expiring permits could impact the schedule and cost. Final agreement and signing of the PCA must take place prior to award of the construction contract. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule significantly.	Possible	Marginal	1
EX-10	10Signs	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Possible	Marginal	1
EX-11	0			Unlikely	Negligible	0
EX-12	Remaining Construction Items	External risks such as failure to obtain permits in a timely manner, political risks, delays in signing Project Cooperation Agreement, delays or cancellation of funding sources could impact project costs.	The estimate excludes any added sponsor costs related to O&M cost and is excluded from the TPC. Although it is possible a major increase in the O&M cost to the sponsor could result in re-design in the PED phase, it is marginal the efects would be a major design effort since the project is relatively straightforward.	Possible	Marginal	1

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significan	Critical	Crisis

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
EX-13	Planning, Engineering, & Design	External risks such as political, funding sources could impact project costs over time.	Changes to permitting and biological requirements could result in added coordination and design efforts.	Possible	Marginal	1
EX-14	Construction Management	Severe weather could impact the grading of the site and impact the schedule.	It is possible that unanticipated storms could cause delays to construction, however anticipated weather delays using Guidance from our field personnel were included in the project. This should marginally affect the overall construction schedule.	Possible	Marginal	1

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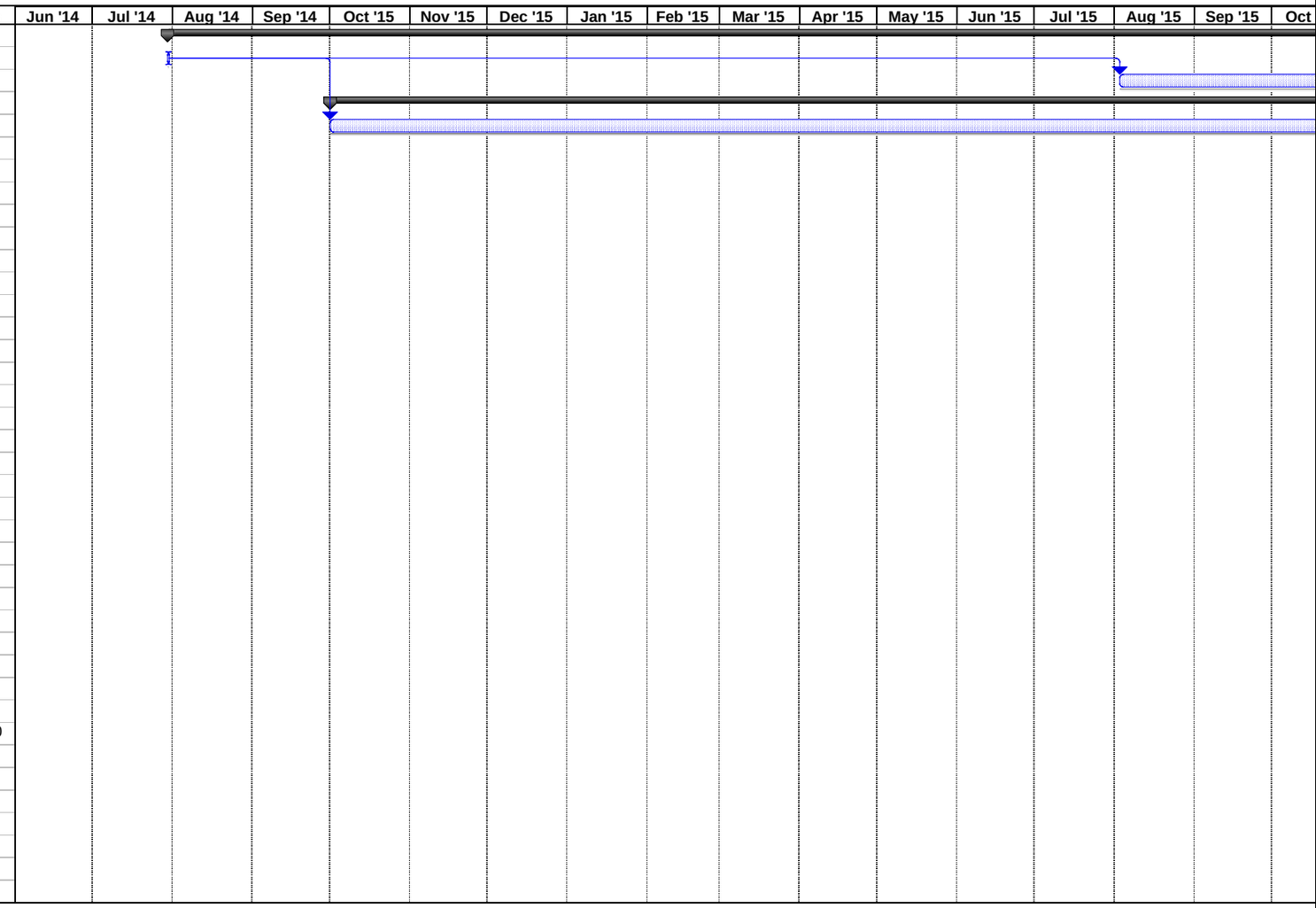
Typical Risk Elements	Potential Risk Areas											
	1 Mob, Demob, Demo, Prep Work	2 Buildings, Proj Operations	3 Water Wells	5 Habitat & Feeding Fac, Site, Wetland Inlet/Outlet	6 Habitat & Feeding Fac, Site, Maint Road	7 Habitat & Feeding Fac, Site, Excavation	8 Habitat & Feeding Fac, Site, Plantings	9 Post Construction Monitoring	10Signs	Remaining Construction Items	Planning, Engineering, & Design	Construction Management
Project Scope Growth	1	1	1	1	1	-	1	-	-	1	2	1
Acquisition Strategy	1	1	1	1	1	1	-	1	1	1	1	1
Construction Elements	-	-	2	-	-	-	1	2	-	-	-	2
Quantities for Current Scope	1	1	1	1	2	-	1	-	-	1	2	1
Specialty Fabrication or Equipment	-	1	2	1	-	-	-	-	-	-	1	-
Cost Estimate Assumptions	1	1	1	1	2	2	2	1	1	1	1	1
External Project Risks	2	2	2	1	-	1	1	1	1	1	1	1

Mokuhinia-TSP

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Mokuhinia - TSP**	**3801.88 days**	**Wed 7/30/14**	**Mon 4/9/29**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	Real Estate Acquisition	352.88 days	Mon 8/3/15	Fri 12/23/16	2
4	**PED Start**	**588 days**	**Wed 10/1/14**	**Wed 2/1/17**	
5	Design	504.88 days	Wed 10/1/14	Fri 9/30/16	2
6	Solicit	3.09 mons	Fri 9/30/16	Tue 1/3/17	5
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6
8	**Construction**	**301 days**	**Wed 2/1/17**	**Wed 4/11/18**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	1 day	Fri 2/24/17	Fri 2/24/17	9SS+14 days
11	Submittals, Permits	4 mons	Mon 2/27/17	Mon 6/19/17	10
12	Contractor Sensitivity Training	3 days	Tue 6/20/17	Thu 6/22/17	11
13	Public Meeting	1 day	Fri 6/23/17	Fri 6/23/17	12
14	Ground Breaking/Blessing Cere	1 day	Mon 6/26/17	Mon 6/26/17	13
15	Mob	2 days	Tue 6/27/17	Wed 6/28/17	14
16	BMPs / Contractor's Storage Are	5 days	Thu 6/29/17	Thu 7/6/17	15
17	Demolition (structures; utilities)	15 days	Fri 7/7/17	Thu 7/27/17	16
18	Clear & Grub	3 days	Fri 7/28/17	Tue 8/1/17	17
19	Core, Well Test, Well drilling	1 mon	Fri 7/28/17	Thu 8/24/17	18SS
20	Excavate for pond	44 days	Fri 8/25/17	Fri 10/27/17	19
21	Drying of damp Soil	70 days	Thu 8/10/17	Mon 11/20/17	19SS+9 days
22	Install Pump	10 days	Tue 11/21/17	Tue 12/5/17	21
23	Load & Haul	70 days	Fri 8/25/17	Wed 12/6/17	20SS
24	Grading Undulated surfaces	10 days	Mon 10/30/17	Mon 11/13/17	20
25	Landscaping	3 wks	Tue 11/14/17	Tue 12/5/17	24
26	Permanment Fencing	20 days	Wed 12/6/17	Wed 1/3/18	25
27	Pump Test & Training	10 days	Thu 12/7/17	Wed 12/20/17	22,23
28	Fill Pond	20 days	Thu 12/21/17	Thu 1/18/18	27
29	Rain Delay	16 days	Wed 12/6/17	Thu 12/28/17	25
30	Cleanup & Demob	10 days	Thu 12/21/17	Thu 1/4/18	27
31	Landcape maintenance	90 days	Wed 12/6/17	Wed 4/11/18	25
32	Construction Complete	0 days	Wed 4/11/18	Wed 4/11/18	31,28,29,26,30
33	**Post Construction Monitoring**	**2606.88 days**	**Fri 4/12/19**	**Mon 4/9/29**	**32**
34	Year 1	239.88 days	Fri 4/12/19	Thu 3/12/20	31FF
35	Year 3	259.88 days	Mon 4/12/21	Fri 4/8/22	34
36	Year 5	257.88 days	Wed 4/12/23	Fri 4/5/24	35
37	Year 7	257.88 days	Mon 4/14/25	Wed 4/8/26	36
38	Year 10	258.88 days	Wed 4/12/28	Mon 4/9/29	37
39	Project complete	0 days	Mon 4/9/29	Mon 4/9/29	38



Mokuhinia - TSP
Lahaina, Maui
Date: Mon 6/10/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-TSP

ID	Task Name	Duration
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24	Grading Undulated surfaces	10 days
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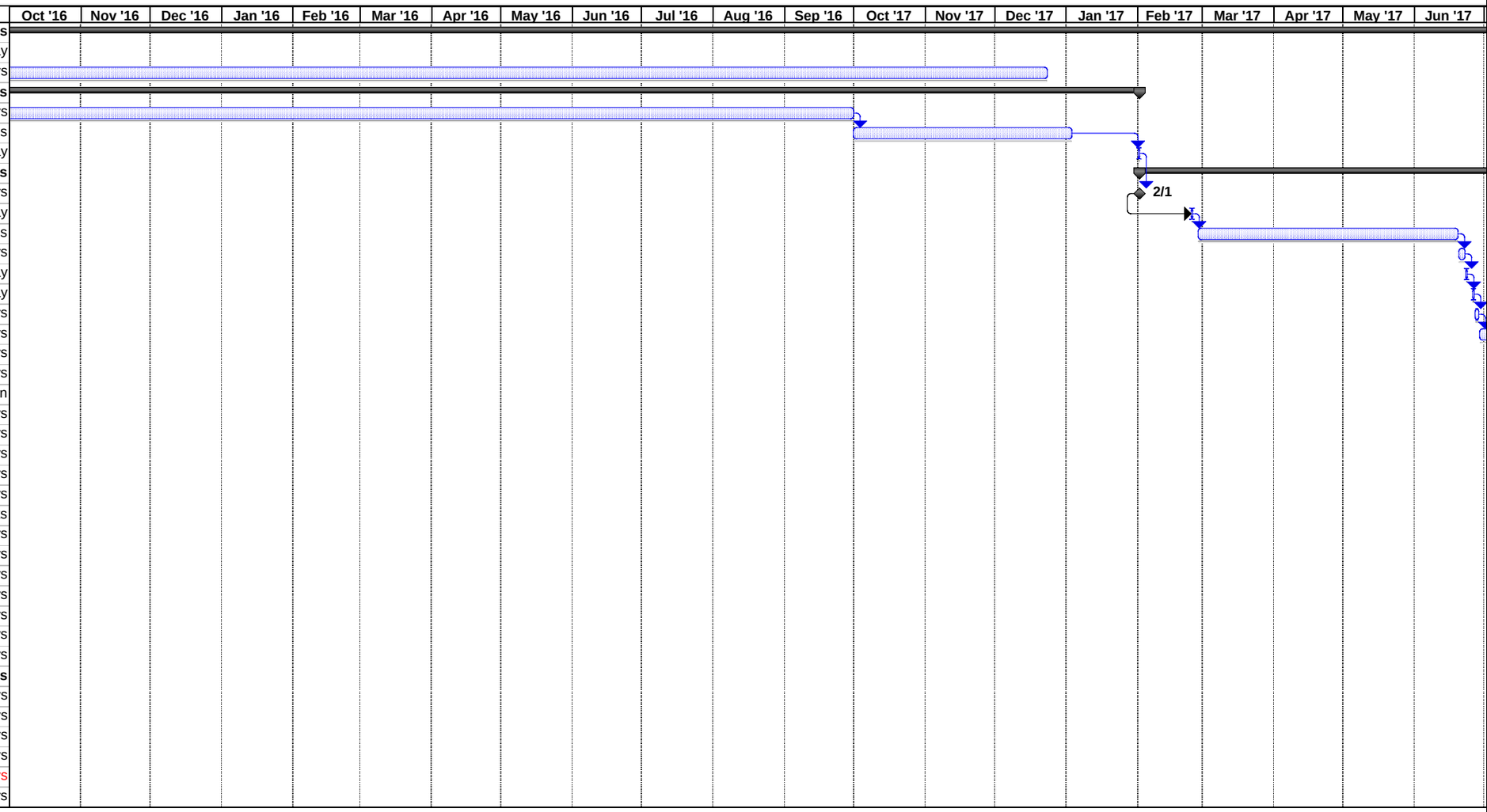
38	Year 10	258.88 days
39	Project complete	0 days



Mokuhinia - TSP
Lahaina, Maui
Date: Mon 6/10/13

Task		Milestone		Rolled Up Critical Task		Split		External MileTask	
Critical Task		Summary		Rolled Up Milestone		External Tasks		Critical Task	
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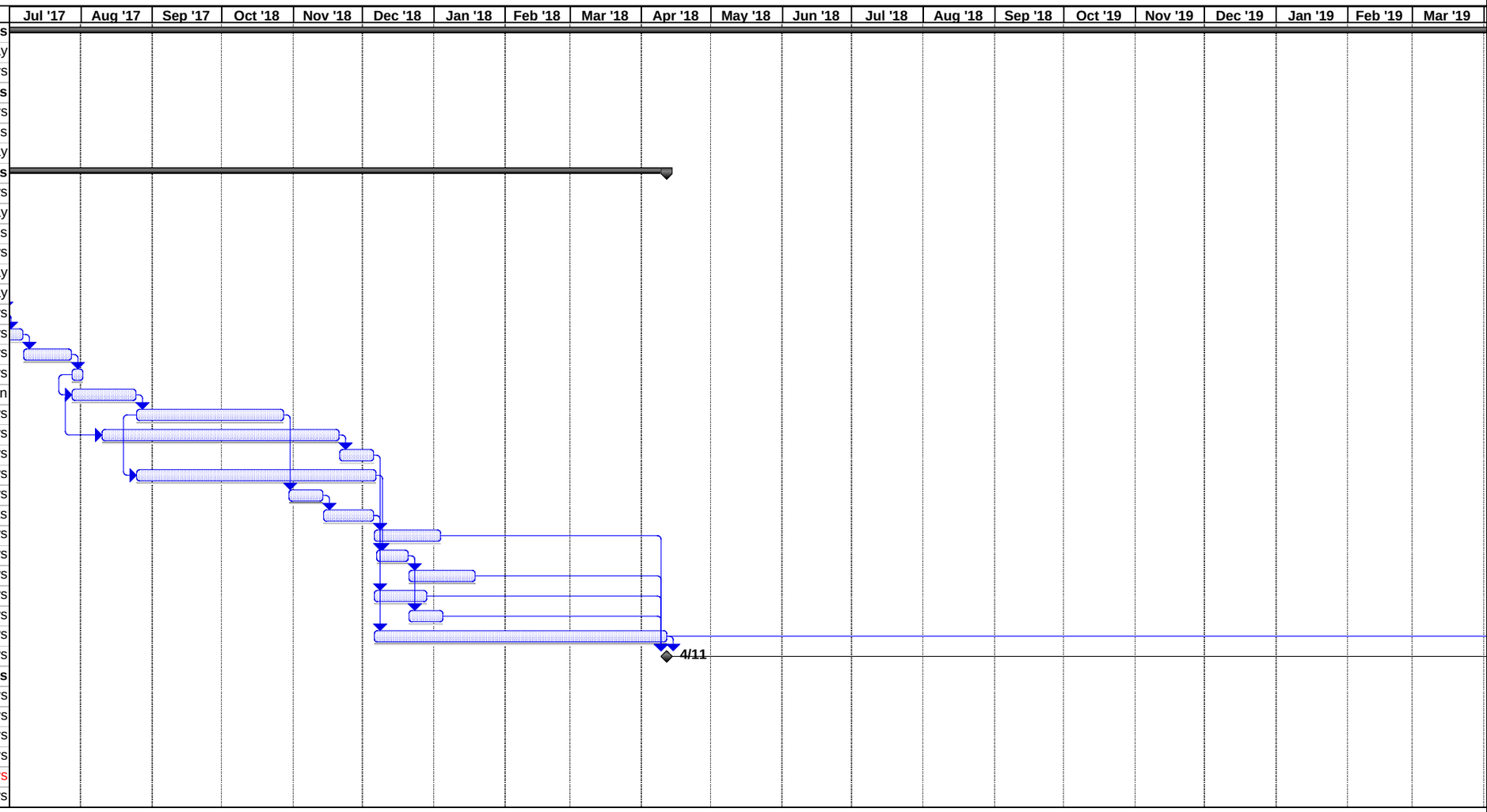

Mokuhinia - TSP
Lahaina, Maui
Date: Mon 6/10/13

Task		Milestone		Rolled Up Critical Task		Split		External MileTask	
Critical Task		Summary		Rolled Up Milestone		External Tasks		Critical Task	
Progress		Rolled Up Task		Rolled Up Progress		Project Summary		Progress	

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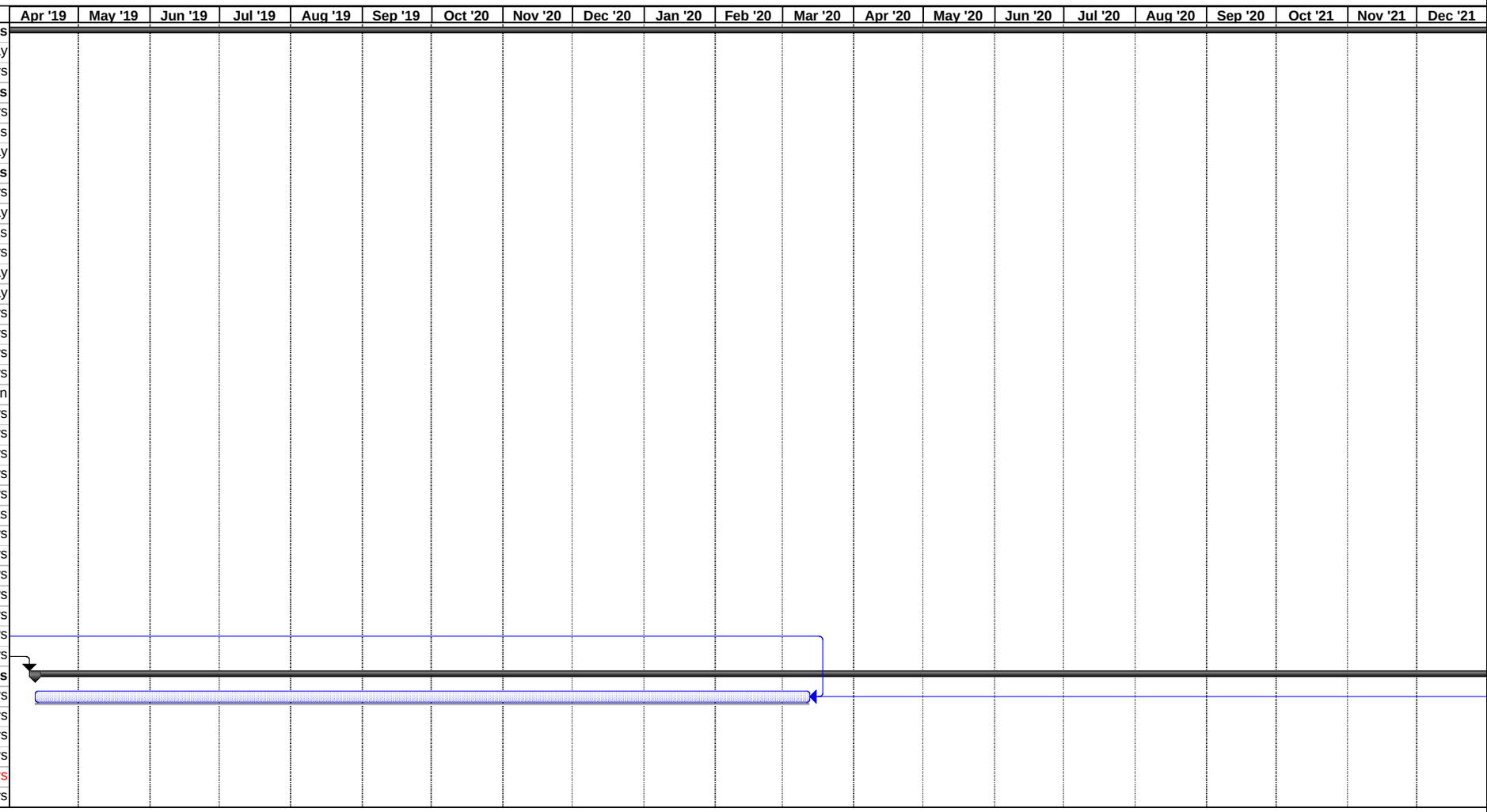

Mokuhinia - TSP
Lahaina, Maui
Date: Mon 6/10/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

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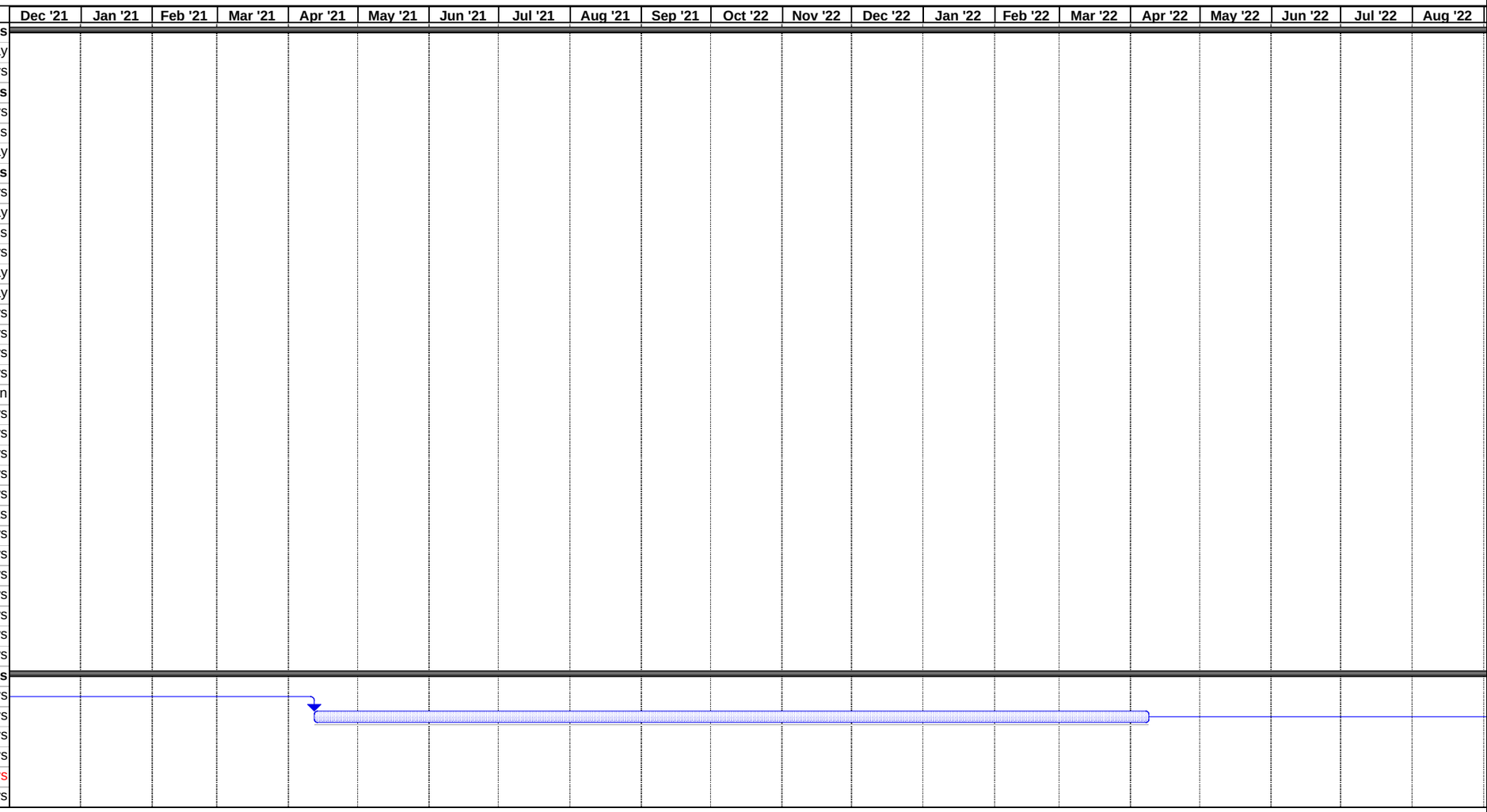

Mokuhinia - TSP
Lahaina, Maui
Date: Mon 6/10/13

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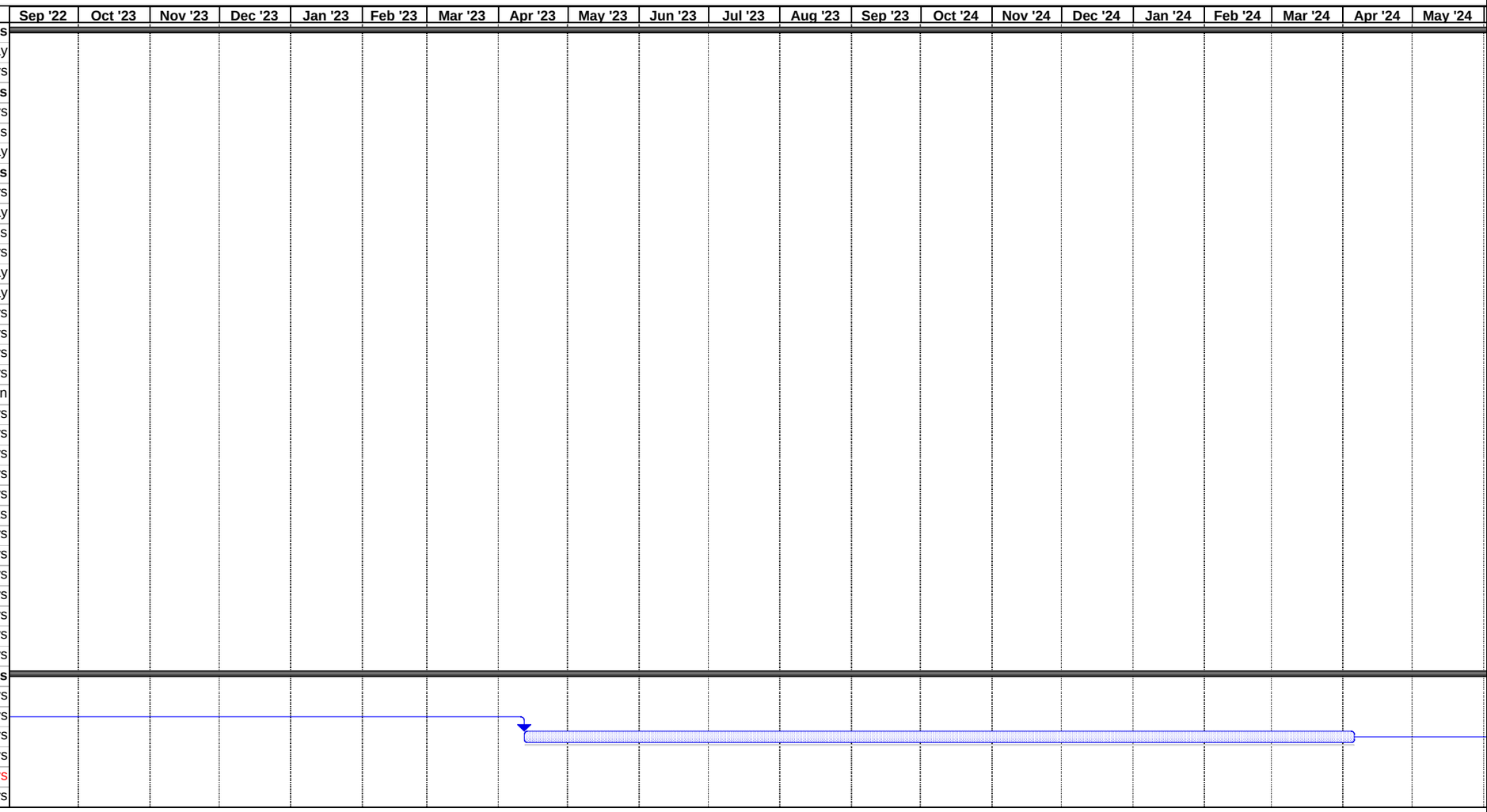

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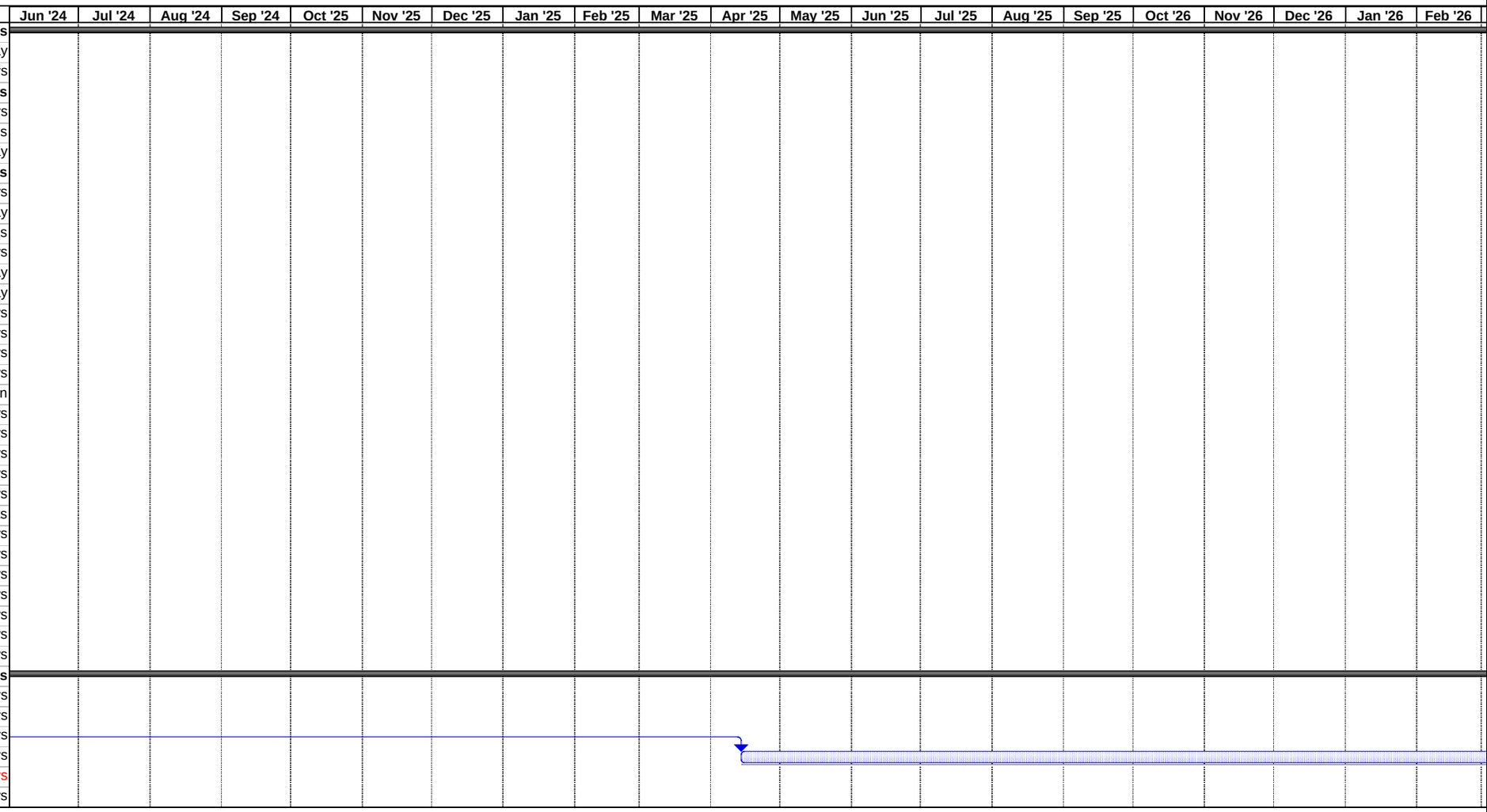

Mokuhinia - TSP
Lahaina, Maui
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Task | Milestone | Rolled Up Critical Task | Split | External MileTask
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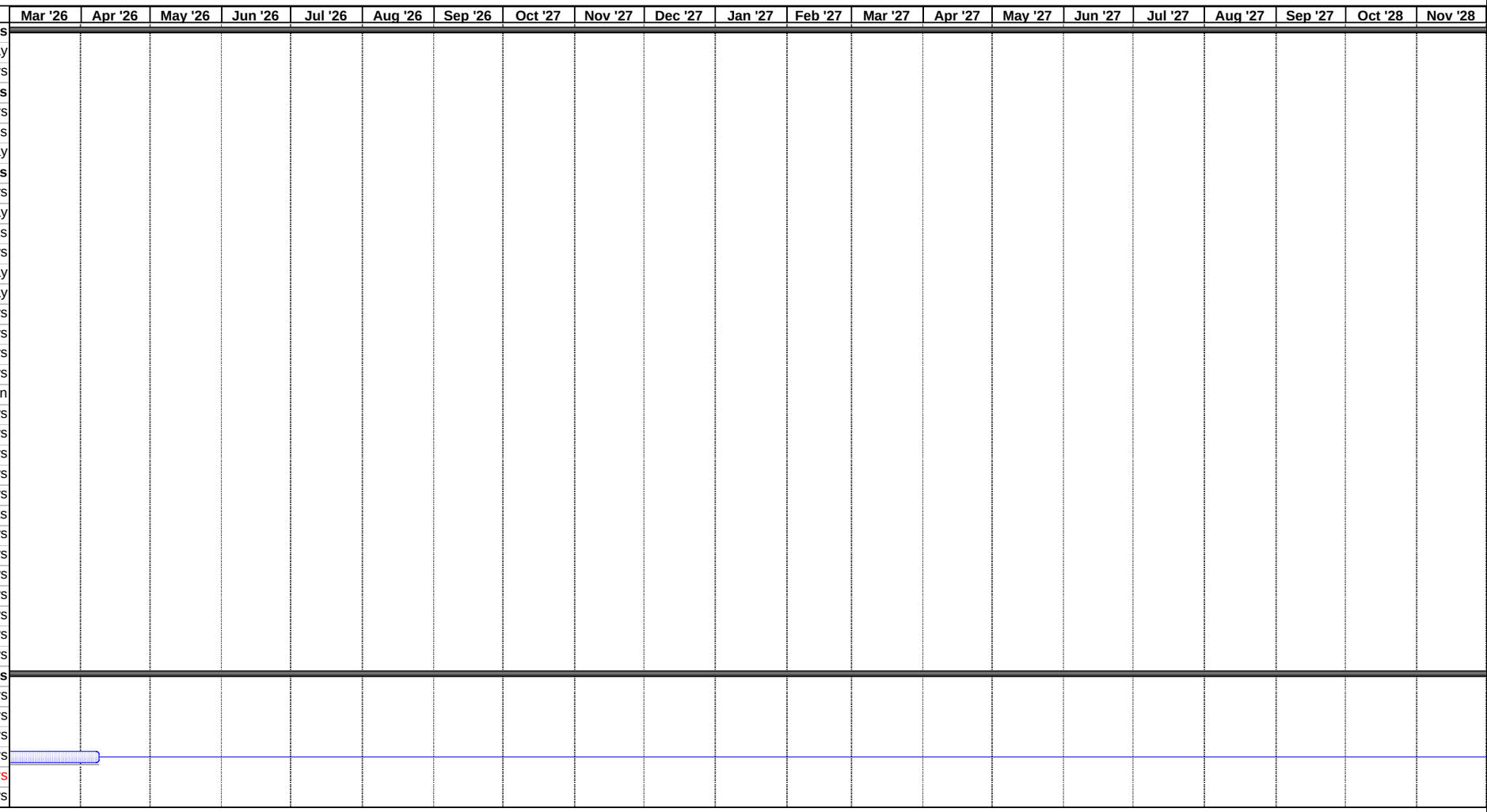

Mokuhinia - TSP
Lahaina, Maui
Date: Mon 6/10/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Mokuhinia , Alt 4 (Rev 15 Jul 13)** DISTRICT: **Honolulu District** PREPARED: **6/14/2013**

PROJECT NO:

LOCATION: **Lahaina, Maui** POC: **CHIEF, COST ENGINEERING, Gary F. Yamauchi**

This Estimate reflects the scope and schedule in report; Feasibility Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: 10/1/2012 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*O*
06	FISH & WILDLIFE FACILITIES	$4,192	$762	18%	$4,954	3.9%	$4,357	$792	$5,148			$4,567	$830	$5,397
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$61	$11	18%	$72	3.9%	$63	$12	$75			$75	$14	$89
	CONSTRUCTION ESTIMATE TOTALS:	$4,253	$773		$5,026	3.9%	$4,420	$803	$5,223			$4,642	$844	$5,486
01	LANDS AND DAMAGES	$1,412	$259	18%	$1,671	3.9%	$1,467	$270	$1,737			$1,510	$277	$1,787
22	FEASIBILITY STUDY (CAP studies)									$1,236				$1,236
30	PLANNING, ENGINEERING & DESIGN	$758	$148	20%	$906	5.5%	$799	$156	$956			$835	$163	$998
31	CONSTRUCTION MANAGEMENT	$467	$91	20%	$558	5.5%	$493	$96	$589			$547	$107	$653
	PROJECT COST TOTALS:	$6,890	$1,272	18%	$8,162		$7,180	$1,325	**$8,505**	$1,236		$7,533	$1,391	$10,160

Mandatory by Regulation	CHIEF, COST ENGINEERING, Gary F. Yamauchi	ESTIMATED FEDERAL COST:	65%	**$5,801**
Mandatory by Regulation	PROJECT MANAGER, Athline Clark	ESTIMATED NON-FEDERAL COST:	35%	**$3,124**
Mandatory by Regulation	CHIEF, REAL ESTATE, Stephen N. Cayetano	FEASIBILITY FEDERAL COST:		**$668**
		FEASIBILITY NON-FEDERAL COST:		**$568**
	CHIEF, PROJECT MGT, Anthony J. Paresa	**ESTIMATED TOTAL PROJECT COST:**		**$10,160**
	CHIEF, ENGRG & CONSTR, Todd C. Barnes			
	CHIEF, Civil Works Tech Branch, Michael F. Wong			
	CHIEF, CONSTRUCTION, Louis Muzzarini, Jr.			
	CHIEF, CONTRACTING, R. David Williams			
	CHIEF, PP-P, Roxane Iseri			
	CHIEF, Programs Mgt Branch, Roxane E. Iseri			

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Mokuhinia , Alt 4 (Rev 15 Jul 13)
LOCATION: Lahaina, Maui
This Estimate reflects the scope and schedule in report; Feasibility Study

DISTRICT: Honolulu District
POC: CHIEF, COST ENGINEERING, Gary F. Yamauchi
PREPARED: 6/14/2013

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 5/31/2013 Effective Price Level: 10/1/2012				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$4,192	$762	18.2%	$18	3.9%	$4,357	$792	$5,148	2017Q3	4.8%	$4,567	$830	$5,397
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$61	$11	18.2%	$72	3.9%	$63	$12	$75	2024Q1	18.5%	$75	$14	$89
	CONSTRUCTION ESTIMATE TOTALS:	$4,253	$773	18.2%	**$5,026**		$4,420	$803	$5,223			$4,642	$844	$5,486
01	LANDS AND DAMAGES	$1,412	$259	18.4%	$1,671	3.9%	$1,467	$270	$1,737	2016Q3	2.9%	$1,510	$277	$1,787
30	PLANNING, ENGINEERING & DESIGN													
1.76%	Project Management	$75	$15	19.6%	$90	5.5%	$79	$15	$95	2016Q1	4.2%	$82	$16	$99
6.00%	Planning & Environmental Compliance	$255	$50	19.6%	$305	5.5%	$269	$53	$322	2016Q1	4.2%	$280	$55	$335
6.65%	Engineering & Design	$283	$55	19.6%	$338	5.5%	$298	$58	$357	2016Q1	4.2%	$311	$61	$372
2.00%	Engineering Tech Review ITR & VE	$85	$17	19.6%	$102	5.5%	$90	$18	$107	2016Q1	4.2%	$93	$18	$112
0.82%	Contracting & Reprographics	$35	$7	19.6%	$42	5.5%	$37	$7	$44	2016Q1	4.2%	$38	$8	$46
	Engineering During Construction			19.6%										
0.59%	Planning During Construction	$25	$5	19.6%	$30	5.5%	$26	$5	$32	2017Q3	11.0%	$29	$6	$35
	Project Operations			19.6%										
31	CONSTRUCTION MANAGEMENT													
9.80%	Construction Management	$417	$82	19.6%	$499	5.5%	$440	$86	$526	2017Q3	11.0%	$488	$95	$584
	Project Operation:			19.6%										
1.18%	Project Management	$50	$10	19.6%	$60	5.5%	$53	$10	$63	2017Q3	11.0%	$59	$11	$70
	CONTRACT COST TOTALS:	$6,890	$1,272		**$8,162**		$7,180	$1,325	$8,505			$7,533	$1,391	**$8,924**

Mokuhinia-Alt4rev(13June13)

Estimated by	T. Kazunaga
Designed by	CH2MHILL
Prepared by	T. Kazunaga
Preparation Date	5/31/2013
Effective Date of Pricing	5/31/2013
Estimated Construction Time	Days

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Description	ContractCost
Contract Cost Summ (ECC)	**4,253,025.46**
06 Fish and Wildlife Facilities	**4,253,025.46**
0603 Wildlife Facilities & Sanctuary	**4,253,025.46**
Mob, Demob, Demo & Preparatory Work	**662,622.51**
060371 Fences & Revetment	**908,236.27**
060373 Habitat and Feeding Facilities	**2,621,016.80**
Monitoring After Construction	**61,149.87**

Alternative 4 Quantity Take-Off

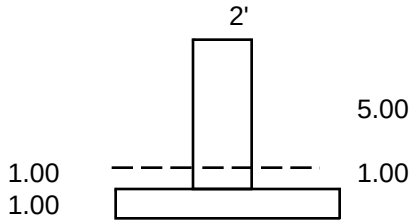
*Revised 14 Jan 13 per new QTO from AE

Site Prep			
staging Area	40,289.00	SF	
Constr Fence	2,675.00	LF	
Constr. Entrance	1.00	EA	
Erosion Control	2,675.00	LF	
Moku'ula Exclusion Fence around perimeter (buffer)	1,250.00	LF	
Archeologist (on-site during Construction)	3.00	mo	
Demo:			
FOM parking lot (entire)	40289	sq ft	
FOM parking lot (excluding Moku`ula)	13971	sq ft	
NE parking lot	10654	sq ft	
NW parking lot	9920	sq ft	
Tennis court (west)	15279	sq ft	
Tennis court (east)	14966	sq ft	
Basketball court	6395	sq ft	
Bathroom	850	sq ft	
Total Parking Demo	34,545.00	sf	
Total Tennis Ct Demo	30,245.00	SF	
2 Wooden Bldg w/ Mtl Roof & Conc Foundation	2,388.00	SF	
Wood Frame Bldg w/ Composition roof & Wooden Pier Foundation	1,116.00	SF	
Cut/Cap, Remove Utilities			
Water	3.00	EA	
Sewer	3.00	EA	
U/G Power	3	EA	
Misc (Court Fences, BB Fences, Lights, Misc utility boxes)	1.00	LS	
Grading	SF	SY	
Wetland Bottom	143,781.00	15,975.67	
Wetland Slope	122,970.00	13,663.33	
Total Excavation	39,803.00	CY	
	4.03		
Compaction	5,927.80	ECY	
Microtopography	29,639.00	SY	
Fine Grading	2.00	wk	
Excavation	39,803.00	CY	(from AE)
Assume Dispose rocks/Dirt >6" @ 50%; 1.34 tons/cy			

De-Water	6.00	wks @ 2'
		From AE
Liner:	None	

Revetment:

Conc/Rock reveetment w/		
buried fooding	1,100.00	LF
lava rock façade	1,100.00	lf
Ht (see Lisa's email 15 Jan 2013)	5.00	Ft



	H (above Gnd) (Ft)	W(ft)	L (ft)	Face SF	CSA
Vert Wall	5.00	2.00	1,100.00	11,000.00	10
Footing	1.00	4.00	1,100.00	1,100.00	4
Vert	0.50	2.00	1,100.00	1,100.00	1

Formwork	13,200.00	SF			
Conc	611.11	cy	5% waste	642.00	cy
Reinf; Assume #4 @ 12" OC	9,900.00	LF	3.31	tons	5% waste
Curing	16,500.00	SF			
Lava Rock Façade	13,200.00	SF	162.80	cy	301.18
Grout	2,640.00	SF	32.56	cy	
Excavate for Footing	325.93	ECY			
Backfill	81.48	ECY	89.63	ccy	
Dispose	236.30	CY	1.34	tons/cy	316.64

Maint Path (grvl rd)

12" Gravel	400.00	LF	16.92	ccy
Assume 12'Wide				
Geotextile	44.44	SY	48.89	SY (10% Waste)

Surface Wter pump (aerator)	1.00	EA

Fence

4'H CLF	2,775.00	LF		
Gate	2.00			
Footing	278.00	EA	0.07	CY
conc	20.59	CY		

Culvert below Mukuhinia Wy

Conc Culvert	10.00	LF			
Trenching	50.00	lf	37.50	cy	48.75
30" HDPE	50.00	LF			

Patch trench		225.00	SF		25.00		
Backfill		22.11	CY		24.32	CCY	31.62
Dispose		15.39	cy		20.62	tons	
Slide Gate:							
Hydrogate SS Fab Slide Gate, non-self contained; 30"X36"		1.00	EA				
Landcaping							
	24	2.00	ac		87,120.34	sf	1,613.34
Planting		21,781.00	EA				
Kaluha		4,356.20	EA				
Makaloa		4,356.20	EA				
Ahuawa		4,356.20	EA				
Akulikuli		4,356.20	EA				
ae'ae		4,356.20	EA				
Total Plants		21,781.00	EA	Say		5.00	min/plant
		1,815.08	HR				

3.47 tons

tons

tons

LCY

LCY

cy

Abbreviated Risk Analysis

Mokuhinia (Alt 4) (Revised15 Jul13)

Feasibility (Alternatives)

Meeting Date: 17-Jan-13

PDT Members

Note: PDT involvement is commensurate with project size and involvement.

PM / Planner:	Athline Clark
Study Manager:	Athline Clark
Contracting:	-
Real Estate:	Mike Sakai
Relocations:	-
OTHER:	-
Engineering & Design:	Lisa Kettley
Technical Lead:	Lisa Kettley
Geotech:	-
Hydrology:	-
Civil:	-
Structural:	-
Mechanical:	-
Electrical:	-
Cost Engineering:	Tracy Kazunaga
Construction:	-
Operations:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-

Abbreviated Risk Analysis

Project (less than $40M): **Mokuhinia (Alt 4) (Revised15 Jul13)**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Low Risk: Simple Project-No Life Safety**

Total Construction Contract Cost = $ 4,253,025

	CWWBS	Feature of Work		Contract Cost		% Contingency		$ Contingency		Total
	01 LANDS AND DAMAGES	Real Estate	$	1,412,000		18.37%	$	259,384	$	1,671,384.40
1	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Mob, Semob, Demo, Prep Work	$	662,623		20.03%	$	132,710	$	795,333.21
2	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Fences & Revetment	$	908,235		18.10%	$	164,430	$	1,072,664.61
3	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Habitat & Feeding Facilities	$	2,621,017		17.73%	$	464,753	$	3,085,770.35
4	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Monitoring After Construction	$	61,150		18.10%	$	11,071	$	72,220.78
5						0.00%	$	-	$	-
6						0.00%	$	-	$	-
7						0.00%	$	-	$	-
8						0.00%	$	-	$	-
9						0.00%	$	-	$	-
10						0.00%	$	-	$	-
11			$	-		0.00%	$	-	$	-
12		Remaining Construction Items	$	-	0.0%	0.00%	$	-	$	-
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$	758,000		19.56%	$	148,300	$	906,299.58
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$	467,000		19.56%	$	91,367	$	558,366.63

Totals								
Real Estate	$	1,412,000		18.37%	$	259,384	$	1,671,384.40
Total Construction Estimate	$	4,253,025		18.17%	$	772,964	$	5,025,989
Total Planning, Engineering & Design	$	758,000		19.56%	$	148,300	$	906,300
Total Construction Management	$	467,000		19.56%	$	91,367	$	558,367
Total	$	6,890,025			$	1,272,015	$	8,162,040

Mokuhinia (Alt 4) (Revised15 Jul13)
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 17-Jan-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth						
					Max Potential Cost Growth	**40%**
PS-1	Mob, Semob, Demo, Prep Work	Scope of facilities and utilites for demolition not well defined.	Estimate based on GIS data, TMK records, and real estate investigation; actual areas may differ, but expected to have marginal impact on cost	Possible	Marginal	1
PS-2	Fences & Revetment	Scope of fence type/design not well defined.	Cost for fence is consistent with anticipated range of design; cost for installation revetments accounts for dewatering.	Possible	Marginal	1
PS-3	Habitat & Feeding Facilities	Project scope increases due to necessary changes in design of habitat.	Monitoring after construction to verify the system is working could find that the project is not achieving anticipated benefits. In particular, inadequate groundwater levels could require additional excavation or pumping (as conceptual design is based on limited data and generic assumptions); this may require future separate contract to modify the system.	Unlikely	Negligible	0

PS-4	Monitoring After Construction	Monitoring after construction to verify the system is working could find that the water quality, hydraulogy and vegetation are not achieving Habitat Unit benefits. This may require future separate contract to modify the system.	Plan to conduct aquifer pump tests during final design phase; with design refinements during final design phase based on results of aquifer pump test as risk management strategy. It is unlikely to happen but could significantly increase the scope of the project.	Unlikely	Significant	**1**
PS-5	0			Unlikely	Negligible	**0**
PS-6	0			Unlikely	Negligible	**0**
PS-7	0			Unlikely	Negligible	**0**
PS-8	0			Unlikely	Negligible	**0**
PS-9	0			Unlikely	Marginal	**0**

PS-12	Remaining Construction Items	Unsurveyed archeological areas below the existing parking lot and Salvation Army Site could affect the conceptual design and delay the construction schedule. Survey to be completed during final design phase.	Refinements are already planned as part of the design phase. Changes to accommodate archeolocal survey are expectied to be minimal. The Salvation Army and parking lot sites are expected to have similar charcteristics as other surveyted portion of Loko o Mokuhinia (with the exception of moku, which is already accounted for in the conceptual design.	Possible	Marginal	**1**
PS-13	Planning, Engineering, & Design	PED costs are estimated and may not reflect actual PED costs	Fee quotes were used for PED costs. It is possible further refinements in the PED phase would increase, but it is expected to marginally affect the overall PED cost since most of the PED features were costed.	Possible	Marginal	**1**
PS-14	Construction Management	Inadvertent archaeological impacts could have impact to overall cost and schedule, requiring additional construction management	Cost estimate already includes arch monitor during all ground disturbing activities; it is possible that arch resources could delay project, but cost impacts are expected to be marginal (arch monitor will already by onsite; may require some modification to project boundary to work around resource)	Possible	Marginal	**1**

Acquisition Strategy

					Max Potential Cost Growth	30%
AS-1	Mob, Semob, Demo, Prep Work	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower	Likely	Marginal	2
AS-2	Fences & Revetment	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-3	Habitat & Feeding Facilities	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-4	Monitoring After Construction	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1

AS-5	0			Unlikely	Negligible	**0**
AS-6	0			Unlikely	Marginal	**0**
AS-7	0			Unlikely	Marginal	**0**
AS-8	0			Unlikely	Marginal	**0**
AS-9	0			Unlikely	Marginal	**0**
AS-12	Remaining Construction Items	Any unidentified construction items could result in cost impacts.	he reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	**1**

AS-13	Planning, Engineering, & Design	Acquisition strategy could change, and impact design and solicitation efforts of the PED.	he reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	**1**
AS-14	Construction Management	Acquisition strategy could affect the construction management effort.	he reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	**1**

Construction Elements

					Max Potential Cost Growth	15%
CE-1	Mob, Semob, Demo, Prep Work	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-2	Fences & Revetment	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-3	Habitat & Feeding Facilities	Excavation could impact arch resources, which could require adjustments during construction	The project cost items are simple. Excavation will be by shallow lifts. By using smaller lifts, unexpected cultural artifacts will have less chance to be damaged. Similar projects (Kawainui Marsh) had no major problems of excavation in shallow lifts. Shallow excavation has been accounted for in the project duration period. No special equipment is required for shallow excavation. The risk is likely low.	Possible	Marginal	1
CE-4	Monitoring After Construction	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	Monitoring will be on-going during 5 years after construction is completed. If funds are not available, delays in the findings will result in possible Habitat Unit benefits not achieved. There could be risks that a design deficiency is encountered, however the likelihood is low and the impact marginal since reasonable assumptions were based on georeference historical maps an other information.	Unlikely	Negligible	0
CE-5	0			Unlikely	Negligible	0

CE-6	0			Unlikely	Negligible	**0**
CE-7	0			Unlikely	Negligible	**0**
CE-8	0			Unlikely	Negligible	**0**
CE-9	0			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	Major construction items have been identified. There is minimal risk that any additional features would be added.	Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Limited funding has resulted in incomplete designs on similar district projects. There is every likelihood of more PED involvement during construction.	Likely	Marginal	**2**
CE-14	Construction Management	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Limited funding has resulted in incomplete designs on similar district projects. There is every likelihood of more construction management involvement related to RFIs, mods and claims.	Likely	Marginal	**2**

Quantities for Current Scope

					Max Potential Cost Growth	20%
Q-1	Mob, Semob, Demo, Prep Work	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-2	Fences & Revetment	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-3	Habitat & Feeding Facilities	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-4	Monitoring After Construction	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-5	0			Unlikely	Negligible	0
Q-6	0			Unlikely	Negligible	0
Q-7	0			Unlikely	Negligible	0

Q-8	0			Unlikely	Negligible	**0**
Q-9	0			Unlikely	Negligible	**0**
Q-12	Remaining Construction Items	As design evolves quantities on current project scope may change.	Major quantities were based on conceptual design by the AE and provided to the Gov't. The project is relatively straight forward except for any unforeseen excavation quantities found during construction of the project which would impact the construction schedule and cost. It is possible but marginal any impact would occur in the PED phase.	Possible	Marginal	**1**
Q-13	Planning, Engineering, & Design	As design evolves quantities on current project scope may change.	Major quantities were based on conceptual design by the AE and provided to the Gov't. The project is relatively straight forward except for any unforeseen excavation quantities found during construction of the project which would impact the construction schedule and cost. It is possible but marginal any impact would occur in the PED phase.	Possible	Marginal	**1**
Q-14	Construction Management	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	**1**

Specialty Fabrication or Equipment

					Max Potential Cost Growth	50%
FE-1	Mob, Semob, Demo, Prep Work	This alternative is straight forward and most of the work in the site work. The only fabricated items are the fences, pumps and solar panels.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-2	Fences & Revetment	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-3	Habitat & Feeding Facilities	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-4	Monitoring After Construction	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-5	0			Unlikely	Negligible	0
FE-6	0			Unlikely	Negligible	0
FE-7	0			Unlikely	Negligible	0
FE-8	0			Unlikely	Negligible	0

FE-9	0			Unlikely	Negligible	**0**
FE-12	Remaining Construction Items	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	**0**
FE-13	Planning, Engineering, & Design	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	**0**
FE-14	Construction Management	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	**0**

Cost Estimate Assumptions

					Max Potential Cost Growth	25%
CT-1	Mob, Semob, Demo, Prep Work	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-2	Fences & Revetment	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1

CT-3	Habitat & Feeding Facilities	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	**1**
CT-4	Monitoring After Construction	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	**1**
CT-5	0			Unlikely	Negligible	**0**

CT-6	0			Unlikely	Negligible	**0**
CT-7	0			Unlikely	Negligible	**0**
CT-8	0			Unlikely	Negligible	**0**
CT-9	0			Unlikely	Negligible	**0**
CT-12	Remaining Construction Items	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	**1**
CT-13	Planning, Engineering, & Design	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	**1**

CT-14	Construction Management	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	**1**

External Project Risks

					Max Potential Cost Growth	20%
EX-1	Mob, Semob, Demo, Prep Work	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-2	Fences & Revetment	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2

EX-3	Habitat & Feeding Facilities	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	**2**
EX-4	Monitoring After Construction	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	**2**
EX-5	0			Unlikely	Negligible	**0**
EX-6	0			Unlikely	Negligible	**0**
EX-7	0			Unlikely	Negligible	**0**

EX-8	0			Unlikely	Negligible	**0**
EX-9	0			Unlikely	Negligible	**0**
EX-12	Remaining Construction Items	External risks such as political, funding sources could impact project costs over time.	The estimate excludes any added sponsor costs related to O&M cost and is excluded from the TPC. Any increase in the O&M cost to the sponsor could result in re-design in the PED phase.	Possible	Significant	**2**
EX-13	Planning, Engineering, & Design	External risks such as political, funding sources could impact project costs over time.	Changes to permitting and biological requirements could result in added coordination and design efforts.	Possible	Marginal	**1**
EX-14	Construction Management	External risks such as political, funding sources could impact project costs over time.	Assuming design is 100% complete upon award, the only impact may be added coordination of external requirements occurring during course of construction and potential design changes resulting in modifications.	Possible	Marginal	**1**

Mokuhinia (Alt 4) (Revised15 Jul13)
Feasibility (Alternatives)
Abbreviated Risk Analysis

Typical Risk Elements	Potential Risk Areas											
	Mob, Semob, Demo, Prep Work	Fences & Revetment	Habitat & Feeding Facilities	Monitoring After Construction	0	0	0	0	0	Remaining Construction Items	Planning, Engineering, & Design	Construction Management
Project Scope Growth	1	1	-	1	-	-	-	-	-	1	1	1
Acquisition Strategy	2	1	1	1	-	-	-	-	-	1	1	1
Construction Elements	-	-	1	-	-	-	-	-	-	-	2	2
Quantities for Current Scope	1	1	1	1	-	-	-	-	-	1	1	1
Specialty Fabrication or Equipment	-	-	-	-	-	-	-	-	-	-	-	-
Cost Estimate Assumptions	1	1	1	1	-	-	-	-	-	1	1	1
External Project Risks	2	2	2	2	-	-	-	-	-	2	1	1

Mokuhinia, Alt 4

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7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6
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9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
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11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
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20	Drying Soil	60 days	Wed 7/5/17	Tue 9/26/17	19SS
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26	Rain Delay	5 days	Wed 11/1/17	Tue 11/7/17	25,20
27	Cleanup & Demob	5 days	Wed 11/8/17	Tue 11/14/17	26
28	Construction Complete	0 days	Tue 11/14/17	Tue 11/14/17	27,21,22
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32	Year 5	262.88 days	Wed 11/16/22	Fri 11/17/23	31
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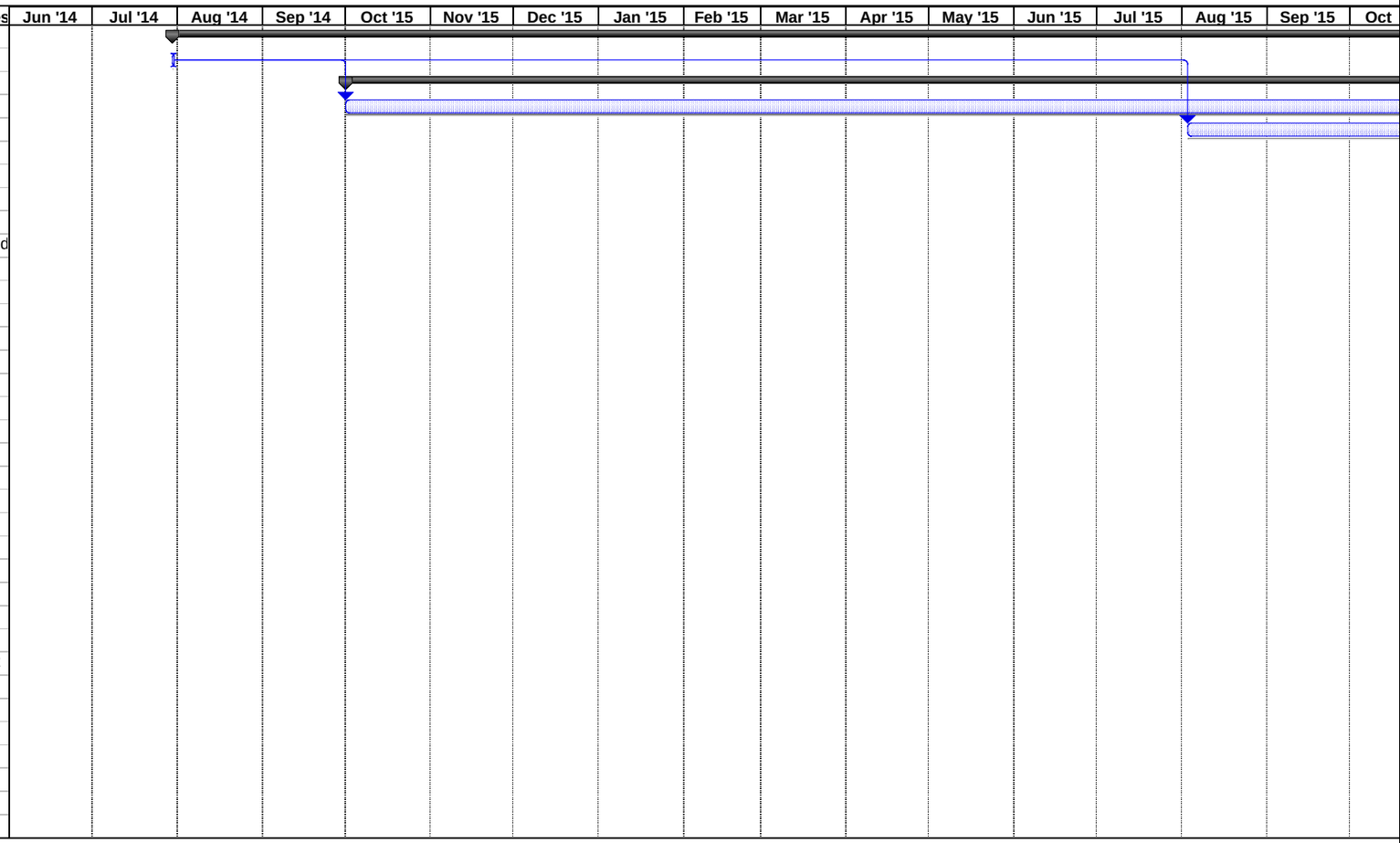
34	Year 10	263.88 days	Tue 11/16/27	Fri 11/17/28	33
35	Project complete	0 days	Fri 11/17/28	Fri 11/17/28	34



Mokuhinia, Alt 4
Lahaina, Maui
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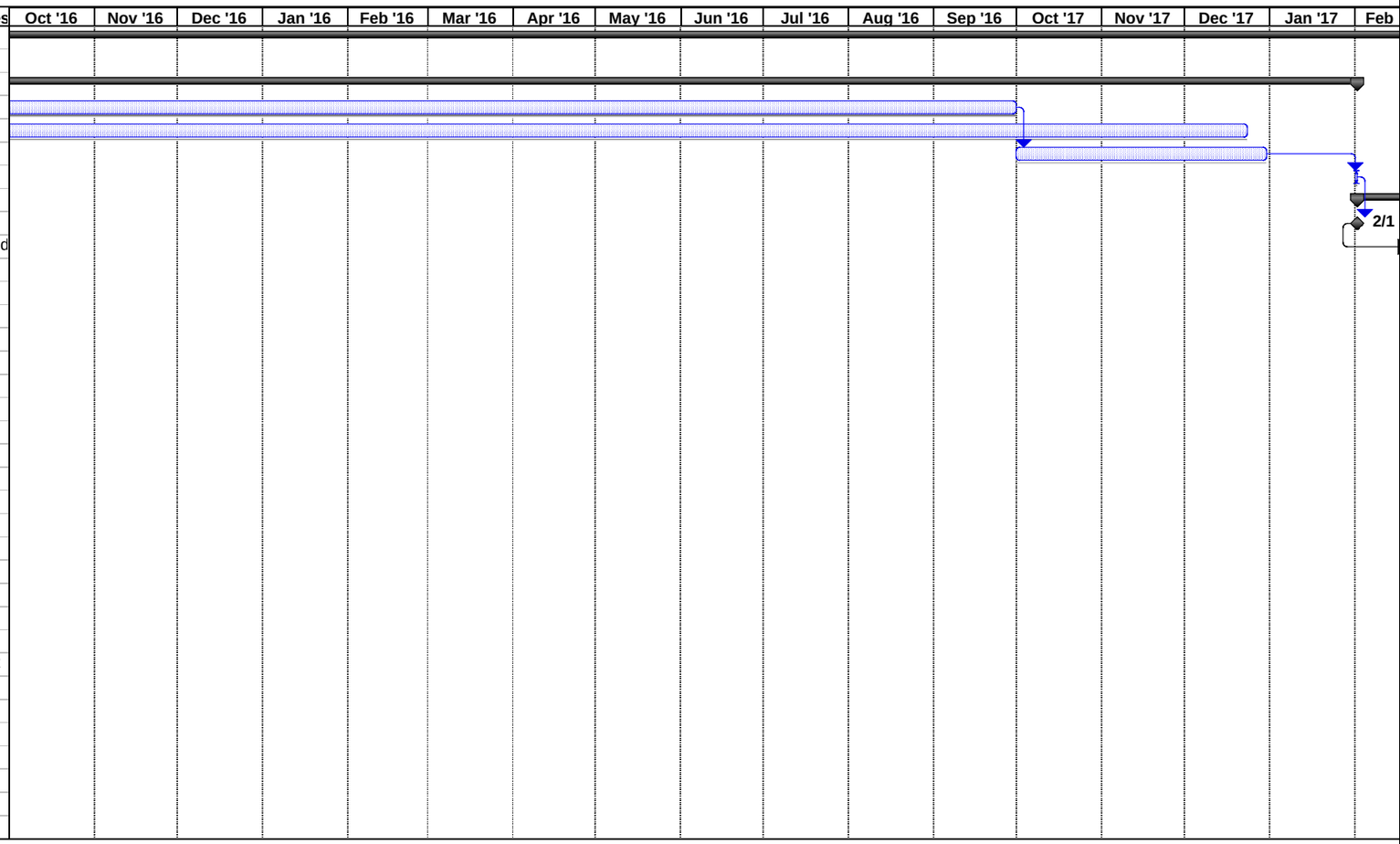

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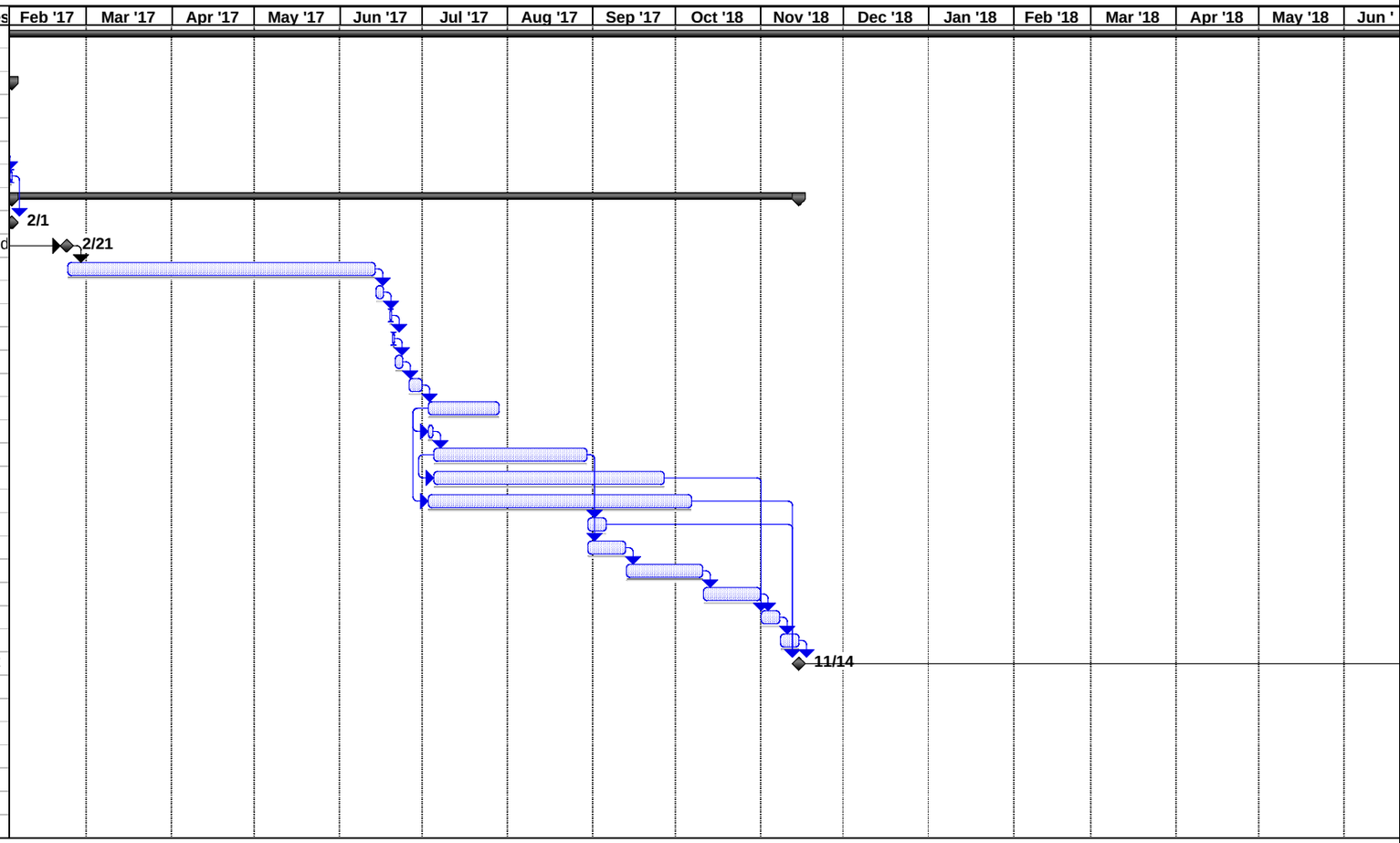

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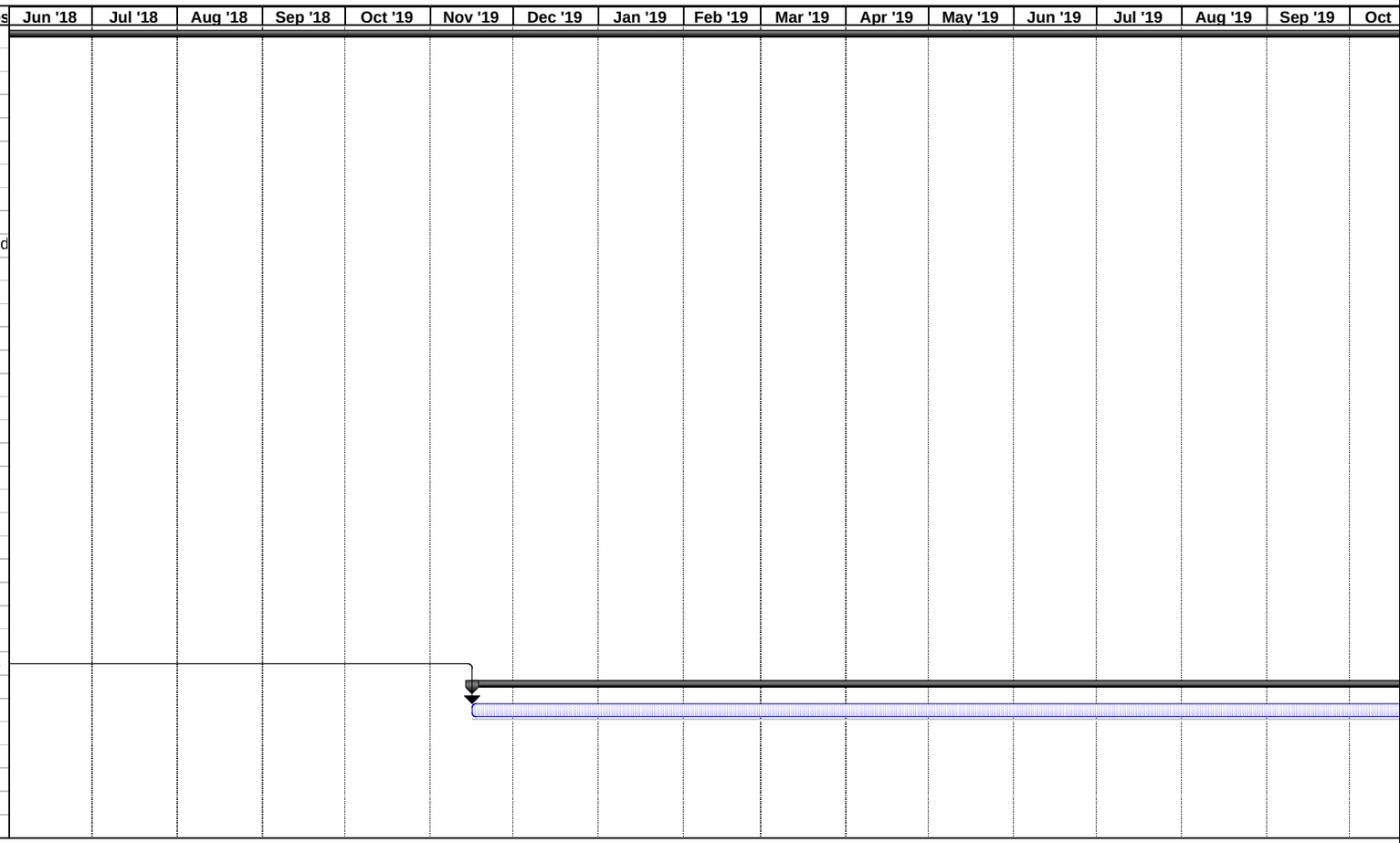

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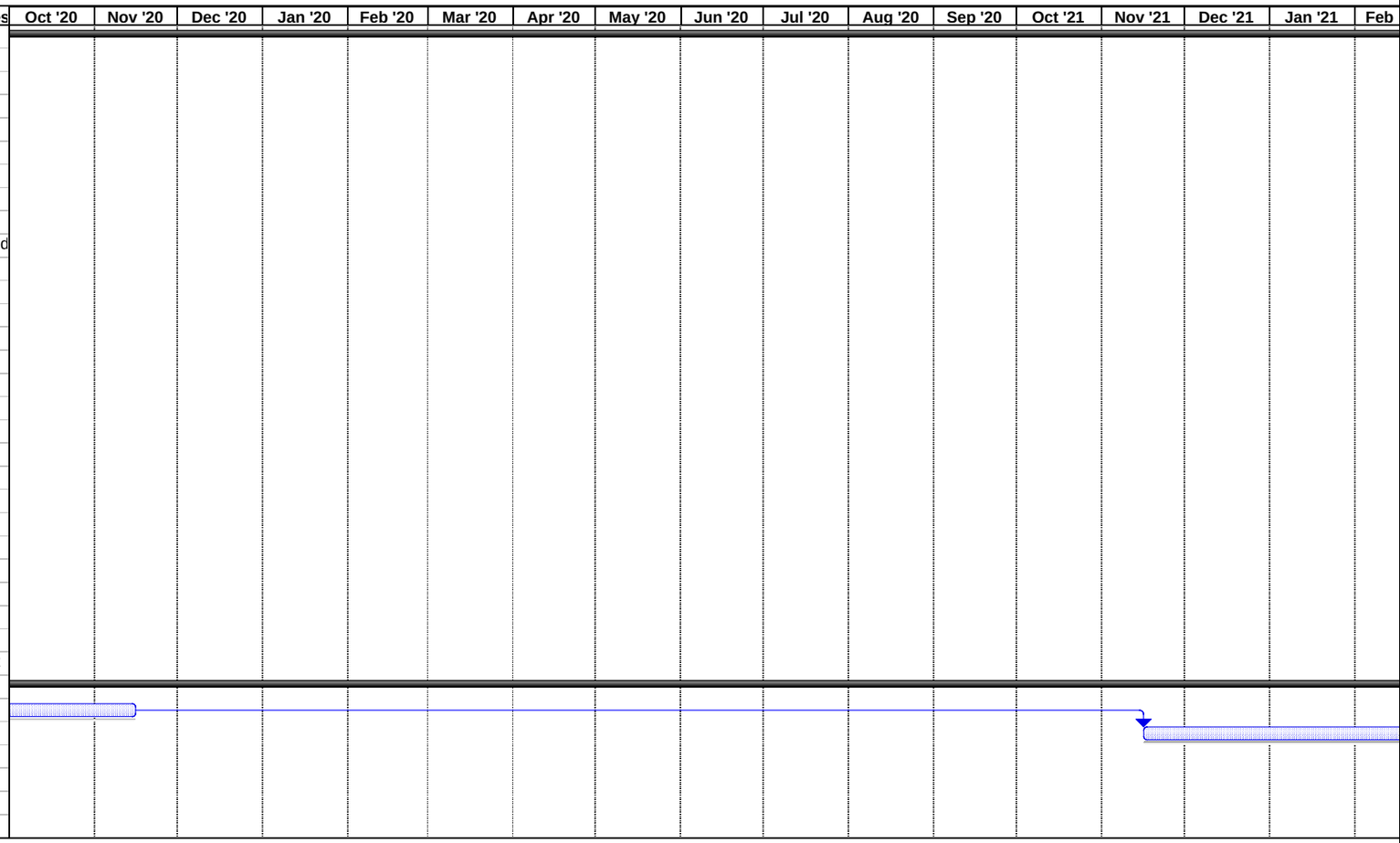

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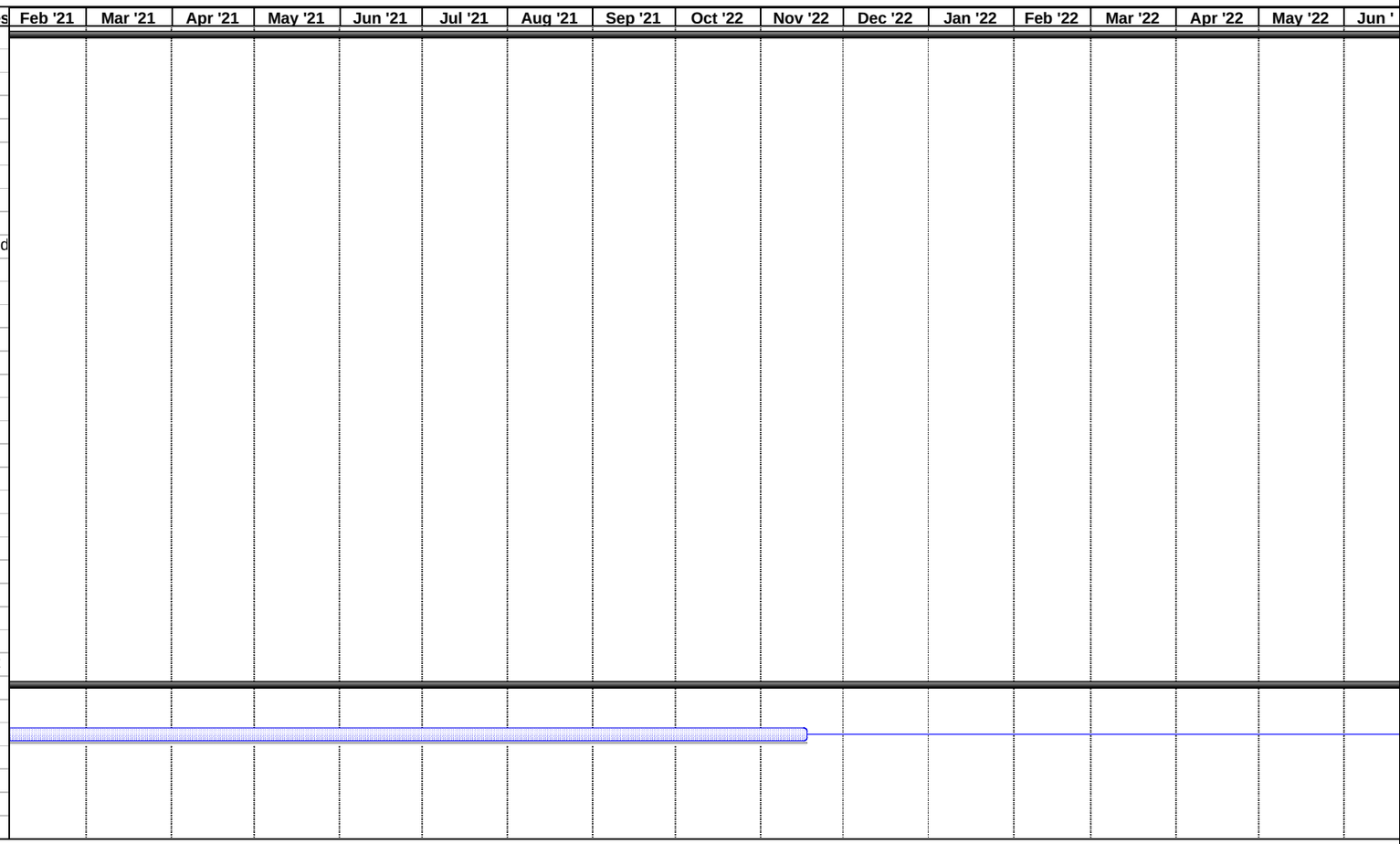
28	Construction Complete	0 days	Tue 11/14/17	Tue 11/14/17	27,21,22
29	**Post Construction Monitoring**	**2610.88 days**	**Fri 11/16/18**	**Fri 11/17/28**	
30	Year 1	260.88 days	Fri 11/16/18	Fri 11/15/19	28
31	Year 3	262.88 days	Mon 11/16/20	Wed 11/17/21	30
32	Year 5	262.88 days	Wed 11/16/22	Fri 11/17/23	31
33	Year 7	261.88 days	Mon 11/17/25	Tue 11/17/26	32
34	Year 10	263.88 days	Tue 11/16/27	Fri 11/17/28	33
35	Project complete	0 days	Fri 11/17/28	Fri 11/17/28	34



Mokuhinia, Alt 4
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia, Alt 4

ID	Task Name	Duration	Start	Finish	Predeces
1	**Mokuhinia - Alt 4**	**3732.88 days**	**Wed 7/30/14**	**Fri 11/17/28**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
6	Solicit	3.25 mons	Fri 9/30/16	Fri 12/30/16	4
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6
8	**Construction**	**204 days**	**Wed 2/1/17**	**Tue 11/14/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
15	Mob	3 days	Wed 6/21/17	Fri 6/23/17	14
16	BMPs / Contractor's Storage Are	5 days	Mon 6/26/17	Fri 6/30/17	15
17	Demolition (structures; utilities, p	20 days	Mon 7/3/17	Fri 7/28/17	16
18	Clear & Grub	2 days	Mon 7/3/17	Tue 7/4/17	17SS
19	Shallow Excavation for pond	40 days	Wed 7/5/17	Tue 8/29/17	18
20	Drying Soil	60 days	Wed 7/5/17	Tue 9/26/17	19SS
21	Load & Haul	70 days	Mon 7/3/17	Fri 10/6/17	17SS
22	Maint Path	5 days	Wed 8/30/17	Tue 9/5/17	19
23	Create Microtopography	10 days	Wed 8/30/17	Tue 9/12/17	19
24	Landscaping	20 days	Wed 9/13/17	Tue 10/10/17	23
25	Permanment Fencing	15 days	Wed 10/11/17	Tue 10/31/17	24
26	Rain Delay	5 days	Wed 11/1/17	Tue 11/7/17	25,20
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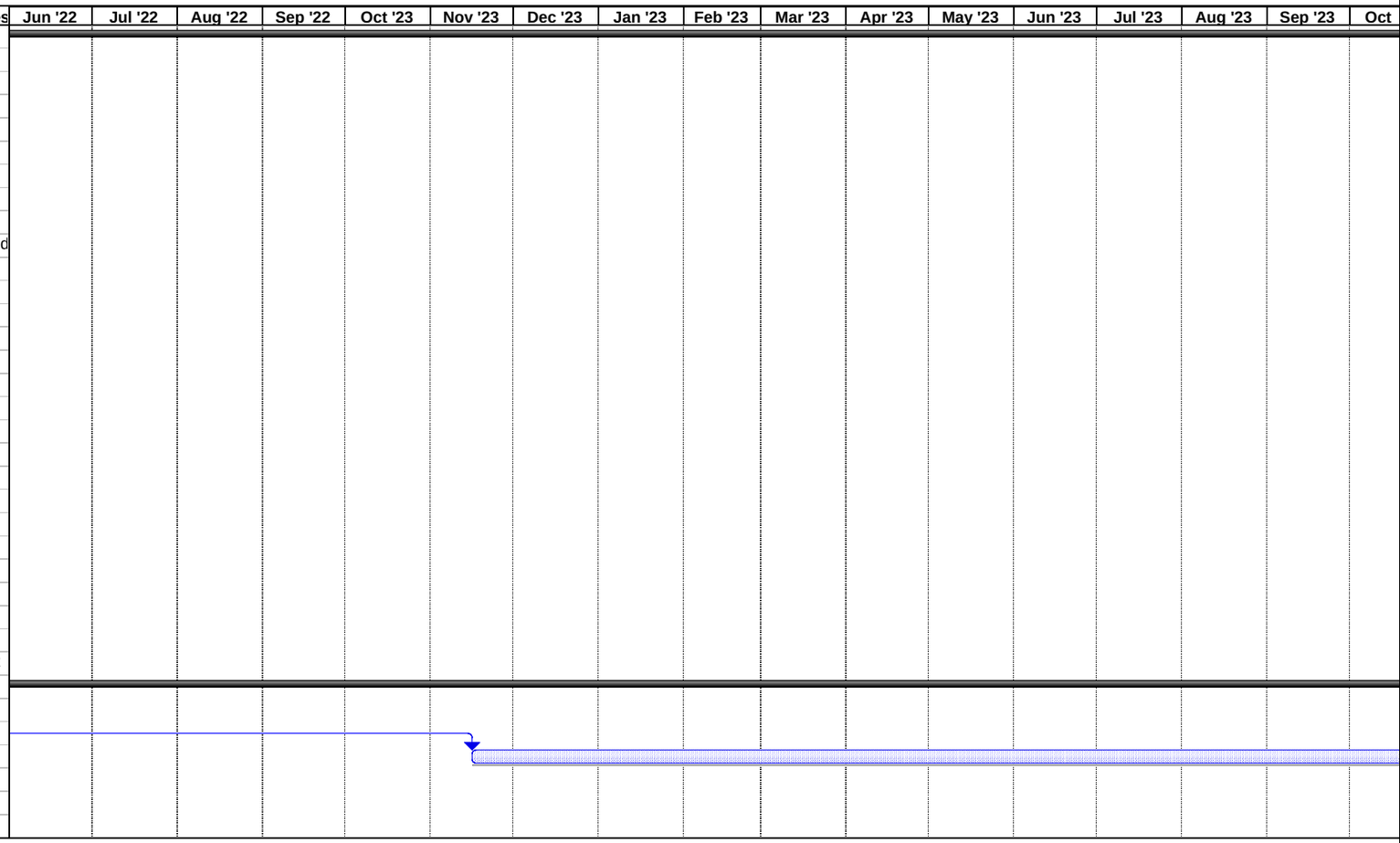

Mokuhinia, Alt 4
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia, Alt 4

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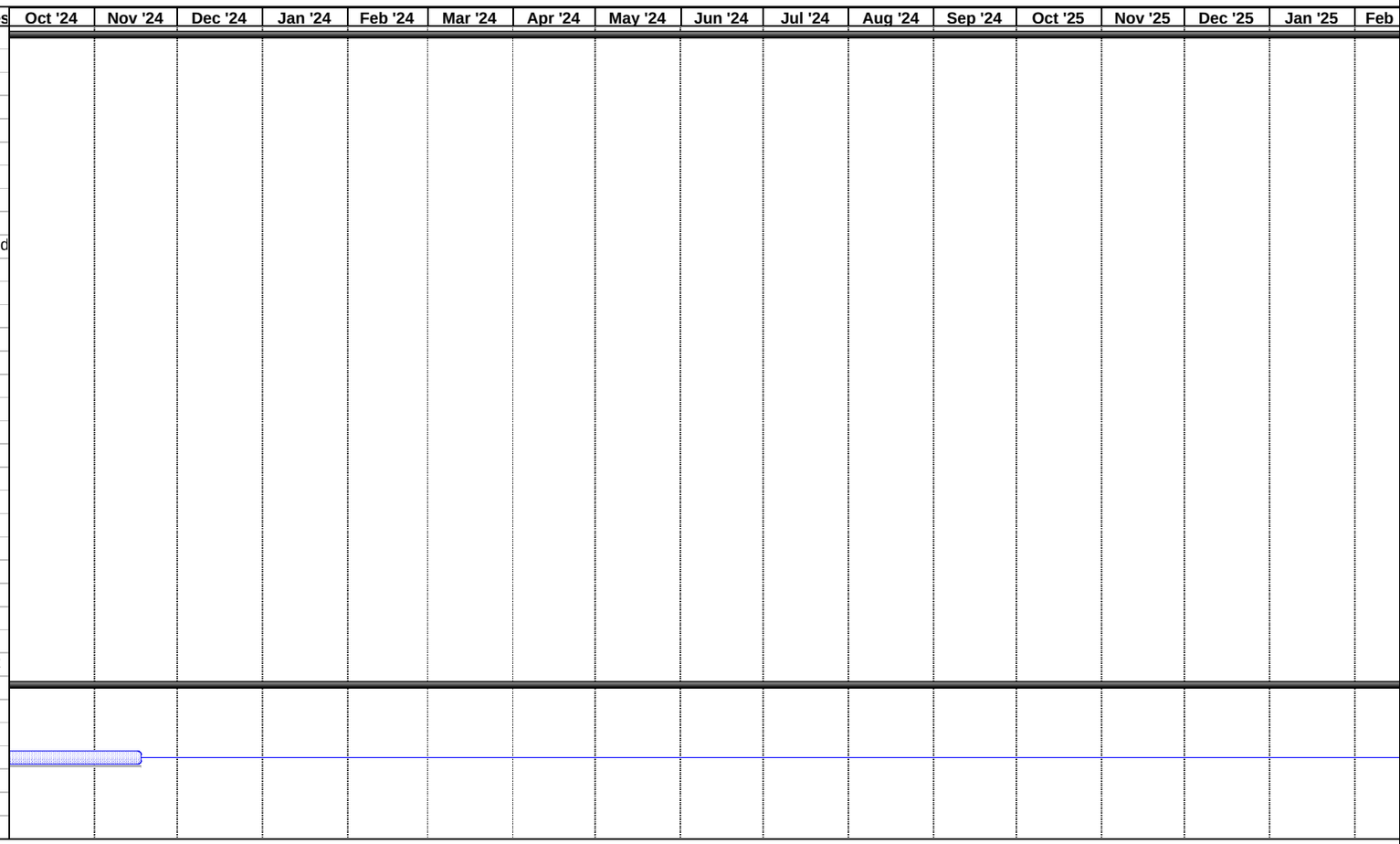

Mokuhinia, Alt 4
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia, Alt 4

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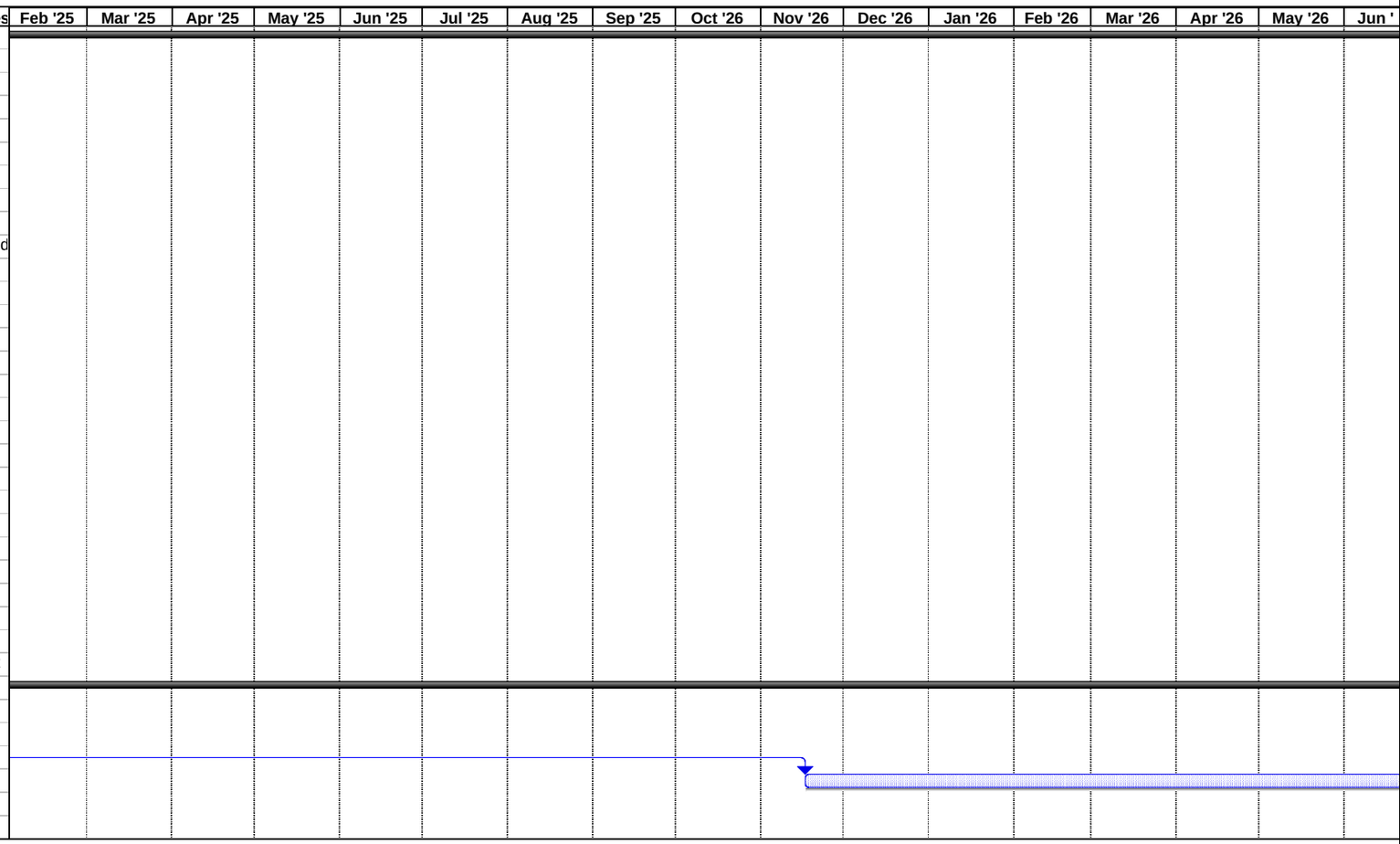

Mokuhinia, Alt 4
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia, Alt 4

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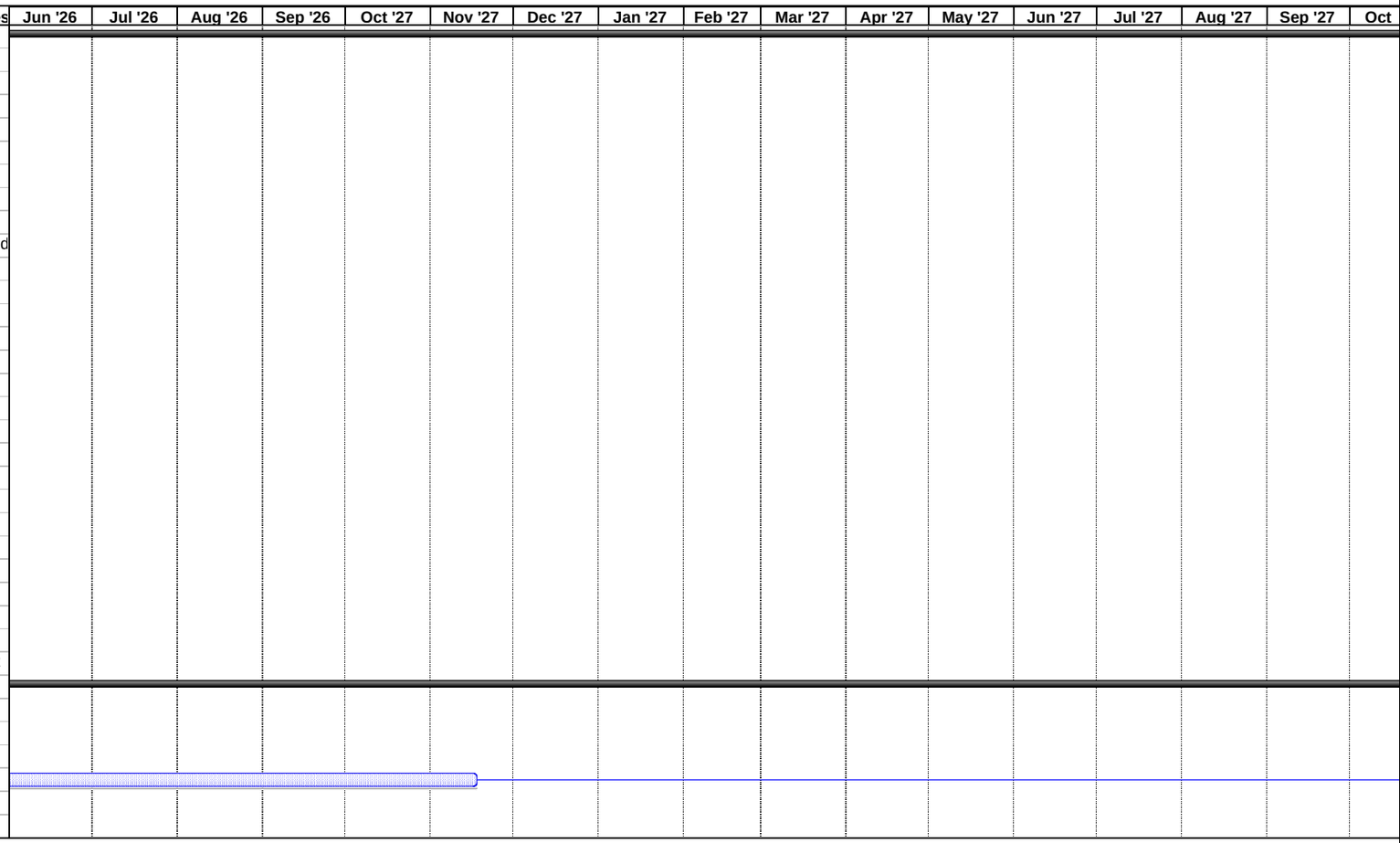

Mokuhinia, Alt 4
Lahaina, Maui
Date: Mon 6/3/13

Task		Milestone		Rolled Up Critical Task		Split		External MileTask	
Critical Task		Summary		Rolled Up Milestone		External Tasks		Critical Task	
Progress		Rolled Up Task		Rolled Up Progress		Project Summary		Progress	

Mokuhinia, Alt 4

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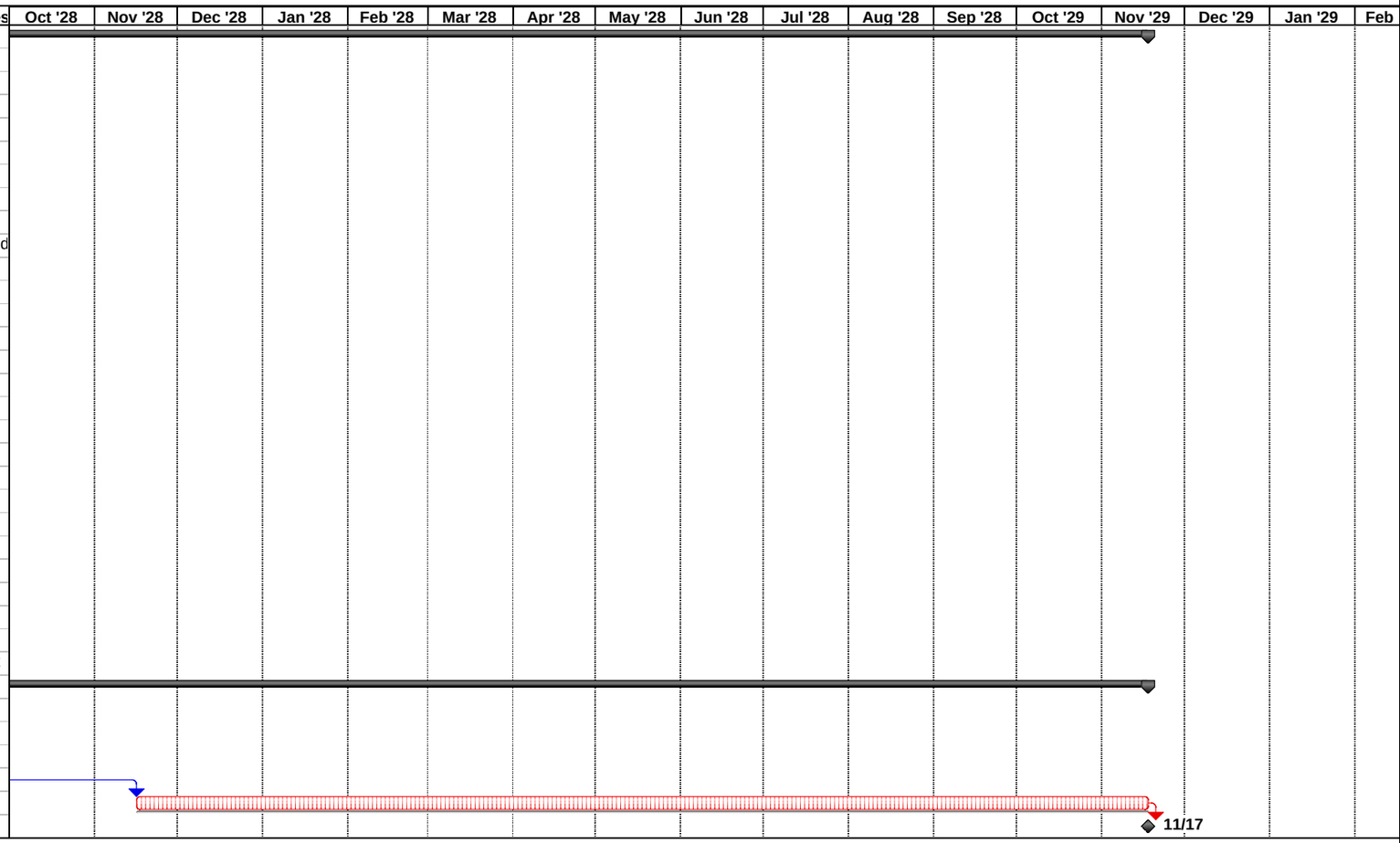

Mokuhinia, Alt 4
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Mokuhinia , Alt 8A(Rev 15 Jul 13)**
PROJECT NO:
LOCATION: **Lahaina, Maui**

DISTRICT: **Honolulu District**
PREPARED: **6/14/2013**
POC: **CHIEF, COST ENGINEERING, Gary F. Yamauchi**

This Estimate reflects the scope and schedule in report; Feasibility Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: 10/1/2012 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*O*
06	FISH & WILDLIFE FACILITIES	$4,152	$750	18%	$4,902	3.9%	$4,315	$780	$5,095			$4,524	$817	$5,341
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$61	$11	18%	$72	3.9%	$63	$11	$75			$75	$14	$89
	CONSTRUCTION ESTIMATE TOTALS:	$4,213	$761		$4,974	3.9%	$4,379	$791	$5,170			$4,599	$831	$5,430
01	LANDS AND DAMAGES	$1,412	$259	18%	$1,671	3.9%	$1,467	$270	$1,737			$1,510	$277	$1,787
22	FEASIBILITY STUDY (CAP studies)									$1,236				$1,236
30	PLANNING, ENGINEERING & DESIGN	$758	$184	24%	$942	5.5%	$799	$195	$994			$835	$203	$1,038
31	CONSTRUCTION MANAGEMENT	$467	$83	18%	$550	5.5%	$493	$87	$580			$547	$97	$644
	PROJECT COST TOTALS:	$6,850	$1,288	19%	$8,138		$7,138	$1,343	**$8,481**	$1,236		$7,490	$1,409	$10,134

Mandatory by Regulation	CHIEF, COST ENGINEERING, Gary F. Yamauchi	ESTIMATED FEDERAL COST:	65%	**$5,784**
Mandatory by Regulation	PROJECT MANAGER, Athline Clark	ESTIMATED NON-FEDERAL COST:	35%	**$3,114**
Mandatory by Regulation	CHIEF, REAL ESTATE, Stephen N. Cayetano	FEASIBILITY FEDERAL COST:		**$668**
		FEASIBILITY NON-FEDERAL COST:		**$568**
	CHIEF, PROJECT MGT, Anthony J. Paresa	**ESTIMATED TOTAL PROJECT COST:**		**$10,134**
	CHIEF, ENGRG & CONSTR, Todd C. Barnes			
	CHIEF, Civil Works Tech Branch, Michael F. Wong			
	CHIEF, CONSTRUCTION, Louis Muzzarini, Jr.			
	CHIEF, CONTRACTING, R. David Williams			
	CHIEF, PP-P, Roxane Iseri			
	CHIEF, Programs Mgt Branch, Roxane E. Iseri			

Filename: Mokuhinia-Alt8A(15Jul13)CAP_TPCS_Mar2013 r4.xlsx
TPCS

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Mokuhinia , Alt 8A(Rev 15 Jul 13)
LOCATION: Lahaina, Maui
This Estimate reflects the scope and schedule in report; Feasibility Study

DISTRICT: Honolulu District
POC: CHIEF, COST ENGINEERING, Gary F. Yamauchi
PREPARED: 6/14/2013

Estimate Prepared: 5/31/2013
Effective Price Level: 10/1/2012

Program Year (Budget EC): 2015
Effective Price Level Date: 1 OCT 14

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$4,152	$750	18.1%	$18	3.9%	$4,315	$780	$5,095	2017Q3	4.8%	$4,524	$817	$5,341
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$61	$11	18.1%	$72	3.9%	$63	$11	$75	2024Q1	18.5%	$75	$14	$89
	CONSTRUCTION ESTIMATE TOTALS:	$4,213	$761	18.1%	**$4,974**		$4,379	$791	$5,170			$4,599	$831	$5,430
01	LANDS AND DAMAGES	$1,412	$259	18.4%	$1,671	3.9%	$1,467	$270	$1,737	2016Q3	2.9%	$1,510	$277	$1,787
30	PLANNING, ENGINEERING & DESIGN													
1.78%	Project Management	$75	$18	24.3%	$93	5.5%	$79	$19	$98	2016Q1	4.2%	$82	$20	$102
6.05%	Planning & Environmental Compliance	$255	$62	24.3%	$317	5.5%	$269	$65	$334	2016Q1	4.2%	$280	$68	$348
6.72%	Engineering & Design	$283	$69	24.3%	$352	5.5%	$298	$73	$371	2016Q1	4.2%	$311	$76	$387
2.02%	Engineering Tech Review ITR & VE	$85	$21	24.3%	$106	5.5%	$90	$22	$111	2016Q1	4.2%	$93	$23	$116
0.83%	Contracting & Reprographics	$35	$9	24.3%	$44	5.5%	$37	$9	$46	2016Q1	4.2%	$38	$9	$48
	Engineering During Construction			24.3%										
0.59%	Planning During Construction	$25	$6	24.3%	$31	5.5%	$26	$6	$33	2017Q3	11.0%	$29	$7	$36
	Project Operations			24.3%										
31	CONSTRUCTION MANAGEMENT													
9.90%	Construction Management	$417	$74	17.7%	$491	5.5%	$440	$78	$518	2017Q3	11.0%	$488	$87	$575
	Project Operation:			17.7%										
1.19%	Project Management	$50	$9	17.7%	$59	5.5%	$53	$9	$62	2017Q3	11.0%	$59	$10	$69
	CONTRACT COST TOTALS:	$6,850	$1,288		**$8,138**		$7,138	$1,343	$8,481			$7,490	$1,409	**$8,898**

Mokuhinia-Alt8A(Rev13June13)

Estimated by	T. Kazunaga
Designed by	CH2MHILL
Prepared by	T. Kazunaga
Preparation Date	5/31/2013
Effective Date of Pricing	5/31/2013
Estimated Construction Time	Days

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Description	ContractCost
Contract Cost Summ (ECC)	**4,213,462.78**
06 Fish and Wildlife Facilities	**4,213,462.78**
0603 Wildlife Facilities & Sanctuary	**4,213,462.78**
Mob, Demob, Demo & Preparatory Work	**662,622.51**
060309 Buildings, Project Operations	**1,652.22**
060337 Water Wells	**292,906.72**
060371 Fences & Revetment	**861,204.34**
060373 Habitat and Feeding Facilities	**2,333,831.15**
Monitoring After Construction	**61,245.83**

Alternative 8A Quantity Take-off

*Revised 14 Jan 13 per new QTO from AE

Site Prep			
staging Area	40,289.00	SF	
Constr Fence	2,675.00	LF	
Constr. Entrance	1.00	EA	
Erosion Control	2,675.00	LF	
Moku'ula Exclusion Fense around perimeter (buffer)	1,250.00	LF	
Archeologist (on-site during Construction)	3.00	mo	
Demo:			
FOM parking lot (entire)	40289	sq ft	
FOM parking lot (excluding Moku`ula)	13971	sq ft	
NE parking lot	10654	sq ft	
NW parking lot	9920	sq ft	
Tennis court (west)	15279	sq ft	
Tennis court (east)	14966	sq ft	
Basketball court	6395	sq ft	
Bathroom	850	sq ft	
Total Parking Demo	34,545.00	sf	
Total Tennis Ct Demo	30,245.00	SF	
2 Wooden Bldg w/ Mtl Roof & Conc Foundation	2,388.00	SF	
Wood Frame Bldg w/ Composition roof & Wooden Pier Foundation	1,116.00	SF	
Cut/Cap, Remove Utilities			
Water	3.00	EA	
Sewer	3.00	EA	
U/G Power	3	EA	
Misc (Court Fences, BB Fences, Lights, Misc utility boxes)	1.00	LS	
Grading	SF	SY	Compact (CY)
Wetland Bottom	185,152.00	20,572.44	3,428.74
Wetland Slope	81,569.00	9,063.22	1,510.54
Total Excavation	36,584.00	CY	4,939.28
	3.70		
Microtopography	29,635.67	SY	
Fine Grading	2.00	wk	
	29,635.67	Fine Grading	
Excavation:	36,584.00	CY	(From AE)

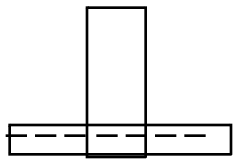
Assume Dispose rocks/Dirt >6" @ 50%; 1.34 tons/cy

De-Water	6.00	wks @ 1.5'		(From AE)

Liner: None

Revetment:

Conc/Rock reveetment w/ buried fooding	1,100.00	LF		2'
lava rock façade	1,100.00	lf		
Ht (see Lisa's email 15 Jan 2013)	4.50	Ft		4.50
			1.00	1.00
			1.00	



	H (above Gnd) (Ft)	W(ft)	L (ft)	Face SF	CSA	
Vert Wall	4.50	2.00	1,100.00	9,900.00	9	
Footing	1.00	4.00	1,100.00	1,100.00	4	
Vert	0.50	2.00	1,100.00	1,100.00	1	

Formwork	12,100.00	SF					
Conc	570.37	cy	5% waste	599.00	cy	tons	
Reinf; Assume #4 @ 12" OC	8,800.00	LF	2.94	tons	5% waste		3.09
Curing	15,400.00	SF					
Lava Rock Façade	12,100.00	SF	149.23	cy	276.08	tons	
Grout	2,420.00	SF	29.85	cy			

Excavate for Footing	325.93	ECY				
Backfill	81.48	ECY	89.63	ccy		
Dispose	236.30	CY	1.34	tons/cy	316.64	tons

Maint Path (grvl rd)

12" Gravel	400.00	LF	16.92	ccy
Assume 12'Wide Geotextile	44.44	SY	48.89	SY (10% Waste)

Fence

4'H CLF	2,775.00	LF		
Gate	2.00			
Footing	278.00	EA	0.07	CY
conc	20.59	CY		

Well & Pump

12" Dia Drill	100.00	VLF
20' Screen	1.00	EA
Cathodic Protection	1.00	EA

Pump:

7.5 HP submersible pump						
& motor, solar powered	100.00	gpm	6,000.00	gph		
Conc pad; 4" thk						
4" Isolation & Check Valve	1.00	EA				
4" Connection Pipe						
4" HDPE	400.00	LF				
Trenching						
Pump Shed (Pre-Fab)						
6'X8'	1.00	EA				
Culvert below Mukuhinia Wy						
Conc Culvert	10.00	LF				
Trenching	50.00	lf	37.50	cy	48.75	LCY
30" HDPE	50.00	LF				
Patch trench	225.00	SF	25.00			
Backfill	22.11	CY	24.32	CCY	31.62	LCY
Dispose	15.39	cy	20.62	tons		
Slide Gate:						
Hydrogate SS Fab Slide Gate, non-self contained;						
30"X36"	1.00	EA				
Landcaping						
24" OC	1.70	ac	74,052.29	sf	1,371.34	cy
Planting	18,514.00	EA				
Kaluha	3,702.80	EA				
Makaloa	3,702.80	EA				
Ahuawa	3,702.80	EA				
Akulikuli	3,702.80	EA				
ae'ae	3,702.80	EA				
Total Plants	18,514.00	EA	Say	5.00	min/plant	
	1,542.83	HR				

Abbreviated Risk Analysis

Mokuhinia (Alt 8A) (Revised 15 Jul 13)

Feasibility (Alternatives)

Meeting Date: 17-Jan-13

PDT Members

Note: PDT involvement is commensurate with project size and involvement.

PM / Planner:	Athline Clark
Study Manager:	Athline Clark
Contracting:	-
Real Estate:	Mike Sakai
Relocations:	-
OTHER:	-
Engineering & Design:	Lisa Kettley
Technical Lead:	Lisa Kettley
Geotech:	-
Hydrology:	-
Civil:	-
Structural:	-
Mechanical:	-
Electrical:	-
Cost Engineering:	Tracy Kazunaga
Construction:	-
Operations:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-

Abbreviated Risk Analysis

Project (less than $40M): **Mokuhinia (Alt 8A) (Revised 15 Jul 13)**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Low Risk: Simple Project-No Life Safety**

Total Construction Contract Cost = $ 4,213,463

	CWWBS	Feature of Work		Contract Cost		% Contingency		$ Contingency		Total
	01 LANDS AND DAMAGES	Real Estate	$	1,412,000		18.37%	$	259,384	$	1,671,384.40
1	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Mob, Demob, Demo, Prep Work	$	662,623		18.10%	$	119,963	$	782,586.27
2	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Fences & Revetment	$	861,204		18.10%	$	155,915	$	1,017,118.97
3	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Habitat & Feeding Facilities	$	2,333,831		17.73%	$	413,830	$	2,747,661.12
4	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Monitoring After Construction	$	61,246		16.01%	$	9,807	$	71,053.34
5	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Buildings, Project Opeations	$	1,652		20.67%	$	341	$	1,993.46
6	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Water Wells	$	292,907		20.98%	$	61,459	$	354,365.95
7						0.00%	$	-	$	-
8						0.00%	$	-	$	-
9						0.00%	$	-	$	-
10						0.00%	$	-	$	-
11			$	-		0.00%	$	-	$	-
12		Remaining Construction Items	$	-	0.0%	0.00%	$	-	$	-
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$	758,000		24.35%	$	184,545	$	942,545.34
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$	467,000		17.74%	$	82,865	$	549,864.60

Totals								
Real Estate	$	1,412,000		18.37%	$	259,384	$	1,671,384.40
Total Construction Estimate	$	4,213,463		18.07%	$	761,316	$	4,974,779
Total Planning, Engineering & Design	$	758,000		24.35%	$	184,545	$	942,545
Total Construction Management	$	467,000		17.74%	$	82,865	$	549,865
Total	$	6,850,463			$	1,288,110	$	8,138,573

Mokuhinia (Alt 8A) (Revised 15 Jul 13)
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 17-Jan-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth						
					Max Potential Cost Growth	**40%**
PS-1	Mob, Demob, Demo, Prep Work	Scope of facilities and utilities for demolition not well defined	Estimate based on GIS data, TMK records, and real estate investigation; actual areas may differ, but expected to have marginal impact on cost	Possible	Marginal	**1**
PS-2	Fences & Revetment	Scope of fence type/design not well defined.	Cost for fence is consistent with anticipated range of design; cost for installation revetments accounts for dewatering.	Possible	Marginal	**1**
PS-3	Habitat & Feeding Facilities	Project scope increases due to necessary changes in design of habitat.	Project is relatively simple; includes industry standard approach to restoration; no anticipated changes in scope related to restoration facilities	Unlikely	Negligible	**0**
PS-4	Monitoring After Construction	Monitoring after construction to verify the system is working could find that the water quality, hydrology and vegetation are not achieving Habitat Unit benefits. This may require future separate contract to modify the system.	It is assumed aquifer pump tests conducted during the PED phase; with design refinements during final design phase based on results of aquifer pump test as risk management strategy. It is anticipated to be unlikely to affect the scope of the project but will marginally affect the scope because wouldn't require additional excavation, only additional require pumping.	Unlikely	Marginal	**0**

PS-5	Buildings, Project Opeations	The conceptual design is based on the well house assumed a prefabricated shed. Scope of the well house could be revised once input from the sponsors / Friends of Moku'ula are consulted.	Because the well house will shelter the motor for the submersible pump, it is assumed that the shelter will be small. The shelter cost would not be a big cost item and is assume a 6'X8' prefabricated shed. It is possible this will be refined in the PED phase, which minimally impact the cost and schedule.	Likely	Marginal	**2**
PS-6	Water Wells	The conceptual design for the water well to includes solar powered pump and motor is based on assumed ground water levels.	Adjustments in excavation and/or pumping is not likely to affect general design approach or functionality of wetland, but could require design adjustments. The pump size and or well depth could be revised during the PED phase but is expected to minimally impact the schedule or cost.	Possible	Marginal	**1**
PS-7	0			Unlikely	Negligible	**0**
PS-8	0			Unlikely	Negligible	**0**
PS-9	0			Unlikely	Marginal	**0**
PS-12	Remaining Construction Items	Unsurveyed archeological areas below the existing parking lot and Salvation Army Site could affect the conceptual design and delay the construction schedule. Survey to be completed during final design phase.	Refinements are already planned as part of the design phase. Changes to accommodate archeological survey are expected to be minimal. The Salvation Army and parking lot sites are expected to have similar characteristics as other surveyed portion of Look o Mokuhinia (with the exception of moku, which is already accounted for in the conceptual design.	Possible	Marginal	**1**

PS-13	Planning, Engineering, & Design	PED costs are estimated and may not reflect actual PED costs	Fee quotes were used for PED costs. It is possible further refinements in the PED phase would increase, but it is expected to marginally affect the overall PED cost since most of the PED features were costed.	Possible	Marginal	**1**
PS-14	Construction Management	Inadvertent archaeological impacts could have impact to overall cost and schedule, requiring additional construction management	Cost estimate already includes arch monitor during all ground disturbing activities; it is possible that arch resources could delay project, but cost impacts are expected to be marginal (arch monitor will already by onsite; may require some modification to project boundary to work around resource)	Possible	Marginal	**1**

Acquisition Strategy

					Max Potential Cost Growth	30%
AS-1	Mob, Demob, Demo, Prep Work	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-2	Fences & Revetment	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-3	Habitat & Feeding Facilities	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-4	Monitoring After Construction	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-5	Buildings, Project Opeations	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1

AS-6	Water Wells	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-7	0			Unlikely	Marginal	0
AS-8	0			Unlikely	Marginal	0
AS-9	0			Unlikely	Marginal	0
AS-12	Remaining Construction Items	Any unidentified construction items could result in cost impacts.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-13	Planning, Engineering, & Design	Acquisition strategy could change, and impact design and solicitation efforts of the PED.	Market survey and level of complexity affect the acquisition strategy. Limited design funds can also affect the design quality.	Possible	Marginal	1

AS-14	Construction Management	Acquisition strategy could affect the construction management effort.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	**1**

Construction Elements

					Max Potential Cost Growth	15%
CE-1	Mob, Demob, Demo, Prep Work	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-2	Fences & Revetment	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-3	Habitat & Feeding Facilities	Excavation could impact arch resources, which could require adjustments during construction	The project cost items are simple. Excavation will be by shallow lifts. By using smaller lifts, unexpected cultural artifacts will have less chance to be damaged. Similar projects (Kawainui Marsh) had no major problems of excavation in shallow lifts. Shallow excavation has been accounted for in the project duration period. No special equipment is required for shallow excavation. The risk is likely low.	Possible	Marginal	1
CE-4	Monitoring After Construction	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	Monitoring will be on-going during 5 years after construction is completed. If funds are not available, delays in the findings will result in possible Habitat Unit benefits not achieved. There could be risks that a design deficiency is encountered, however the likelihood is low and the impact marginal since reasonable assumptions were based on georeference historical maps an other information.	Unlikely	Negligible	0
CE-5	Buildings, Project Opeations	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-6	Water Wells	When drilling for the water well during construction, the water level might not be ad the assumption that was designed for.	Plan to conduct aquifer pump tests during final design phase; with design refinements during final design phase based on results of aquifer pump test as risk management strategy. It is anticipated to unlikely affect the construction effort since the drill rig will already be positioned in the well location, and will not require additional excavation, only pumping (de-watering).	Unlikely	Marginal	0
CE-7	0			Unlikely	Negligible	0

CE-8	0			Unlikely	Negligible	**0**
CE-9	0			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	Major construction items have been identified. There is minimal risk that any additional features would be added.	Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Limited funding has resulted in incomplete designs on similar district projects. There is every likelihood of more PED involvement during construction.	Likely	Marginal	**2**
CE-14	Construction Management	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Limited funding has resulted in incomplete designs on similar district projects. There is every likelihood of more construction management involvement related to RFIs, mods and claims.	Likely	Marginal	**2**

Quantities for Current Scope

					Max Potential Cost Growth	20%
Q-1	Mob, Demob, Demo, Prep Work	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-2	Fences & Revetment	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-3	Habitat & Feeding Facilities	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-4	Monitoring After Construction	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-5	Buildings, Project Opeations	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-6	Water Wells	As design evolves quantities on current project scope may change.	Pump size and capacity were based on conceptual design by the AE and provided to the Gov't. It is possible the pump size/capacity would be impacted by additional ground water data during the PED phase.	Possible	Marginal	1
Q-7	0			Unlikely	Negligible	0
Q-8	0			Unlikely	Negligible	0
Q-9	0			Unlikely	Negligible	0
Q-12	Remaining Construction Items	As design evolves quantities on current project scope may change.	Major construction items have been identified. There is minimal risk that any additional features would be added.	Unlikely	Negligible	0

Q-13	Planning, Engineering, & Design	As design evolves quantities on current project scope may change.	Major quantities were based on conceptual design by the AE and provided to the Gov't. The project is relatively straight forward except for any unforeseen excavation quantities found during construction of the project which would impact the construction schedule and cost. It is possible but marginal any impact would occur in the PED phase.	Possible	Marginal	**1**
Q-14	Construction Management	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Unlikely	Negligible	**0**

Specialty Fabrication or Equipment

					Max Potential Cost Growth	50%
FE-1	Mob, Demob, Demo, Prep Work	This alternative is straight forward and most of the work in the site work. The only fabricated items are the fences, pumps and solar panels.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-2	Fences & Revetment	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-3	Habitat & Feeding Facilities	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-4	Monitoring After Construction	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-5	Buildings, Project Opeations	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	The project is relatively straight forward and the pump house design (pre-fabricated structure) could be refined to a non-prefab structure. This would impact the cost and schedule minimally since the size of the shelter is small.	Possible	Marginal	1
FE-6	Water Wells	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Pump size and capacity were based on conceptual design by the AE and provided to the Gov't. It is possible the pump size/capacity would be impacted by additional ground water data during the PED phase.	Possible	Significant	2
FE-7	0			Unlikely	Negligible	0
FE-8	0			Unlikely	Negligible	0
FE-9	0			Unlikely	Negligible	0
FE-12	Remaining Construction Items	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0

FE-13	Planning, Engineering, & Design	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Pump size and capacity were based on conceptual design by the AE and provided to the Gov't. It is possible the pump size/capacity would be impacted by additional ground water data during the PED phase.	Possible	Significant	**2**
FE-14	Construction Management	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	**0**

Cost Estimate Assumptions

					Max Potential Cost Growth	25%
CT-1	Mob, Demob, Demo, Prep Work	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-2	Fences & Revetment	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-3	Habitat & Feeding Facilities	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-4	Monitoring After Construction	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1

CT-5	Buildings, Project Opeations			Unlikely	Negligible	0
CT-6	Water Wells			Unlikely	Negligible	0
CT-7	0			Unlikely	Negligible	0
CT-8	0			Unlikely	Negligible	0
CT-9	0			Unlikely	Negligible	0
CT-12	Remaining Construction Items	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1

CT-14	Construction Management	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	**1**

External Project Risks

						Max Potential Cost Growth	20%
EX-1	Mob, Demob, Demo, Prep Work	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal		2
EX-2	Fences & Revetment	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal		2
EX-3	Habitat & Feeding Facilities	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal		2
EX-4	Monitoring After Construction	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal		2

EX-5	Buildings, Project Opeations	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-6	Water Wells	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-7	0			Unlikely	Negligible	0
EX-8	0			Unlikely	Negligible	0
EX-9	0			Unlikely	Negligible	0
EX-12	Remaining Construction Items	External risks such as political, funding sources could impact project costs over time.	The estimate excludes any added sponsor costs related to O&M cost and is excluded from the TPC. Any increase in the O&M cost to the sponsor could result in re-design in the PED phase.	Possible	Significant	2
EX-13	Planning, Engineering, & Design	External risks such as political, funding sources could impact project costs over time.	Changes to permitting and biological requirements could result in added coordination and design efforts.	Possible	Marginal	1
EX-14	Construction Management	External risks such as political, funding sources could impact project costs over time.	Assuming design is 100% complete upon award, the only impact may be added coordination of external requirements occurring during course of construction and potential design changes resulting in modifications.	Possible	Marginal	1

Mokuhinia (Alt 8A) (Revised 15 Jul 13)
Feasibility (Alternatives)
Abbreviated Risk Analysis

Typical Risk Elements	Potential Risk Areas											
	Mob, Demob, Demo, Prep Work	Fences & Revetment	Habitat & Feeding Facilities	Monitoring After Construction	Buildings, Project Opeations	Water Wells	0	0	0	Remaining Construction Items	Planning, Engineering, & Design	Construction Management
Project Scope Growth	1	1	-	-	2	1	-	-	-	1	1	1
Acquisition Strategy	1	1	1	1	1	1	-	-	-	1	1	1
Construction Elements	-	-	1	-	-	-	-	-	-	-	2	2
Quantities for Current Scope	1	1	1	1	1	1	-	-	-	-	1	-
Specialty Fabrication or Equipment	-	-	-	-	1	2	-	-	-	-	2	-
Cost Estimate Assumptions	1	1	1	1	-	-	-	-	-	1	1	1
External Project Risks	2	2	2	2	2	2	-	-	-	2	1	1

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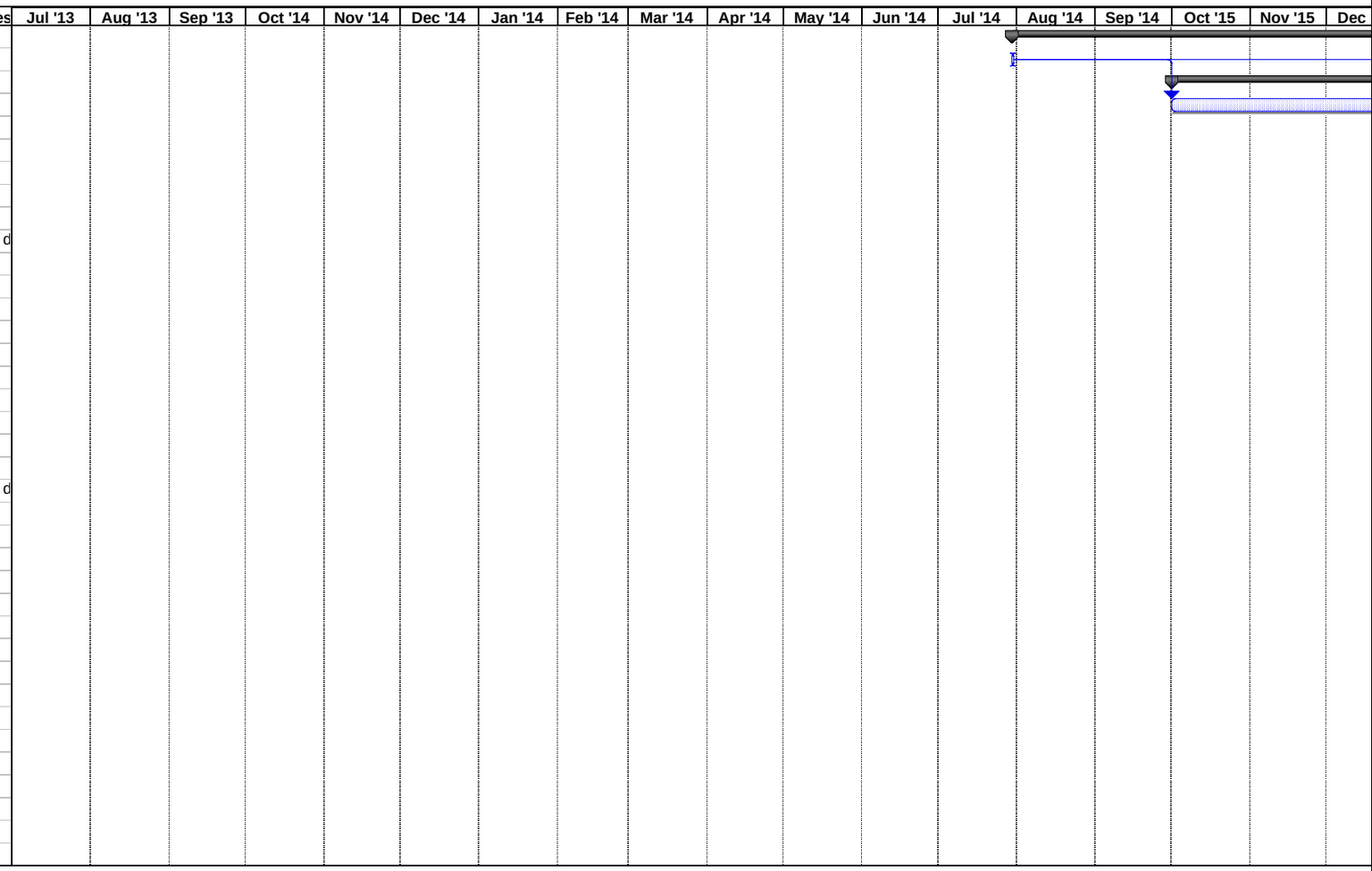
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
6	Solicit	3.25 mons	Fri 9/30/16	Fri 12/30/16	4
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6,5
8	**Construction**	**234 days**	**Wed 2/1/17**	**Tue 12/26/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
15	Mob	3 days	Wed 6/21/17	Fri 6/23/17	14
16	BMPs / Contractor's Storage Are	5 days	Mon 6/26/17	Fri 6/30/17	15
17	Demolition (structures; utilities)	20 days	Mon 7/3/17	Fri 7/28/17	16
18	Clear & Grub	2 days	Mon 7/31/17	Tue 8/1/17	17
19	Excavate for pond	35 days	Wed 8/2/17	Tue 9/19/17	18
20	Drying Soil	80 days	Wed 8/2/17	Tue 11/21/17	19SS
21	Load & Haul	100 days	Mon 7/10/17	Fri 11/24/17	17SS+5 d
22	Liner	5 days	Wed 9/20/17	Tue 9/26/17	19
23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
25	Landscaping	20 days	Wed 10/25/17	Tue 11/21/17	24,23
26	Permanment Fencing	15 days	Wed 11/22/17	Tue 12/12/17	25
27	Test & Train	5 days	Wed 12/13/17	Tue 12/19/17	26
28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
29	Demob	5 days	Wed 12/20/17	Tue 12/26/17	28,27
30	Construction Complete	0 days	Tue 12/26/17	Tue 12/26/17	29,26
31	**Post Construction Monitoring**	**2608.88 days**	**Thu 12/27/18**	**Tue 12/26/28**	
32	Year 1	260.88 days	Thu 12/27/18	Thu 12/26/19	30FF
33	Year 3	260.88 days	Mon 12/28/20	Mon 12/27/21	32
34	Year 5	260.88 days	Tue 12/27/22	Tue 12/26/23	33
35	Year 7	260.88 days	Fri 12/27/24	Fri 12/26/25	34
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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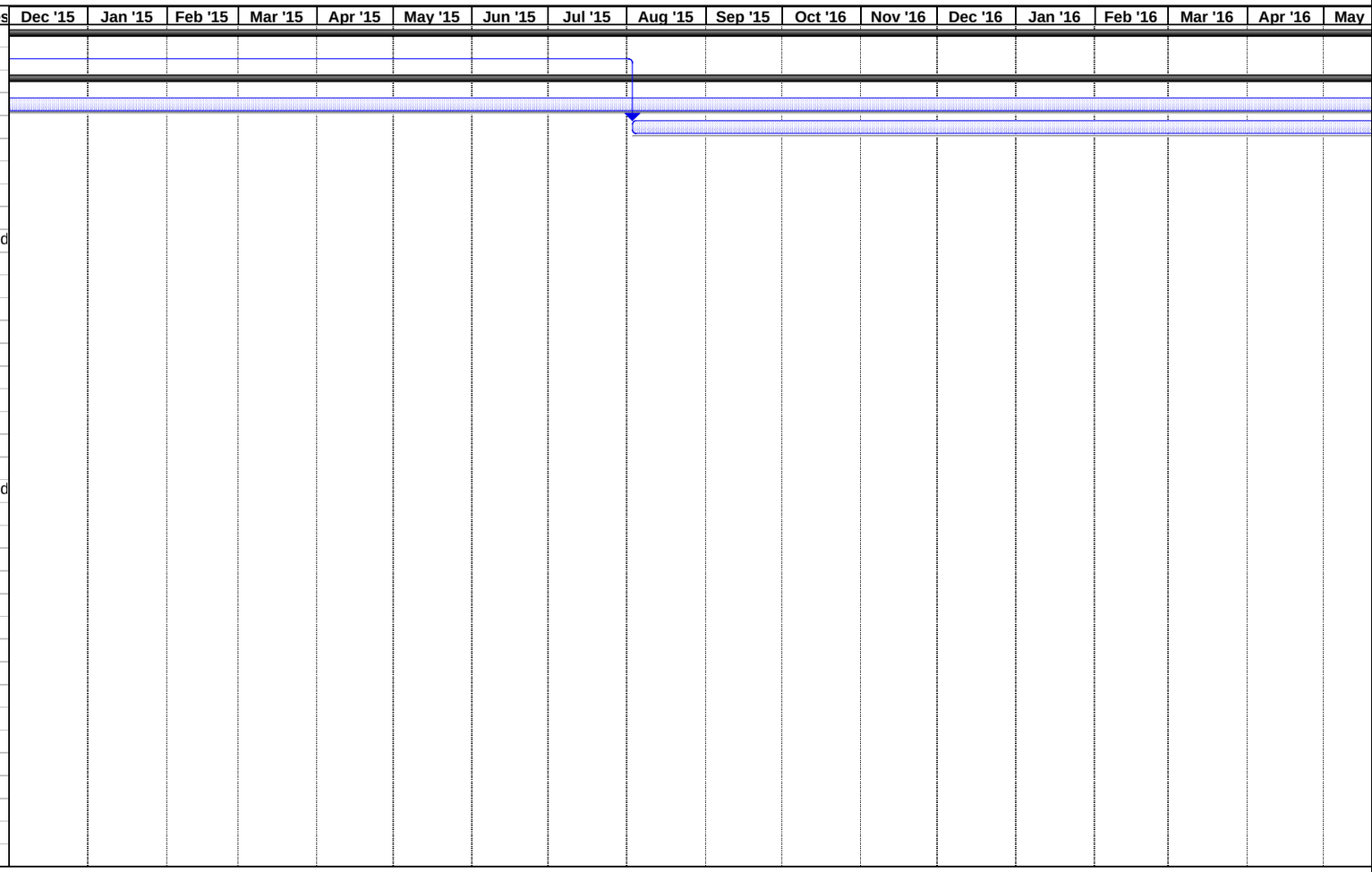
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
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Mokuhinia-Alt 8A/B

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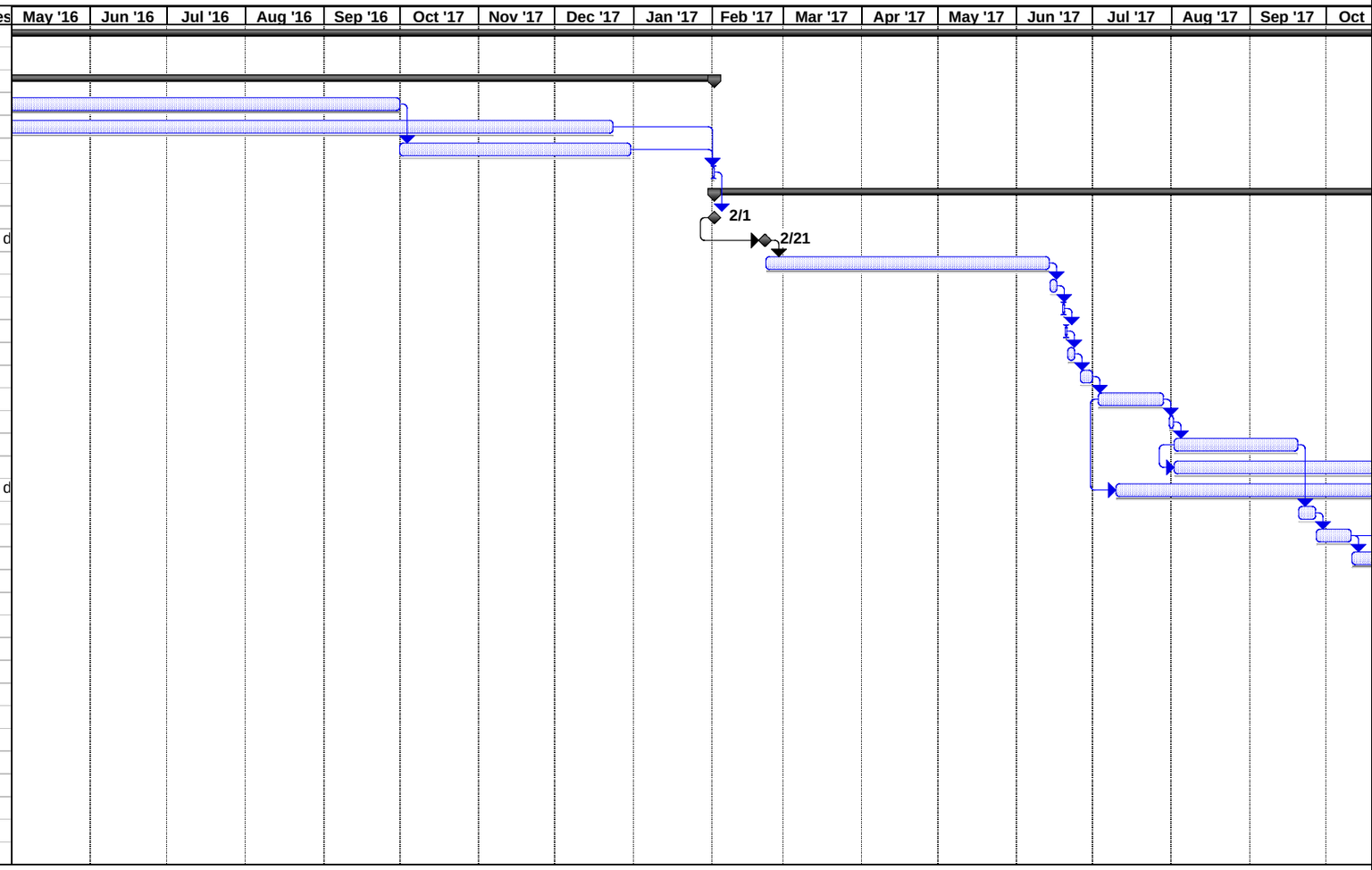

Mokuhinia - Alt 8A/B
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Mokuhinia-Alt 8A/B

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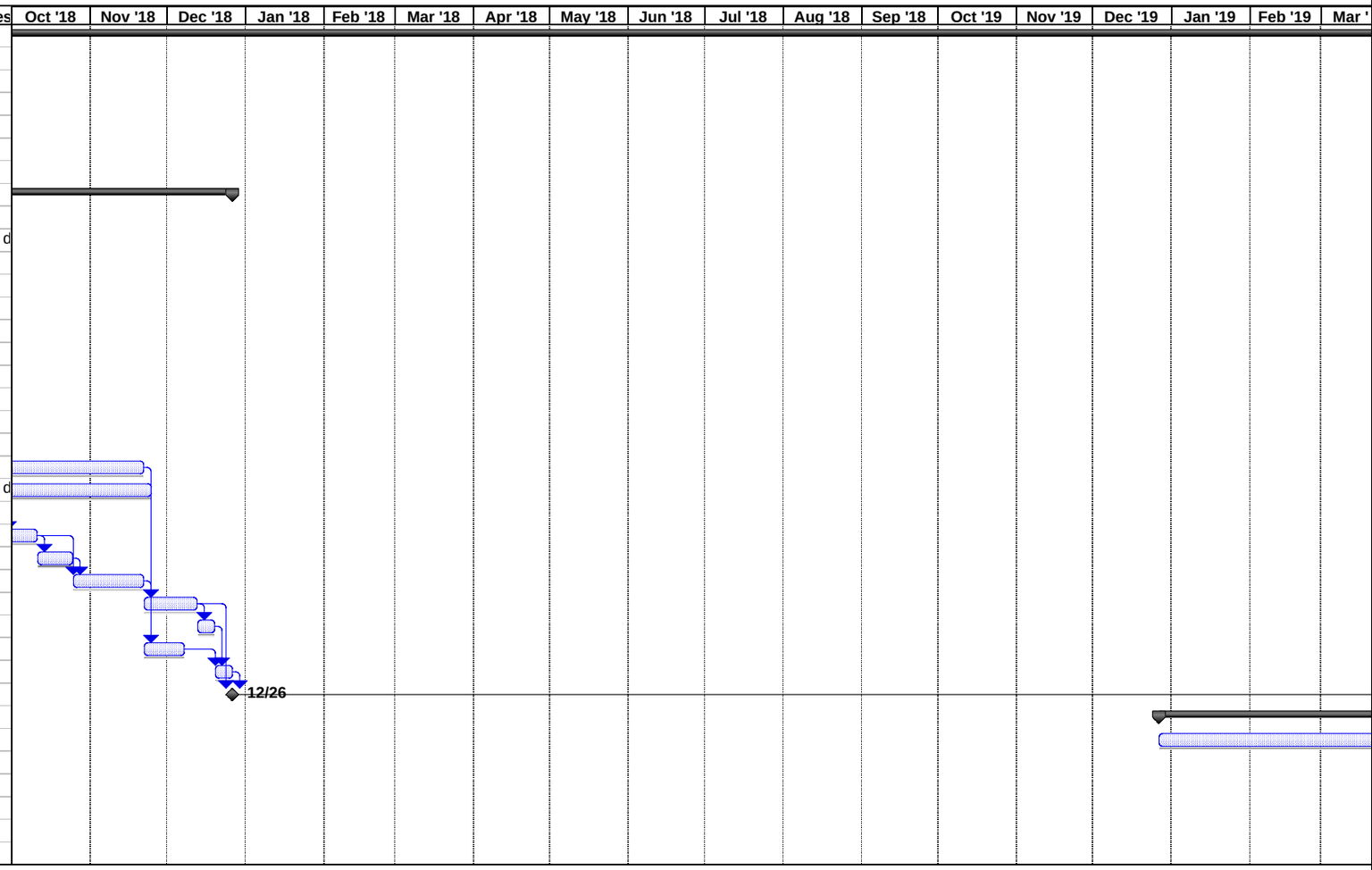

Mokuhinia - Alt 8A/B
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Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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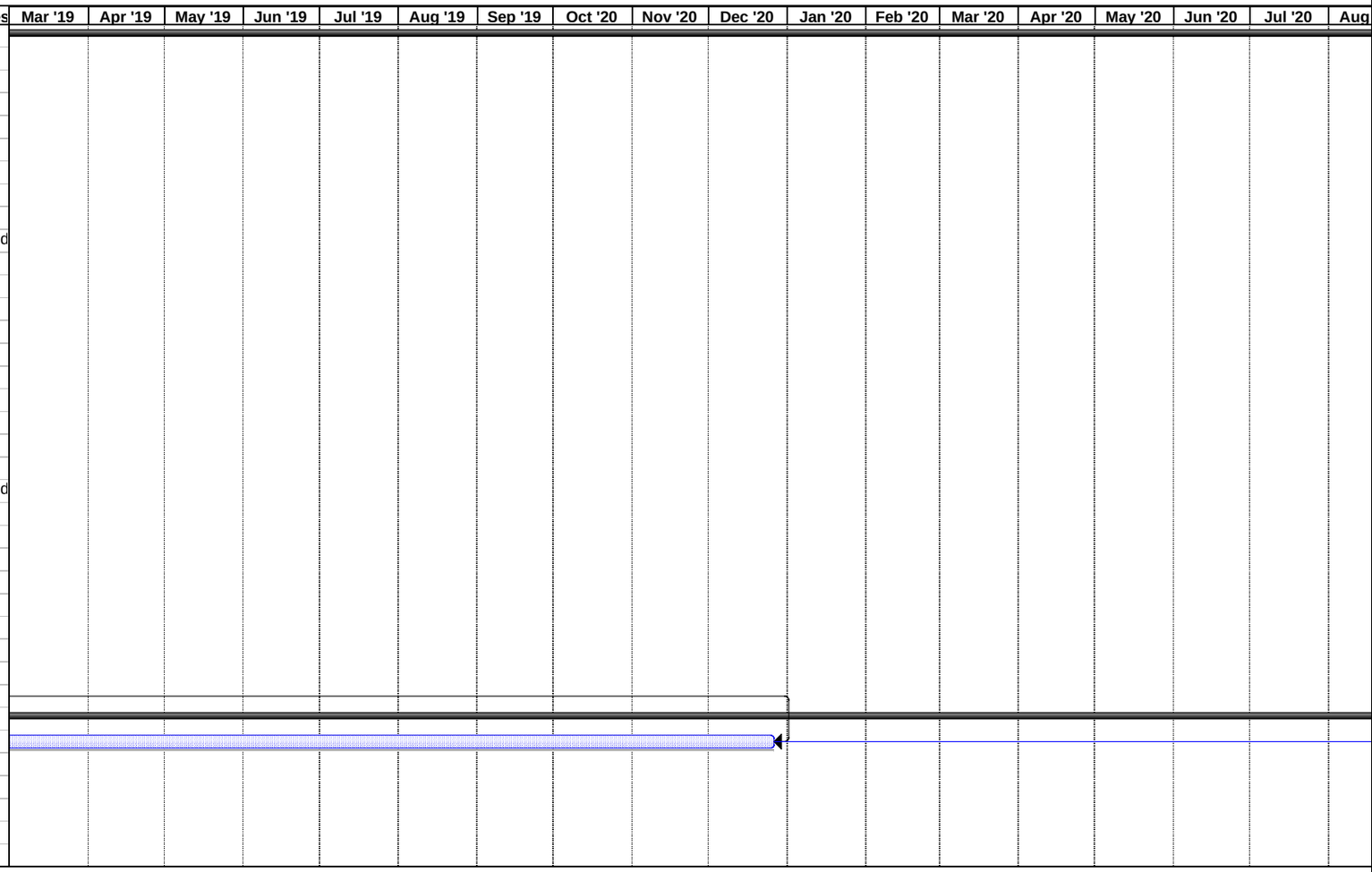
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6,5
8	**Construction**	**234 days**	**Wed 2/1/17**	**Tue 12/26/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
15	Mob	3 days	Wed 6/21/17	Fri 6/23/17	14
16	BMPs / Contractor's Storage Are	5 days	Mon 6/26/17	Fri 6/30/17	15
17	Demolition (structures; utilities)	20 days	Mon 7/3/17	Fri 7/28/17	16
18	Clear & Grub	2 days	Mon 7/31/17	Tue 8/1/17	17
19	Excavate for pond	35 days	Wed 8/2/17	Tue 9/19/17	18
20	Drying Soil	80 days	Wed 8/2/17	Tue 11/21/17	19SS
21	Load & Haul	100 days	Mon 7/10/17	Fri 11/24/17	17SS+5 d
22	Liner	5 days	Wed 9/20/17	Tue 9/26/17	19
23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
25	Landscaping	20 days	Wed 10/25/17	Tue 11/21/17	24,23
26	Permanment Fencing	15 days	Wed 11/22/17	Tue 12/12/17	25
27	Test & Train	5 days	Wed 12/13/17	Tue 12/19/17	26
28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
29	Demob	5 days	Wed 12/20/17	Tue 12/26/17	28,27
30	Construction Complete	0 days	Tue 12/26/17	Tue 12/26/17	29,26
31	**Post Construction Monitoring**	**2608.88 days**	**Thu 12/27/18**	**Tue 12/26/28**	
32	Year 1	260.88 days	Thu 12/27/18	Thu 12/26/19	30FF
33	Year 3	260.88 days	Mon 12/28/20	Mon 12/27/21	32
34	Year 5	260.88 days	Tue 12/27/22	Tue 12/26/23	33
35	Year 7	260.88 days	Fri 12/27/24	Fri 12/26/25	34
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

ID	Task Name	Duration	Start	Finish	Predeces
1	**Mokuhinia - Alt 8A/B**	**3759.88 days**	**Wed 7/30/14**	**Tue 12/26/28**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
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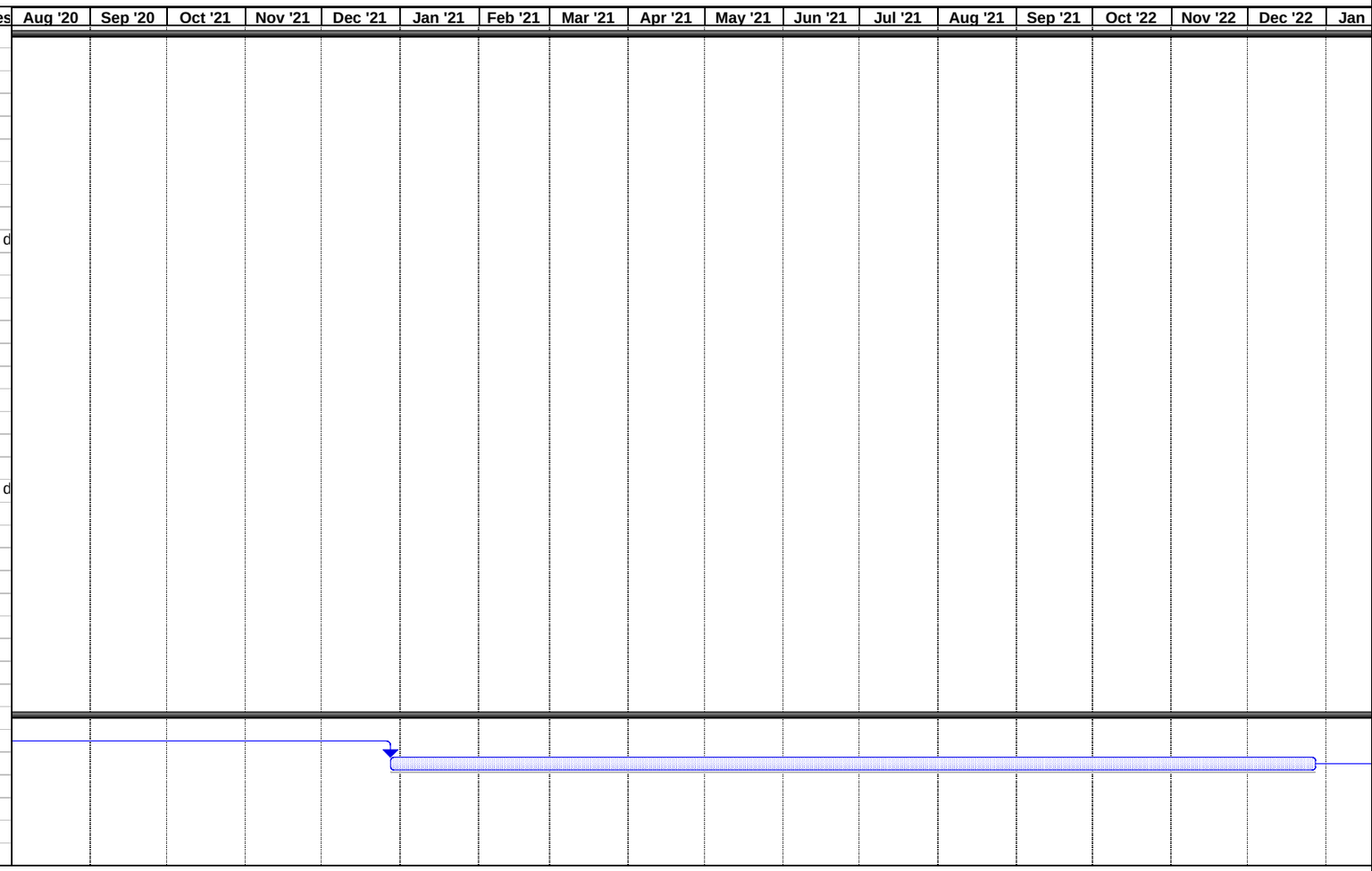
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
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Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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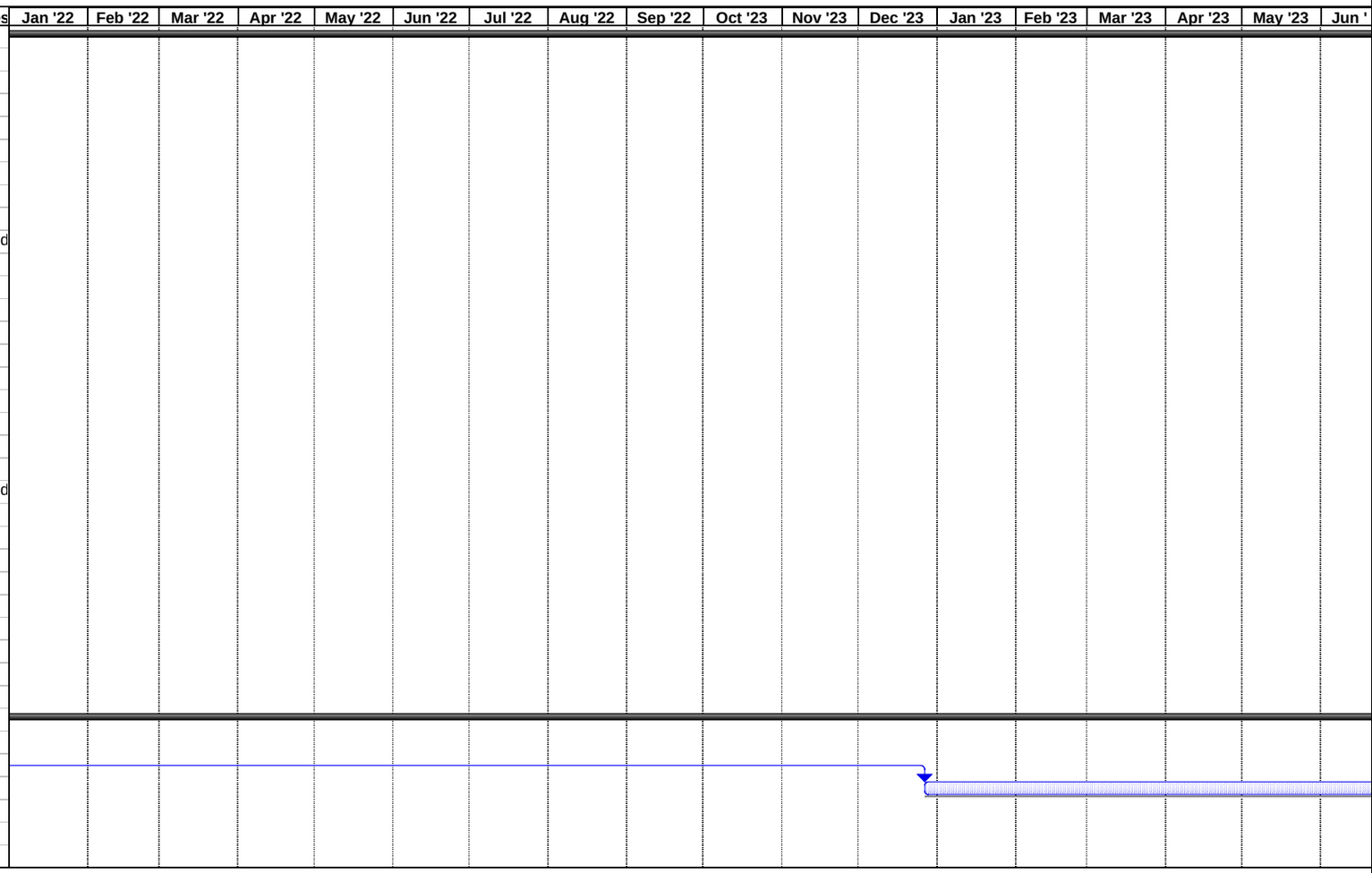
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
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Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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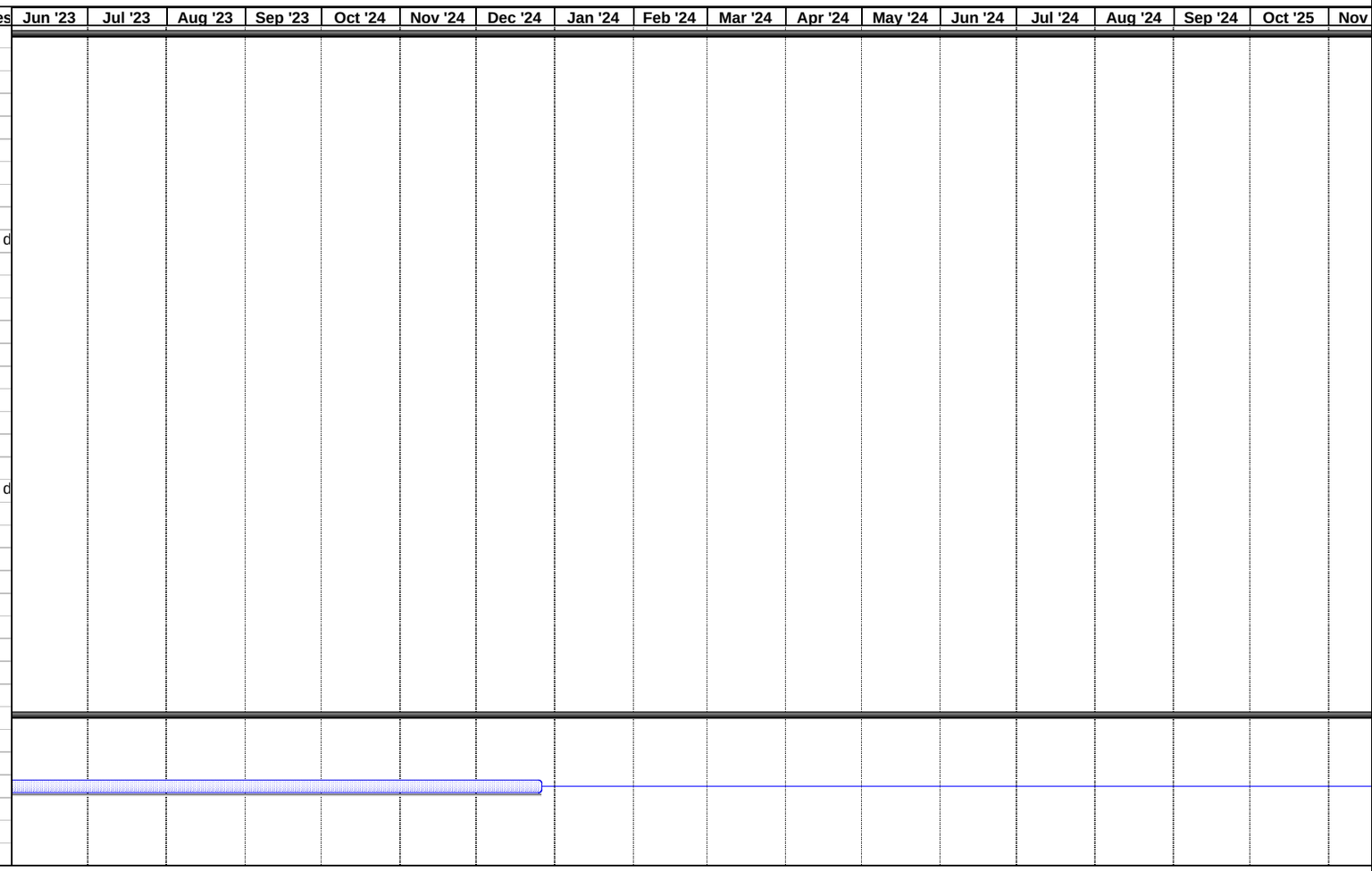
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
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Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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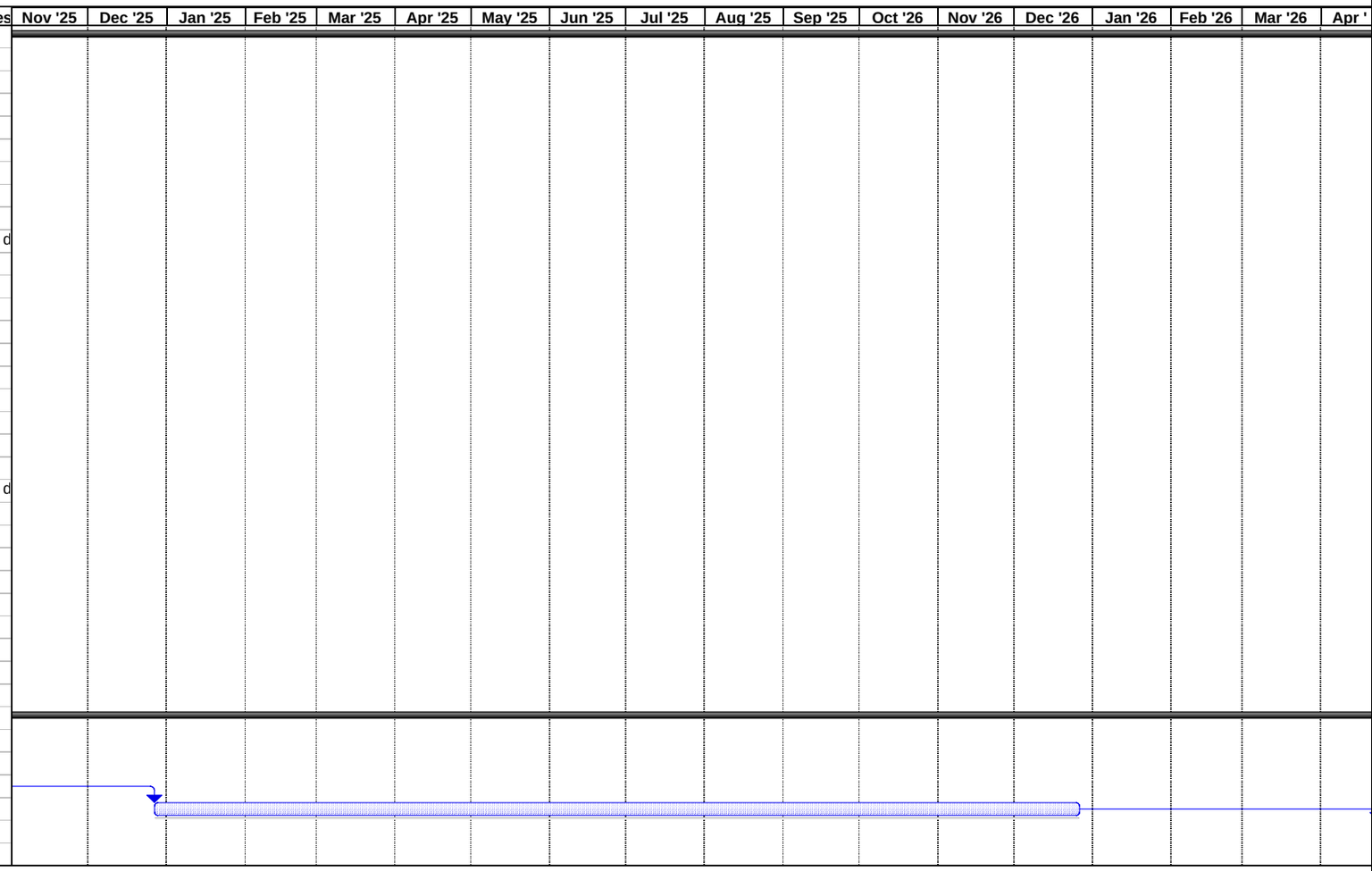

Mokuhinia - Alt 8A/B
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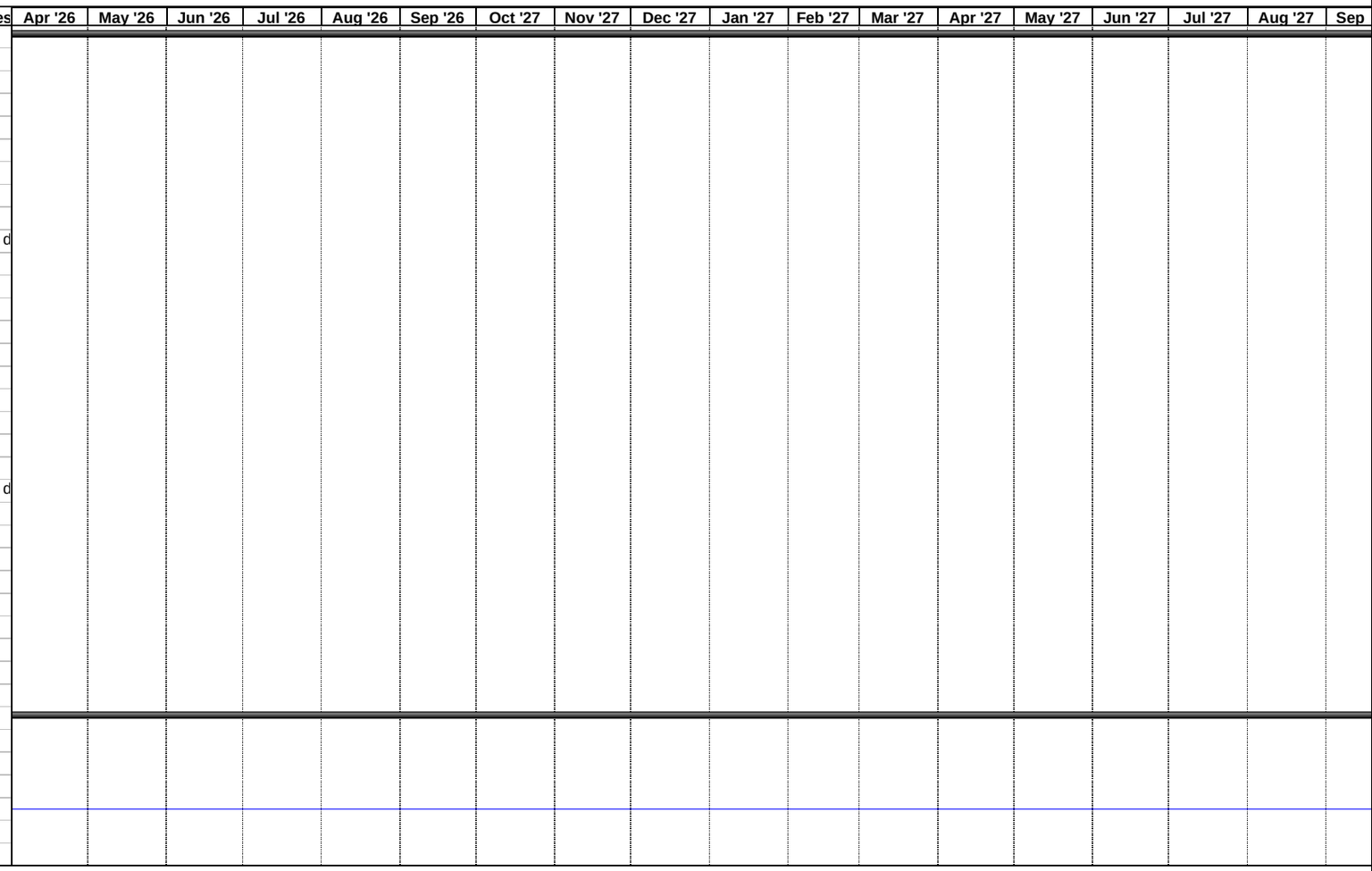

Mokuhinia - Alt 8A/B
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Mokuhinia-Alt 8A/B

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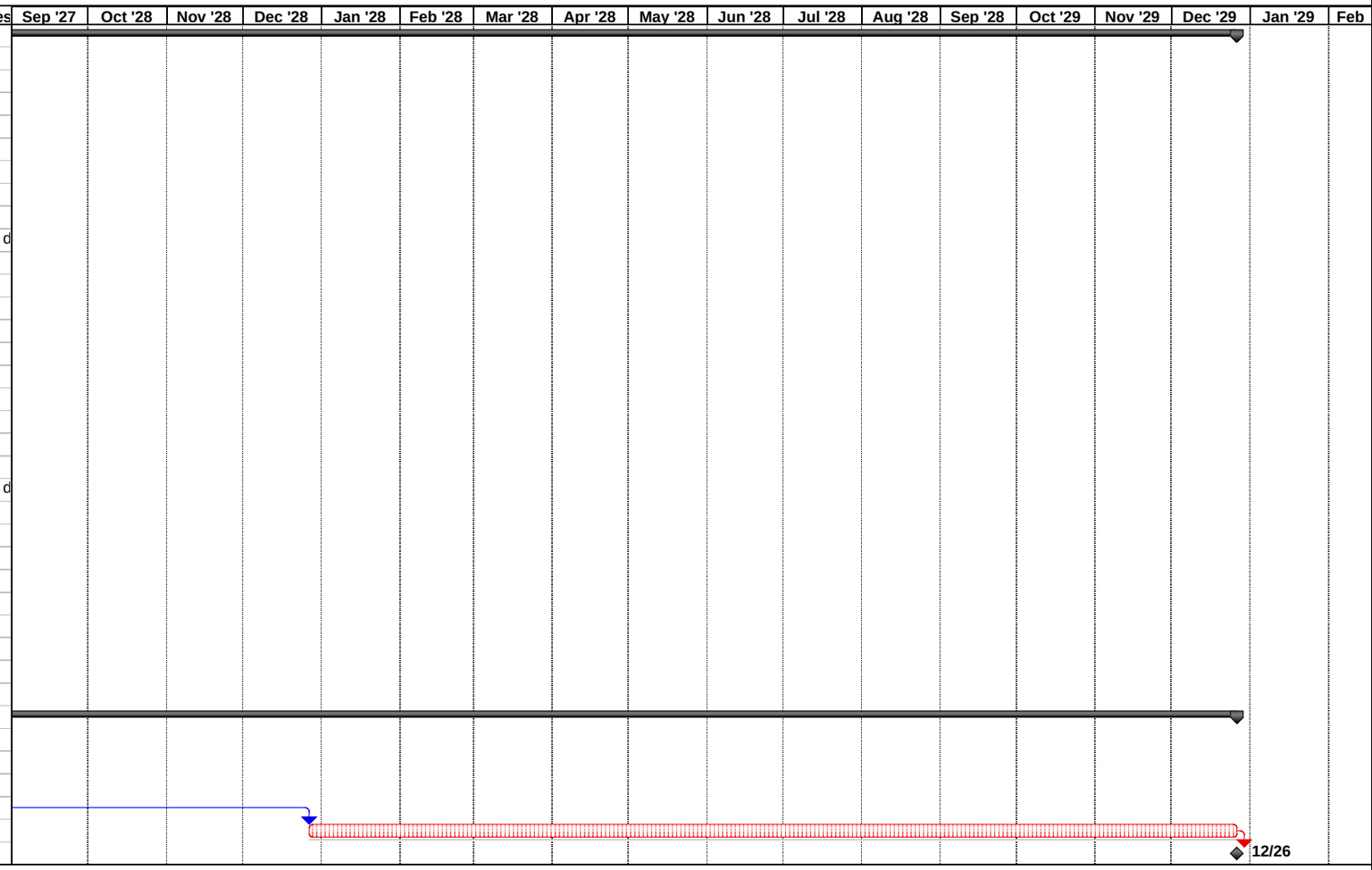
20	Drying Soil	80 days	Wed 8/2/17	Tue 11/21/17	19SS
21	Load & Haul	100 days	Mon 7/10/17	Fri 11/24/17	17SS+5 d
22	Liner	5 days	Wed 9/20/17	Tue 9/26/17	19
23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
25	Landscaping	20 days	Wed 10/25/17	Tue 11/21/17	24,23
26	Permanment Fencing	15 days	Wed 11/22/17	Tue 12/12/17	25
27	Test & Train	5 days	Wed 12/13/17	Tue 12/19/17	26
28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
29	Demob	5 days	Wed 12/20/17	Tue 12/26/17	28,27
30	Construction Complete	0 days	Tue 12/26/17	Tue 12/26/17	29,26
31	**Post Construction Monitoring**	**2608.88 days**	**Thu 12/27/18**	**Tue 12/26/28**	
32	Year 1	260.88 days	Thu 12/27/18	Thu 12/26/19	30FF
33	Year 3	260.88 days	Mon 12/28/20	Mon 12/27/21	32
34	Year 5	260.88 days	Tue 12/27/22	Tue 12/26/23	33
35	Year 7	260.88 days	Fri 12/27/24	Fri 12/26/25	34
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Mokuhinia , Alt 8B (Rev 15 Jul 13)**
PROJECT NO:
LOCATION: **Lahaina, Maui**

DISTRICT: **Honolulu District**
PREPARED: **6/14/2013**
POC: **CHIEF, COST ENGINEERING, Gary F. Yamauchi**

This Estimate reflects the scope and schedule in report; Feasibility Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: 10/1/2012 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*O*
06	FISH & WILDLIFE FACILITIES	$5,394	$970	18%	$6,364	3.9%	$5,606	$1,009	$6,615			$5,905	$1,062	$6,967
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$61	$11	18%	$72	3.9%	$63	$11	$75			$75	$14	$89
	CONSTRUCTION ESTIMATE TOTALS:	$5,455	$981		$6,436	3.9%	$5,669	$1,020	$6,689			$5,980	$1,076	$7,055
01	LANDS AND DAMAGES	$1,412	$259	18%	$1,671	3.9%	$1,467	$270	$1,737			$1,510	$277	$1,787
22	FEASIBILITY STUDY (CAP studies)									$1,236				$1,236
30	PLANNING, ENGINEERING & DESIGN	$758	$185	24%	$943	5.5%	$799	$195	$994			$835	$203	$1,039
31	CONSTRUCTION MANAGEMENT	$467	$91	20%	$558	5.5%	$493	$96	$589			$552	$108	$660
	PROJECT COST TOTALS:	$8,092	$1,517	19%	$9,609		$8,429	$1,581	**$10,009**	$1,236		$8,877	$1,665	$11,777

Mandatory by Regulation	CHIEF, COST ENGINEERING, Gary F. Yamauchi	ESTIMATED FEDERAL COST:	65%	**$6,852**
Mandatory by Regulation	PROJECT MANAGER, Athline Clark	ESTIMATED NON-FEDERAL COST:	35%	**$3,690**
Mandatory by Regulation	CHIEF, REAL ESTATE, Stephen N. Cayetano	FEASIBILITY FEDERAL COST:		**$668**
		FEASIBILITY NON-FEDERAL COST:		**$568**
	CHIEF, PROJECT MGT, Anthony J. Paresa	**ESTIMATED TOTAL PROJECT COST:**		**$11,777**
	CHIEF, ENGRG & CONSTR, Todd C. Barnes			
	CHIEF, Civil Works Tech Branch, Michael F. Wong			
	CHIEF, CONSTRUCTION, Louis Muzzarini, Jr.			
	CHIEF, CONTRACTING, R. David Williams			
	CHIEF, PP-P, Roxane Iseri			
	CHIEF, Programs Mgt Branch, Roxane E. Iseri			

Filename: Mokuhinia-Alt8B(15Jul13)CAP_TPCS_Mar2013 r4.xlsx
TPCS

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Mokuhinia , Alt 8B (Rev 15 Jul 13)
LOCATION: Lahaina, Maui
This Estimate reflects the scope and schedule in report; Feasibility Study

DISTRICT: Honolulu District
POC: CHIEF, COST ENGINEERING, Gary F. Yamauchi
PREPARED: 6/14/2013

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 5/31/2013 Effective Price Level: 10/1/2012				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$5,394	$970	18.0%	$18	3.9%	$5,606	$1,009	$6,615	2017Q4	5.3%	$5,905	$1,062	$6,967
06	FISH & WILDLIFE FACILITIES (Post Construction Monitoring)	$61	$11	18.0%	$72	3.9%	$63	$11	$75	2024Q1	18.5%	$75	$14	$89
	CONSTRUCTION ESTIMATE TOTALS:	$5,455	$981	18.0%	**$6,436**		$5,669	$1,020	$6,689			$5,980	$1,076	$7,055
01	LANDS AND DAMAGES	$1,412	$259	18.4%	$1,671	3.9%	$1,467	$270	$1,737	2016Q3	2.9%	$1,510	$277	$1,787
30	PLANNING, ENGINEERING & DESIGN													
1.37%	Project Management	$75	$18	24.4%	$93	5.5%	$79	$19	$98	2016Q1	4.2%	$82	$20	$102
4.67%	Planning & Environmental Compliance	$255	$62	24.4%	$317	5.5%	$269	$65	$334	2016Q1	4.2%	$280	$68	$348
5.19%	Engineering & Design	$283	$69	24.4%	$352	5.5%	$298	$73	$371	2016Q1	4.2%	$311	$76	$387
1.56%	Engineering Tech Review ITR & VE	$85	$21	24.4%	$106	5.5%	$90	$22	$111	2016Q1	4.2%	$93	$23	$116
0.64%	Contracting & Reprographics	$35	$9	24.4%	$44	5.5%	$37	$9	$46	2016Q1	4.2%	$38	$9	$48
	Engineering During Construction			24.4%										
0.46%	Planning During Construction	$25	$6	24.4%	$31	5.5%	$26	$6	$33	2017Q4	12.1%	$30	$7	$37
	Project Operations			24.4%										
31	CONSTRUCTION MANAGEMENT													
7.64%	Construction Management	$417	$82	19.6%	$499	5.5%	$440	$86	$526	2017Q4	12.1%	$493	$96	$590
	Project Operation:			19.6%										
0.92%	Project Management	$50	$10	19.6%	$60	5.5%	$53	$10	$63	2017Q4	12.1%	$59	$12	$71
	CONTRACT COST TOTALS:	$8,092	$1,517		**$9,609**		$8,429	$1,581	$10,009			$8,877	$1,665	**$10,541**

Mokuhinia-Alt8Brev(13June13))

Estimated by	T. Kazunaga
Designed by	CH2MHILL
Prepared by	T. Kazunaga
Preparation Date	5/31/2013
Effective Date of Pricing	5/31/2013
Estimated Construction Time	Days

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Description	ContractCost
Contract Cost Summ (ECC)	**5,455,152.91**
06 Fish and Wildlife Facilities	**5,455,152.91**
0603 Wildlife Facilities & Sanctuary	**5,455,152.91**
Mob, Demob, Demo & Preparatory Work	**662,622.51**
060309 Buildings, Project Operations	**1,652.22**
060337 Water Wells	**294,509.50**
060371 Fences & Revetment	**768,854.09**
060373 Habitat and Feeding Facilities	**3,666,268.74**
Monitoring After Construction (Adaptive Mgt)	**61,245.83**

Alt 8B Quantity Take-off

*Revised 14 Jan 13 per new QTO from AE

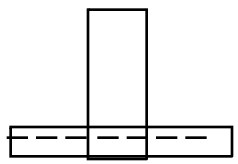
Site Prep		
staging Area	40,289.00	SF
Constr Fence	2,675.00	LF
Constr. Entrance	1.00	EA
Erosion Control	2,675.00	LF
Moku'ula Exclusion Fense around perimeter (buffer)	1,250.00	LF
Archeologist (on-site during Construction)	3.00	mo
Demo:		
FOM parking lot (entire)	40289	sq ft
FOM parking lot (excluding Moku`ula)	13971	sq ft
NE parking lot	10654	sq ft
NW parking lot	9920	sq ft
Tennis court (west)	15279	sq ft
Tennis court (east)	14966	sq ft
Basketball court	6395	sq ft
Bathroom	850	sq ft
Total Parking Demo	34,545.00	sf
Total Tennis Ct Demo	30,245.00	SF
2 Wooden Bldg w/ Mtl Roof & Conc Foundation	2,388.00	SF
Wood Frame Bldg w/ Composition roof & Wooden Pier Foundation	1,116.00	SF
Cut/Cap, Remove Utilities		
Water	3.00	EA
Sewer	3.00	EA
U/G Power	3	EA
Misc (Court Fences, BB Fences, Lights, Misc utility boxes)	1.00	LS

Grading	SF	SY	Compact (CY)
Wetland Bottom	185,152.00	20,572.44	3,428.74
Wetland Slope	81,569.00	9,063.22	1,510.54
Total Excavation	28,559.00	CY	4,939.28
	2.89		
Microtopography	29,635.67	SY	
Fine Grading	2.00	wk	
Excavation	28,599.00	CY	(from AE)
Assume Dispose rocks/Dirt >6" @ 50%; 1.34 tons/cy			
De-Water	6.00	wks @ 0.5'	

Liner:										$ -
Clay Liner *topsoil mayb be re-used from on-site										
For cost, assume off-site compact clay to 95%	266,751.00	SF	Bulking			CY		100% Std Proctor Shrink		
6" thk, 266,751 SF	4,939.83	cy		1.39	6,866.37	LCY		1.06	5,236	CCY
Organic Topsoil: 12" thk; 266,751 SF	9,879.67	cy		1.3	12,843.57	LCY		1.10	10,868	CCY
		Clay		115.00	lbs/sf		1.55	tons/cy		

Revetment:

Conc/Rock reveetment w/ buried fooding	1,100.00	LF		2'		
lava rock façade	1,100.00	lf				
Ht (see Lisa's email 15 Jan 2013)	3.50	Ft			3.50	
			1.00		1.00	
			1.00			



	H (above Gnd) (Ft)	W(ft)	L (ft)	Face SF	CSA
Vert Wall	3.50	2.00	1,100.00	7,700.00	7
Footing	1.00	4.00	1,100.00	1,100.00	4
Vert	0.50	2.00	1,100.00	1,100.00	1
Formwork	9,900.00	SF			

Conc	488.89	cy	5% waste	513.00	cy			
Reinf; Assume #4 @ 12" OC	7,700.00	LF	2.57	tons	5% waste	2.70	tons	
Curing	13,200.00	SF						
Lava Rock Façade	9,900.00	SF	122.10	cy	225.89	tons		
Grout	1,980.00	SF	24.42	cy				
Excavate for Footing	325.93	ECY						
Backfill	81.48	ECY	89.63	ccy				
Dispose	236.30	CY	1.34	tons/cy	316.64	tons		
Maint Path (grvl rd)								
12" Gravel	400.00	LF	16.92	ccy				
Assume 12'Wide								
Geotextile	44.44	SY	48.89	SY (10% Waste)				
Maint Path (grvl rd)								
12" Gravel	400.00	LF	16.92	ccy				
Fence								
4'H CLF	2,775.00	LF						
Gate	2.00							
Footing	278.00	EA	0.07	CY				
conc	20.59	CY						
Well & Pump								
12" Dia Drill	50.00	VLF						
20' Screen	1.00	EA						
Cathodic Protection	1.00	EA						
Pump:								
5 HP Submersible pump & Motor, solar powered	50.00	GPM	3,000.00	gph				
Conc pad; 4" thk								
4" Isolation & Check Valve	1.00	EA						
3"HDPE	400.00	LF						
Trenching								
Pump Shed (Pre-Fab)								
6'X8'	1.00	EA						

Culvert below Mukuhinia Wy						
Conc Culvert	10.00	LF				
Trenching	50.00	lf				
30" HDPE	50.00	LF				
Patch trench						
Slide Gate:						
Hydrogate SS Fab Slide Gate, non-self contained; 30"X36"	1.00	EA				
Landcaping						
24" OC	0.90	ac	39,204.15	sf	726.00	cy
Planting	9,802.00	EA				
Kaluha	1,960.40	EA				
Makaloa	1,960.40	EA				
Ahuawa	1,960.40	EA				
Akulikuli	1,960.40	EA				
ae'ae	1,960.40	EA				
Total Plants	9,802.00	EA	Say	5.00	min/plant	
	816.83	HR				

8129.237 tons

*Diff MII Calc

Abbreviated Risk Analysis

Mokuhinia (Alt 8B) (Revised 15 Jul 13)

Feasibility (Alternatives)

Meeting Date: 17-Jan-13

PDT Members

Note: PDT involvement is commensurate with project size and involvement.

PM / Planner:	Athline Clark
Study Manager:	Athline Clark
Contracting:	-
Real Estate:	Mike Sakai
Relocations:	-
OTHER:	-
Engineering & Design:	Lisa Kettley
Technical Lead:	Lisa Kettley
Geotech:	-
Hydrology:	-
Civil:	-
Structural:	-
Mechanical:	-
Electrical:	-
Cost Engineering:	Tracy Kazunaga
Construction:	-
Operations:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-
OTHER:	-

Abbreviated Risk Analysis

Project (less than $40M): **Mokuhinia (Alt 8B) (Revised 15 Jul 13)**
Project Development Stage: **Feasibility (Alternatives)**
Risk Category: **Low Risk: Simple Project-No Life Safety**

Total Construction Contract Cost = $ 5,455,153

	CWWBS	Feature of Work		Contract Cost		% Contingency		$ Contingency		Total
	01 LANDS AND DAMAGES	Real Estate	$	1,412,000		18.37%	$	259,384	$	1,671,384.40
1	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Mob, Demob, Demo, Prep Work	$	662,623		18.10%	$	119,963	$	782,586.27
2	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Fences & Revetment	$	768,854		18.10%	$	139,196	$	908,049.65
3	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Habitat & Feeding Facilities	$	3,666,269		17.73%	$	650,095	$	4,316,364.29
4	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Monitoring After Construction	$	61,246		16.01%	$	9,807	$	71,053.34
5	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Buildings, Project Opeations	$	1,652		20.67%	$	341	$	1,993.46
6	06 03 WILDLIFE FACILITIES AND SANCTUARIES	Water Wells	$	294,509		20.98%	$	61,795	$	356,304.09
7						0.00%	$	-	$	-
8						0.00%	$	-	$	-
9						0.00%	$	-	$	-
10						0.00%	$	-	$	-
11			$	-		0.00%	$	-	$	-
12		Remaining Construction Items	$	-	0.0%	0.00%	$	-	$	-
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$	758,000		24.35%	$	184,545	$	942,545.34
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$	467,000		19.56%	$	91,367	$	558,366.63

Totals								
Real Estate	$	1,412,000		18.37%	$	259,384	$	1,671,384.40
Total Construction Estimate	$	5,455,153		17.99%	$	981,198	$	6,436,351
Total Planning, Engineering & Design	$	758,000		24.35%	$	184,545	$	942,545
Total Construction Management	$	467,000		19.56%	$	91,367	$	558,367
Total	$	8,092,153			$	1,516,494	$	9,608,647

Mokuhinia (Alt 8B) (Revised 15 Jul 13)
Feasibility (Alternatives)
Abbreviated Risk Analysis

Meeting Date: 17-Jan-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth						
					Max Potential Cost Growth	**40%**
PS-1	Mob, Demob, Demo, Prep Work	Scope of facilities and utilities for demolition not well defined.	Estimate based on GIS data, TMK records, and real estate investigation; actual areas may differ, but expected to have marginal impact on cost	Possible	Marginal	1
PS-2	Fences & Revetment	Cost for fence is consistent with anticipated range of design; cost for installation revetments accounts for dewatering	Cost for fence is consistent with anticipated range of design; cost for installation revetments accounts for dewatering	Possible	Marginal	1
PS-3	Habitat & Feeding Facilities	Project scope increases due to necessary changes in design of habitat.	Project is relatively simple; includes industry standard approach to restoration; no anticipated changes in scope related to restoration facilities	Unlikely	Negligible	0
PS-4	Monitoring After Construction	Monitoring after construction to verify the system is working could find that the water quality, hydrology and vegetation are not achieving Habitat Unit benefits. This may require future separate contract to modify the system.	It is assumed aquifer pump tests conducted during the PED phase; with design refinements during final design phase based on results of aquifer pump test as risk management strategy. It is anticipated to be unlikely to affect the scope of the project but will marginally affect the scope because wouldn't require additional excavation, only additional require pumping.	Unlikely	Marginal	0
PS-5	Buildings, Project Opeations	The conceptual design is based on the well house assumed a prefabricated shed. Scope of the well house could be revised once input from the sponsors / Friends of Moku'ula are consulted.	Because the well house will shelter the motor for the submersible pump, it is assumed that the shelter will be small. The shelter cost would not be a big cost item and is assume a 6'X8' prefabricated shed. It is possible this will be refined in the PED phase, which minimally impact the cost and schedule.	Likely	Marginal	2

PS-6	Water Wells	The conceptual design for the water well to includes solar powered pump and motor is based on assumed ground water levels.	Adjustments in excavation and/or pumping is not likely to affect general design approach or functionality of wetland, but could require design adjustments. The pump size and or well depth could be revised during the PED phase but is expected to minimally impact the schedule or cost.	Possible	Marginal	1
PS-7	0			Unlikely	Negligible	0
PS-8	0			Unlikely	Negligible	0
PS-9	0			Unlikely	Marginal	0
PS-12	Remaining Construction Items	Unsurveyed archeological areas below the existing parking lot and Salvation Army Site could affect the conceptual design and delay the construction schedule. Survey to be completed during final design phase.	Refinements are already planned as part of the design phase. Changes to accommodate archeological survey are expected to be minimal. The Salvation Army and parking lot sites are expected to have similar characteristics as other surveyed portion of Loko o Mokuhinia (with the exception of moku, which is already accounted for in the conceptual design.	Possible	Marginal	1
PS-13	Planning, Engineering, & Design	PED costs estimated and may not reflect actual PED costs	Fee quotes were used for PED costs. It is possible further refinements in the PED phase would increase, but it is expected to marginally affect the overall PED cost since most of the PED features were coasted.	Likely	Negligible	1
PS-14	Construction Management	Inadvertent archaeological impacts could have impact to overall cost and schedule, requiring additional construction management	Cost estimate already includes arch monitor during all ground disturbing activities; it is possible that arch resources could delay project, but cost impacts are expected to be marginal (arch monitor will already by onsite; may require some modification to project boundary to work around resource)	Possible	Marginal	1

Acquisition Strategy

					Max Potential Cost Growth	30%
AS-1	Mob, Demob, Demo, Prep Work	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-2	Fences & Revetment	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-3	Habitat & Feeding Facilities	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-4	Monitoring After Construction	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-5	Buildings, Project Opeations	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1
AS-6	Water Wells	Contract acquisition strategy is not defined. The strategy could result in less competition and increased cost.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	1

AS-7	0			Unlikely	Marginal	**0**
AS-8	0			Unlikely	Marginal	**0**
AS-9	0			Unlikely	Marginal	**0**
AS-12	Remaining Construction Items	Any unidentified construction items could result in cost impacts.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	**1**
AS-13	Planning, Engineering, & Design	Acquisition strategy could change, and impact design and solicitation efforts of the PED.	Market survey and level of complexity affect the acquisition strategy. Limited design funds can also affect the design quality.	Possible	Marginal	**1**
AS-14	Construction Management	Acquisition strategy could affect the construction management effort.	The reasonable assumption is that the contract will be advertised as small business with the sub contractor performing most of the work. 8A prime contractor markups factored into the estimate. It is possible the acquisition strategy could changed based on market research, but this would affect the cost marginally since the cost would be lower if advertised by full and open (more competition).	Possible	Marginal	**1**

Construction Elements

					Max Potential Cost Growth	15%
CE-1	Mob, Demob, Demo, Prep Work	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-2	Fences & Revetment	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-3	Habitat & Feeding Facilities	Excavation could impact arch resources, which could require adjustments during construction	The project cost items are simple. Excavation will be by shallow lifts. By using smaller lifts, unexpected cultural artifacts will have less chance to be damaged. Similar projects (Kawainui Marsh) had no major problems of excavation in shallow lifts. Shallow excavation has been accounted for in the project duration period. No special equipment is required for shallow excavation. The risk is likely low.	Possible	Marginal	1
CE-4	Monitoring After Construction	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	Monitoring will be on-going during 5 years after construction is completed. If funds are not available, delays in the findings will result in possible Habitat Unit benefits not achieved. There could be risks that a design deficiency is encountered, however the likelihood is low and the impact marginal since reasonable assumptions were based on georeference historical maps an other information.	Unlikely	Negligible	0
CE-5	Buildings, Project Opeations	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	The listed cost items are fairly simple. Any risk is likely low.	Unlikely	Negligible	0
CE-6	Water Wells	When drilling for the water well during construction, the water level might not be ad the assumption that was designed f.r.	Plan to conduct aquifer pump tests during final design phase; with design refinements during final design phase based on results of aquifer pump test as risk management strategy. It is anticipated to unlikely affect the construction effort since the drill rig will already be positioned in the well location, and will not require additional excavation, only pumping (de-watering).	Unlikely	Marginal	0
CE-7	0			Unlikely	Negligible	0
CE-8	0			Unlikely	Negligible	0

CE-9	0			Unlikely	Negligible	**0**
CE-12	Remaining Construction Items	Project complexity of these items may impact construction bid, site complexity, possible contract modifications.	Major construction items have been identified. There is minimal risk that any additional features would be added.	Unlikely	Negligible	**0**
CE-13	Planning, Engineering, & Design	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Limited funding has resulted in incomplete designs on similar district projects. There is every likelihood of more PED involvement during construction.	Likely	Marginal	**2**
CE-14	Construction Management	Incomplete designs or poor quality designs could result in more design effort during the construction period in the form of RFIs and mods.	Limited funding has resulted in incomplete designs on similar district projects. There is every likelihood of more construction management involvement related to RFIs, mods and claims.	Likely	Marginal	**2**

Quantities for Current Scope

					Max Potential Cost Growth	20%
Q-1	Mob, Demob, Demo, Prep Work	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-2	Fences & Revetment	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-3	Habitat & Feeding Facilities	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-4	Monitoring After Construction	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-5	Buildings, Project Opeations	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-6	Water Wells	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	1
Q-7	0			Unlikely	Negligible	0
Q-8	0			Unlikely	Negligible	0
Q-9	0			Unlikely	Negligible	0
Q-12	Remaining Construction Items	As design evolves quantities on current project scope may change.	Major quantities were based on conceptual design by the AE and provided to the Gov't. The project is relatively straight forward except for any unforeseen excavation quantities found during construction of the project which would impact the construction schedule and cost. It is possible but marginal any impact would occur in the PED phase.	Possible	Marginal	1

Q-13	Planning, Engineering, & Design	As design evolves quantities on current project scope may change.	Major quantities were based on conceptual design by the AE and provided to the Gov't. The project is relatively straight forward except for any unforeseen excavation quantities found during construction of the project which would impact the construction schedule and cost. It is possible but marginal any impact would occur in the PED phase.	Possible	Marginal	**1**
Q-14	Construction Management	As design evolves quantities on current project scope may change.	Quantities were based on conceptual design by the AE and provided to the Gov't. It is possible quantities would change. Major quantities were captured in the estimate. Any increases in quantities would marginally affect the overall cost and schedule.	Possible	Marginal	**1**

Specialty Fabrication or Equipment

					Max Potential Cost Growth	50%
FE-1	Mob, Demob, Demo, Prep Work	This alternative is straight forward and most of the work in the site work. The only fabricated items are the fences, pumps and solar panels.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-2	Fences & Revetment	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-3	Habitat & Feeding Facilities	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-4	Monitoring After Construction	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0
FE-5	Buildings, Project Opeations	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	The project is relatively straight forward and the pump house design (pre-fabricated structure) could be refined to a non-prefab structure. This would impact the cost and schedule minimally since the size of the shelter is small.	Possible	Marginal	1
FE-6	Water Wells	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Pump size and capacity were based on conceptual design by the AE and provided to the Gov't. It is possible the pump size/capacity would be impacted by additional ground water data during the PED phase.	Possible	Significant	2
FE-7	0			Unlikely	Negligible	0
FE-8	0			Unlikely	Negligible	0
FE-9	0			Unlikely	Negligible	0
FE-12	Remaining Construction Items	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	0

FE-13	Planning, Engineering, & Design	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Pump size and capacity were based on conceptual design by the AE and provided to the Gov't. It is possible the pump size/capacity would be impacted by additional ground water data during the PED phase.	Possible	Significant	**2**
FE-14	Construction Management	Any specialized fabrication could impact cost due to change of material costs, complex designs, sole source fabrications that are not competitive.	Not applicable for these cost items.	Unlikely	Negligible	**0**

Cost Estimate Assumptions

					Max Potential Cost Growth	25%
CT-1	Mob, Demob, Demo, Prep Work	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-2	Fences & Revetment	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-3	Habitat & Feeding Facilities	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-4	Monitoring After Construction	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-5	Buildings, Project Opeations			Unlikely	Negligible	0
CT-6	Water Wells			Unlikely	Negligible	0

CT-7	0			Unlikely	Negligible	0
CT-8	0			Unlikely	Negligible	0
CT-9	0			Unlikely	Negligible	0
CT-12	Remaining Construction Items	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-13	Planning, Engineering, & Design	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1
CT-14	Construction Management	Estimate assumptions play a large role in establishing estimated costs relative to contractor markups and assignment, quantities, waste factors, crews and productivities, quotes and historical cost data.	The Cost Estimate was prepared with a reasonable assumption (based on historical Acquisition Strategies for a similar project) Small Business Contractor from Oahu as the Prime with the Sub Contractors performing most of the work. Major quantities factor in waste, costs of major items were based on historical or current quotes. Although it is possible for quantities to change as a result of refinement in the design, the cost should marginally increase.	Possible	Marginal	1

External Project Risks

					Max Potential Cost Growth	20%
EX-1	Mob, Demob, Demo, Prep Work	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-2	Fences & Revetment	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-3	Habitat & Feeding Facilities	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-4	Monitoring After Construction	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2

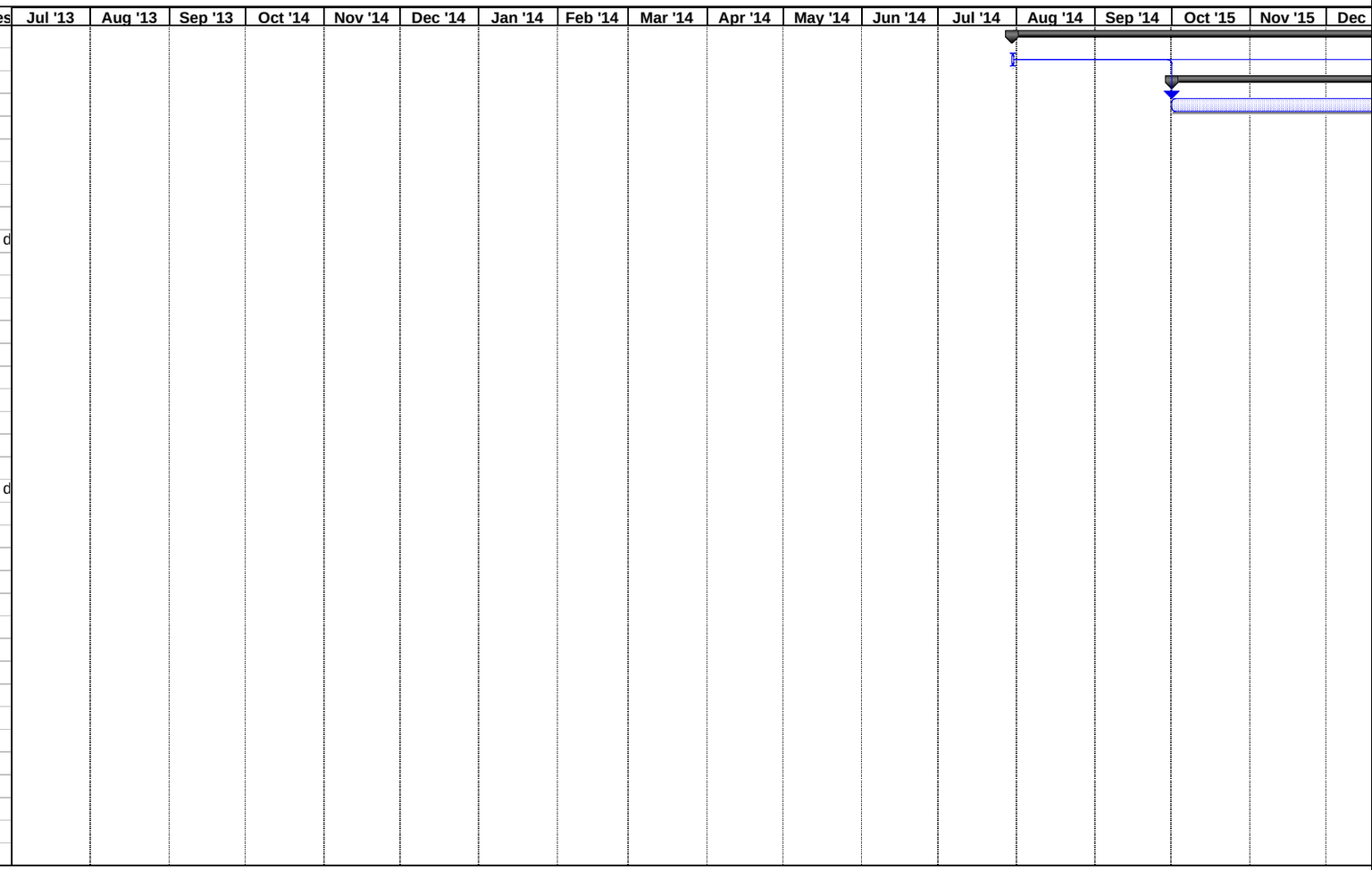
EX-5	Buildings, Project Opeations	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-6	Water Wells	External risks such as political, funding sources could impact project costs over time.	The Friends of Moku'ula have an interest in construction the project and do not want to delay the project. The sponsor, County of Maui is in favor of the project. Funding delays could impact the schedule of the project. It is an uncertain time for funding on the Sponsor & Federal Level and likely to impact the schedule. It is possible the funding could be delayed, however the estimate will be updated accordingly using costs at that time and published escalation rates. This would affect the overall cost marginally since this is a common to all Districts.	Likely	Marginal	2
EX-7	0			Unlikely	Negligible	0
EX-8	0			Unlikely	Negligible	0
EX-9	0			Unlikely	Negligible	0
EX-12	Remaining Construction Items	External risks such as political, funding sources could impact project costs over time.	The estimate excludes any added sponsor costs related to O&M cost and is excluded from the TPC. Any increase in the O&M cost to the sponsor could result in re-design in the PED phase.	Possible	Significant	2
EX-13	Planning, Engineering, & Design	External risks such as political, funding sources could impact project costs over time.	Changes to permitting and biological requirements could result in added coordination and design efforts.	Possible	Marginal	1
EX-14	Construction Management	External risks such as political, funding sources could impact project costs over time.	Assuming design is 100% complete upon award, the only impact may be added coordination of external requirements occurring during course of construction and potential design changes resulting in modifications.	Possible	Marginal	1

Mokuhinia (Alt 8B) (Revised 15 Jul 13)
Feasibility (Alternatives)
Abbreviated Risk Analysis

Typical Risk Elements	Potential Risk Areas											
	Mob, Demob, Demo, Prep Work	Fences & Revetment	Habitat & Feeding Facilities	Monitoring After Construction	Buildings, Project Opeations	Water Wells	0	0	0	Remaining Construction Items	Planning, Engineering, & Design	Construction Management
Project Scope Growth	1	1	-	-	2	1	-	-	-	1	1	1
Acquisition Strategy	1	1	1	1	1	1	-	-	-	1	1	1
Construction Elements	-	-	1	-	-	-	-	-	-	-	2	2
Quantities for Current Scope	1	1	1	1	1	1	-	-	-	1	1	1
Specialty Fabrication or Equipment	-	-	-	-	1	2	-	-	-	-	2	-
Cost Estimate Assumptions	1	1	1	1	-	-	-	-	-	1	1	1
External Project Risks	2	2	2	2	2	2	-	-	-	2	1	1

Mokuhinia-Alt 8A/B

ID	Task Name	Duration	Start	Finish	Predeces
1	**Mokuhinia - Alt 8A/B**	**3759.88 days**	**Wed 7/30/14**	**Tue 12/26/28**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
6	Solicit	3.25 mons	Fri 9/30/16	Fri 12/30/16	4
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6,5
8	**Construction**	**234 days**	**Wed 2/1/17**	**Tue 12/26/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
15	Mob	3 days	Wed 6/21/17	Fri 6/23/17	14
16	BMPs / Contractor's Storage Are	5 days	Mon 6/26/17	Fri 6/30/17	15
17	Demolition (structures; utilities)	20 days	Mon 7/3/17	Fri 7/28/17	16
18	Clear & Grub	2 days	Mon 7/31/17	Tue 8/1/17	17
19	Excavate for pond	35 days	Wed 8/2/17	Tue 9/19/17	18
20	Drying Soil	80 days	Wed 8/2/17	Tue 11/21/17	19SS
21	Load & Haul	100 days	Mon 7/10/17	Fri 11/24/17	17SS+5 d
22	Liner	5 days	Wed 9/20/17	Tue 9/26/17	19
23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
25	Landscaping	20 days	Wed 10/25/17	Tue 11/21/17	24,23
26	Permanment Fencing	15 days	Wed 11/22/17	Tue 12/12/17	25
27	Test & Train	5 days	Wed 12/13/17	Tue 12/19/17	26
28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
29	Demob	5 days	Wed 12/20/17	Tue 12/26/17	28,27
30	Construction Complete	0 days	Tue 12/26/17	Tue 12/26/17	29,26
31	**Post Construction Monitoring**	**2608.88 days**	**Thu 12/27/18**	**Tue 12/26/28**	
32	Year 1	260.88 days	Thu 12/27/18	Thu 12/26/19	30FF
33	Year 3	260.88 days	Mon 12/28/20	Mon 12/27/21	32
34	Year 5	260.88 days	Tue 12/27/22	Tue 12/26/23	33
35	Year 7	260.88 days	Fri 12/27/24	Fri 12/26/25	34
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36

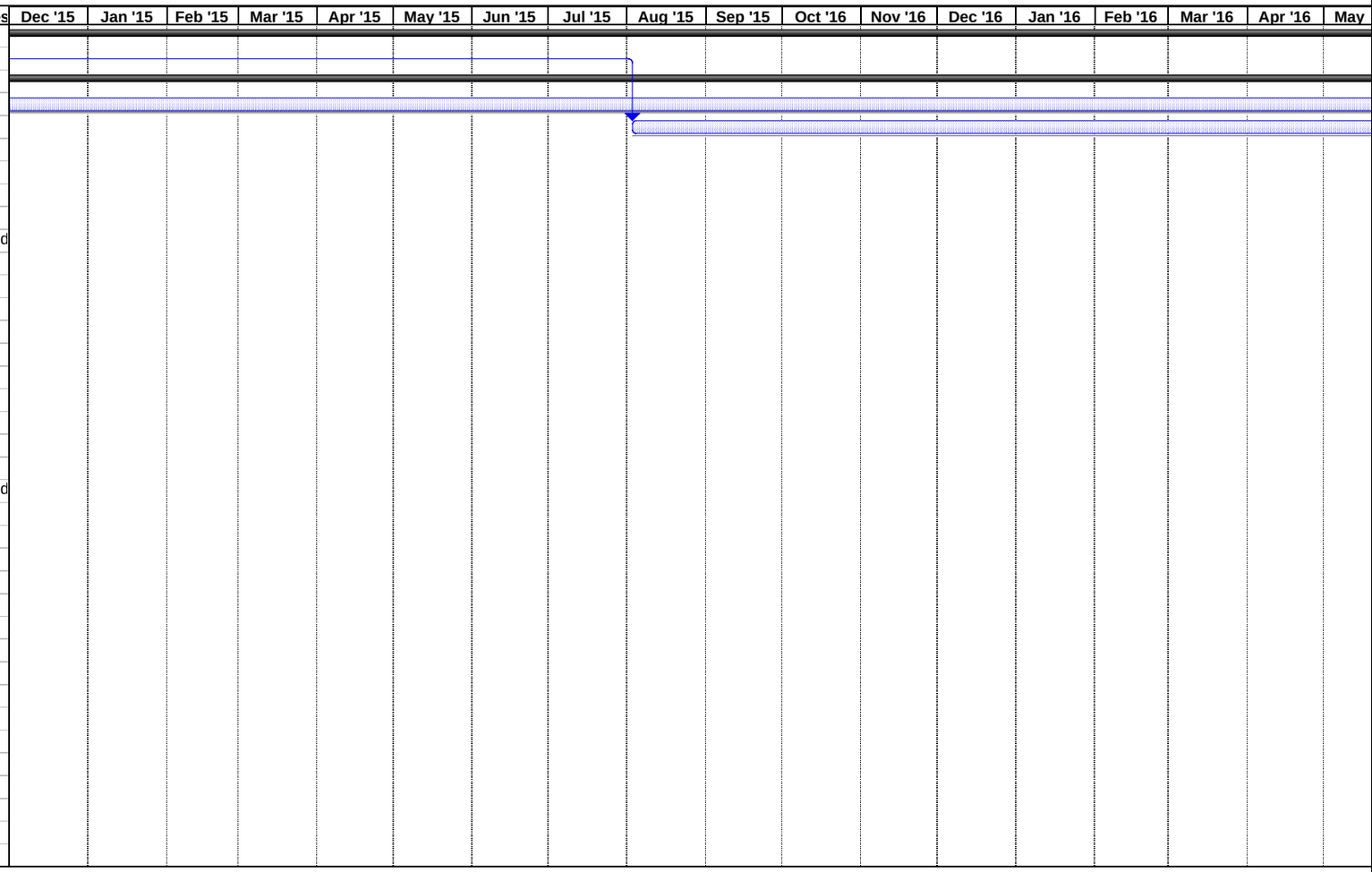


Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Milestone | Rolled Up Critical Task | Split | External MileTask
Critical Task | Summary | Rolled Up Milestone | External Tasks | Critical Task
Progress | Rolled Up Task | Rolled Up Progress | Project Summary | Progress

Mokuhinia-Alt 8A/B

ID	Task Name	Duration	Start	Finish	Predeces
1	**Mokuhinia - Alt 8A/B**	**3759.88 days**	**Wed 7/30/14**	**Tue 12/26/28**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
6	Solicit	3.25 mons	Fri 9/30/16	Fri 12/30/16	4
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6,5
8	**Construction**	**234 days**	**Wed 2/1/17**	**Tue 12/26/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
15	Mob	3 days	Wed 6/21/17	Fri 6/23/17	14
16	BMPs / Contractor's Storage Are	5 days	Mon 6/26/17	Fri 6/30/17	15
17	Demolition (structures; utilities)	20 days	Mon 7/3/17	Fri 7/28/17	16
18	Clear & Grub	2 days	Mon 7/31/17	Tue 8/1/17	17
19	Excavate for pond	35 days	Wed 8/2/17	Tue 9/19/17	18
20	Drying Soil	80 days	Wed 8/2/17	Tue 11/21/17	19SS
21	Load & Haul	100 days	Mon 7/10/17	Fri 11/24/17	17SS+5 d
22	Liner	5 days	Wed 9/20/17	Tue 9/26/17	19
23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
25	Landscaping	20 days	Wed 10/25/17	Tue 11/21/17	24,23
26	Permanment Fencing	15 days	Wed 11/22/17	Tue 12/12/17	25
27	Test & Train	5 days	Wed 12/13/17	Tue 12/19/17	26
28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
29	Demob	5 days	Wed 12/20/17	Tue 12/26/17	28,27
30	Construction Complete	0 days	Tue 12/26/17	Tue 12/26/17	29,26
31	**Post Construction Monitoring**	**2608.88 days**	**Thu 12/27/18**	**Tue 12/26/28**	
32	Year 1	260.88 days	Thu 12/27/18	Thu 12/26/19	30FF
33	Year 3	260.88 days	Mon 12/28/20	Mon 12/27/21	32
34	Year 5	260.88 days	Tue 12/27/22	Tue 12/26/23	33
35	Year 7	260.88 days	Fri 12/27/24	Fri 12/26/25	34
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

ID	Task Name	Duration	Start	Finish	Predeces
1	**Mokuhinia - Alt 8A/B**	**3759.88 days**	**Wed 7/30/14**	**Tue 12/26/28**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
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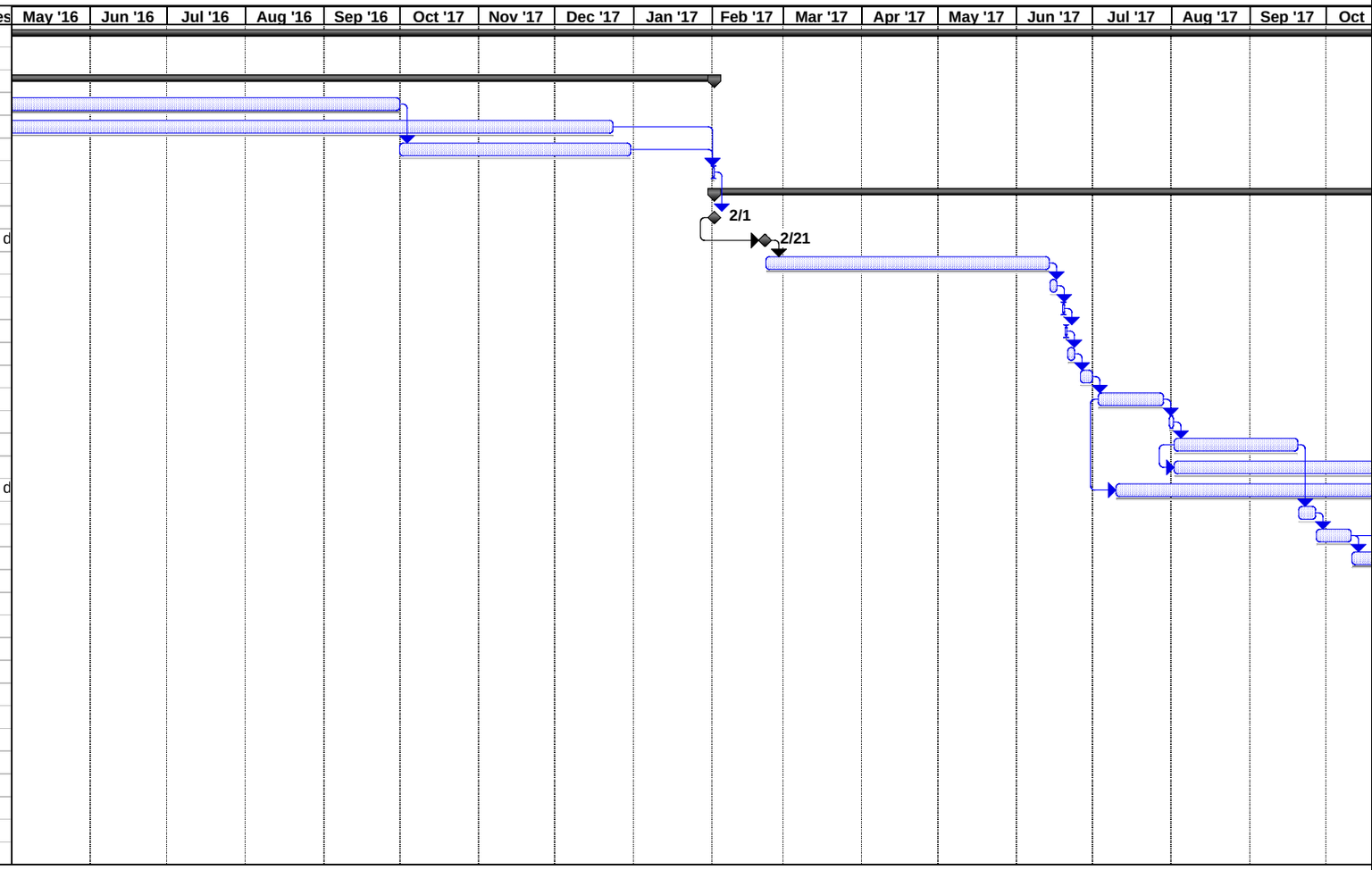
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6,5
8	**Construction**	**234 days**	**Wed 2/1/17**	**Tue 12/26/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
15	Mob	3 days	Wed 6/21/17	Fri 6/23/17	14
16	BMPs / Contractor's Storage Are	5 days	Mon 6/26/17	Fri 6/30/17	15
17	Demolition (structures; utilities)	20 days	Mon 7/3/17	Fri 7/28/17	16
18	Clear & Grub	2 days	Mon 7/31/17	Tue 8/1/17	17
19	Excavate for pond	35 days	Wed 8/2/17	Tue 9/19/17	18
20	Drying Soil	80 days	Wed 8/2/17	Tue 11/21/17	19SS
21	Load & Haul	100 days	Mon 7/10/17	Fri 11/24/17	17SS+5 d
22	Liner	5 days	Wed 9/20/17	Tue 9/26/17	19
23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
25	Landscaping	20 days	Wed 10/25/17	Tue 11/21/17	24,23
26	Permanment Fencing	15 days	Wed 11/22/17	Tue 12/12/17	25
27	Test & Train	5 days	Wed 12/13/17	Tue 12/19/17	26
28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
29	Demob	5 days	Wed 12/20/17	Tue 12/26/17	28,27
30	Construction Complete	0 days	Tue 12/26/17	Tue 12/26/17	29,26
31	**Post Construction Monitoring**	**2608.88 days**	**Thu 12/27/18**	**Tue 12/26/28**	
32	Year 1	260.88 days	Thu 12/27/18	Thu 12/26/19	30FF
33	Year 3	260.88 days	Mon 12/28/20	Mon 12/27/21	32
34	Year 5	260.88 days	Tue 12/27/22	Tue 12/26/23	33
35	Year 7	260.88 days	Fri 12/27/24	Fri 12/26/25	34
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

ID	Task Name	Duration	Start	Finish	Predeces
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2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
6	Solicit	3.25 mons	Fri 9/30/16	Fri 12/30/16	4
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6,5
8	**Construction**	**234 days**	**Wed 2/1/17**	**Tue 12/26/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
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28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
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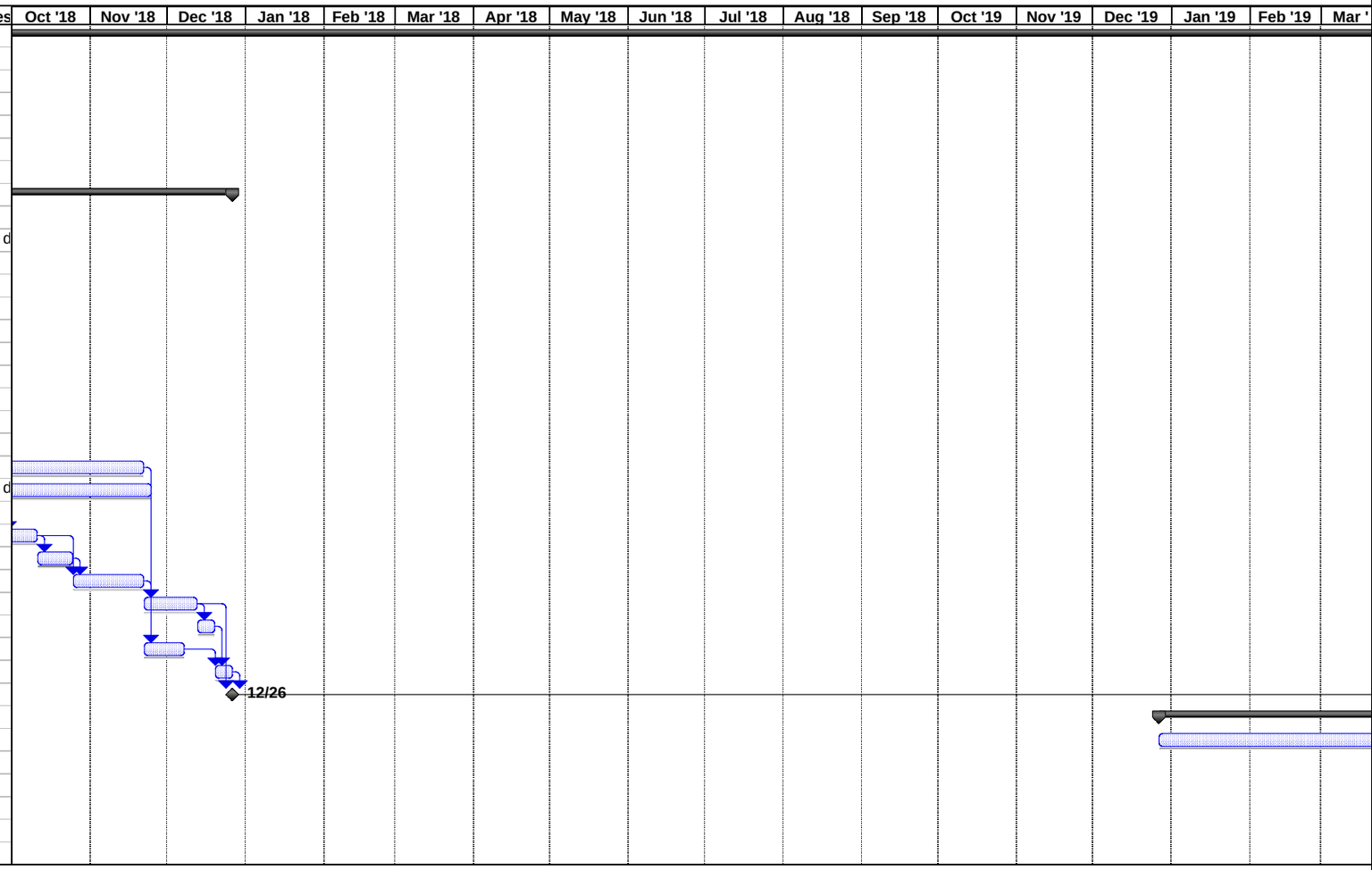
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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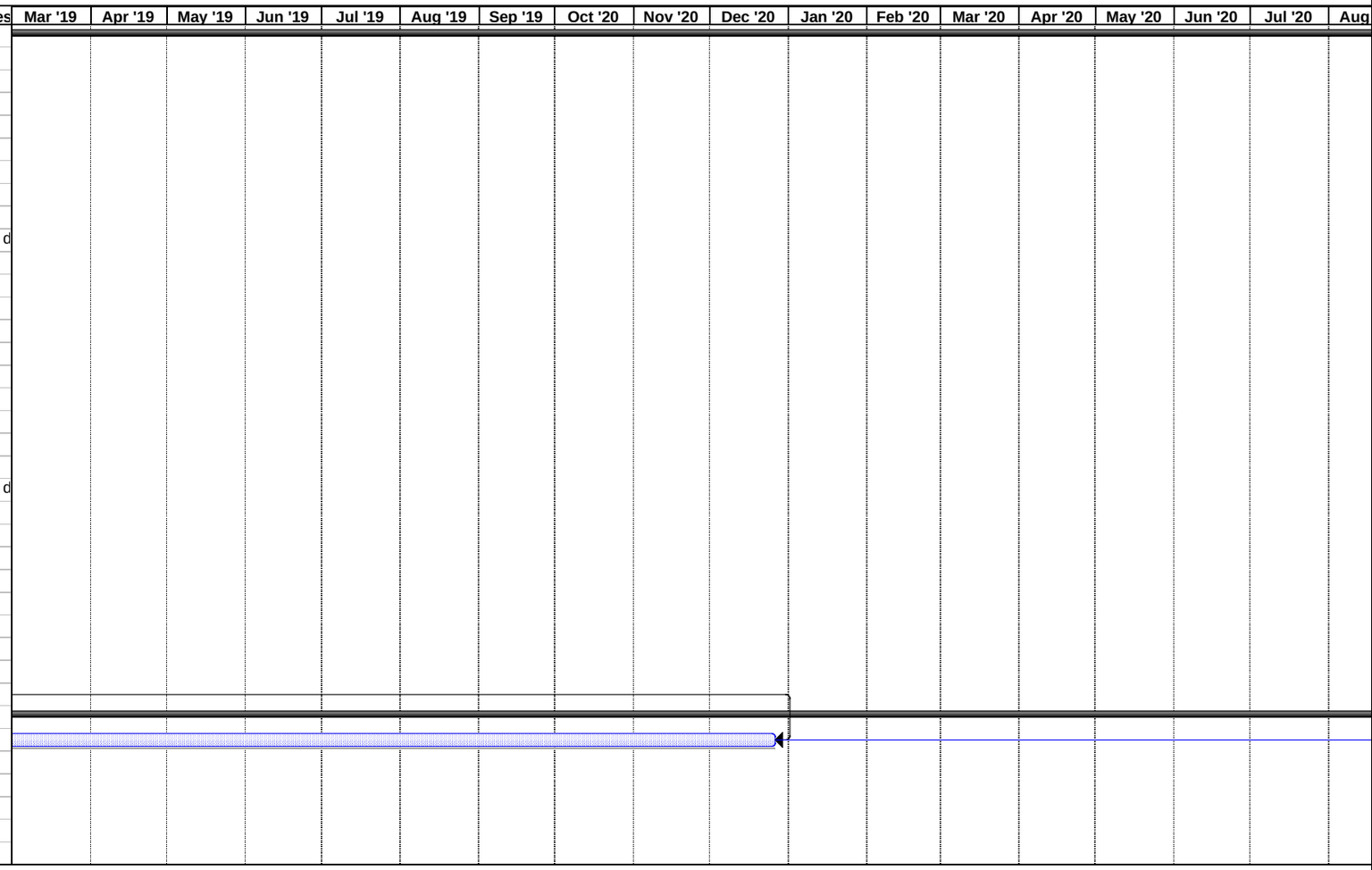
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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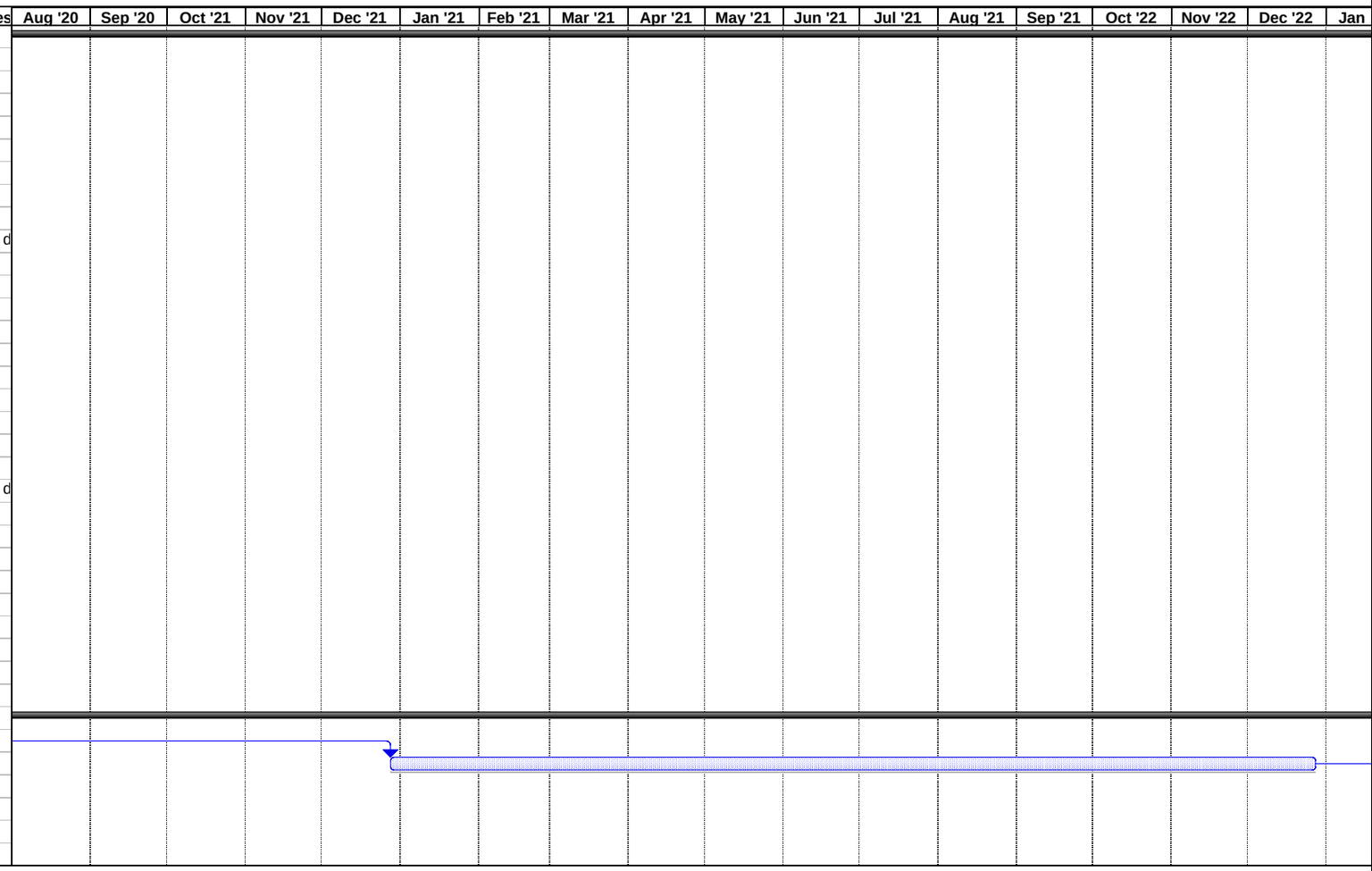
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

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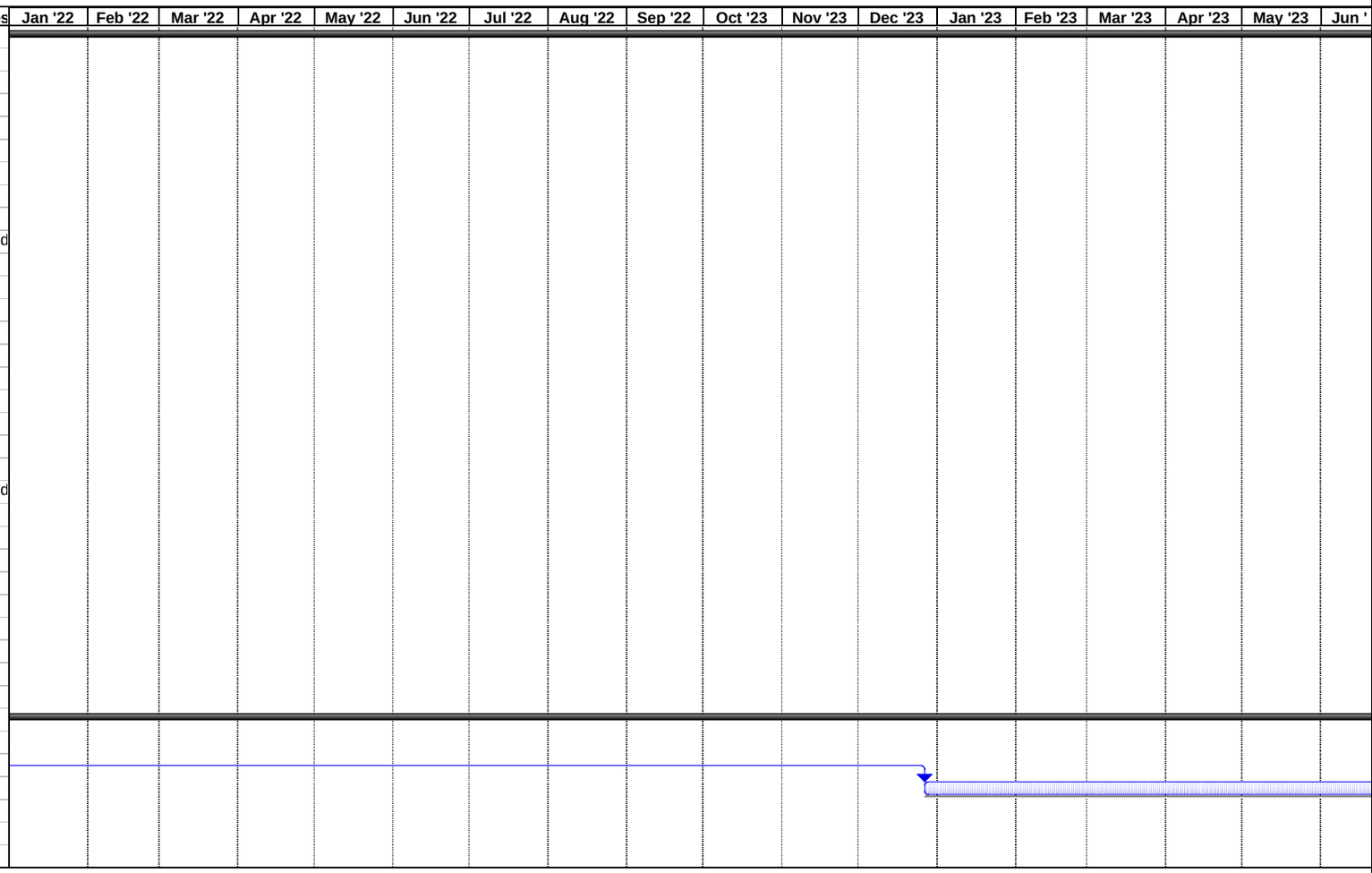

Mokuhinia - Alt 8A/B
Lahaina, Maui
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Task | Milestone | Rolled Up Critical Task | Split | External MileTask
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Mokuhinia-Alt 8A/B

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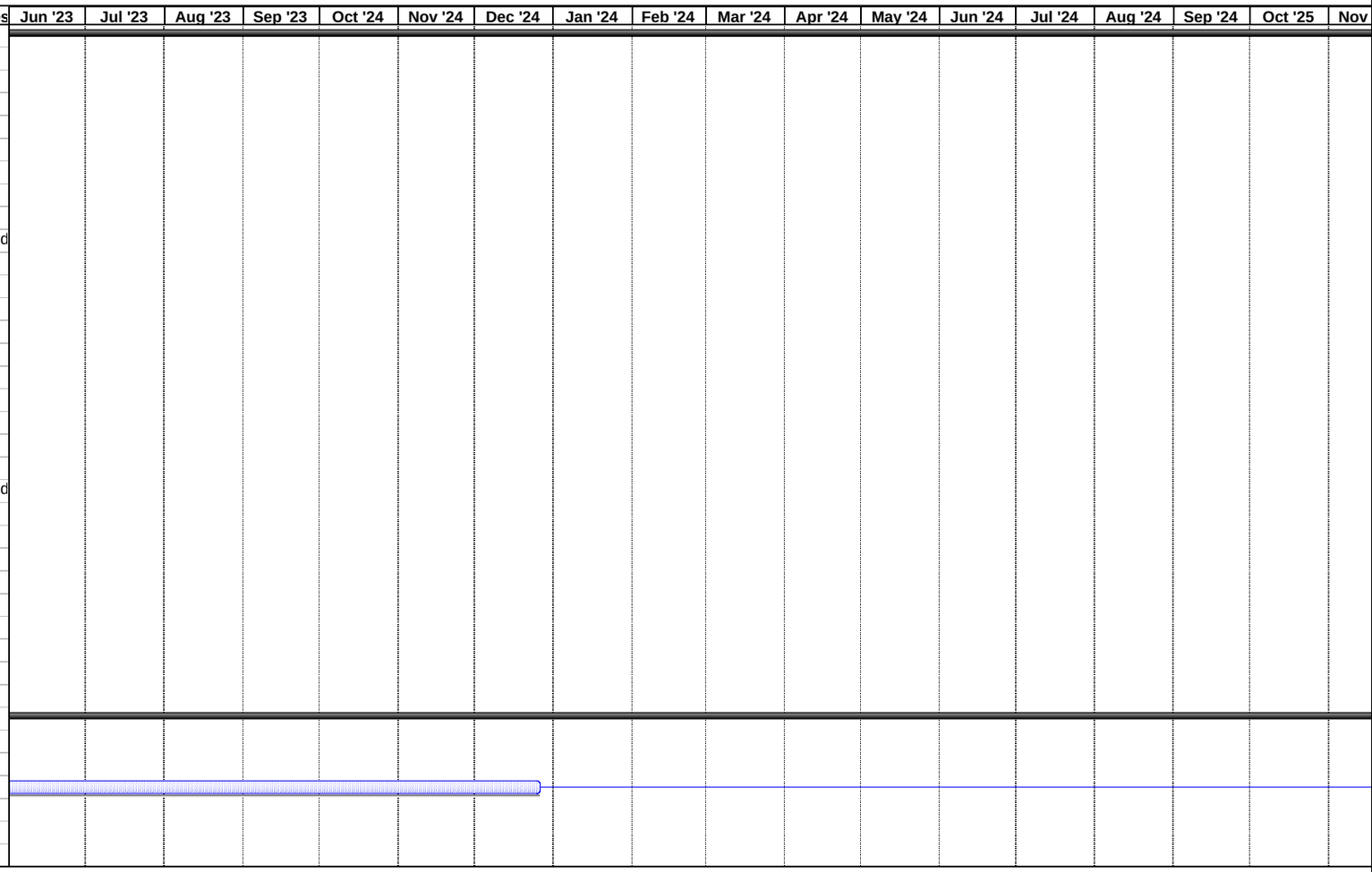

Mokuhinia - Alt 8A/B
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Mokuhinia-Alt 8A/B

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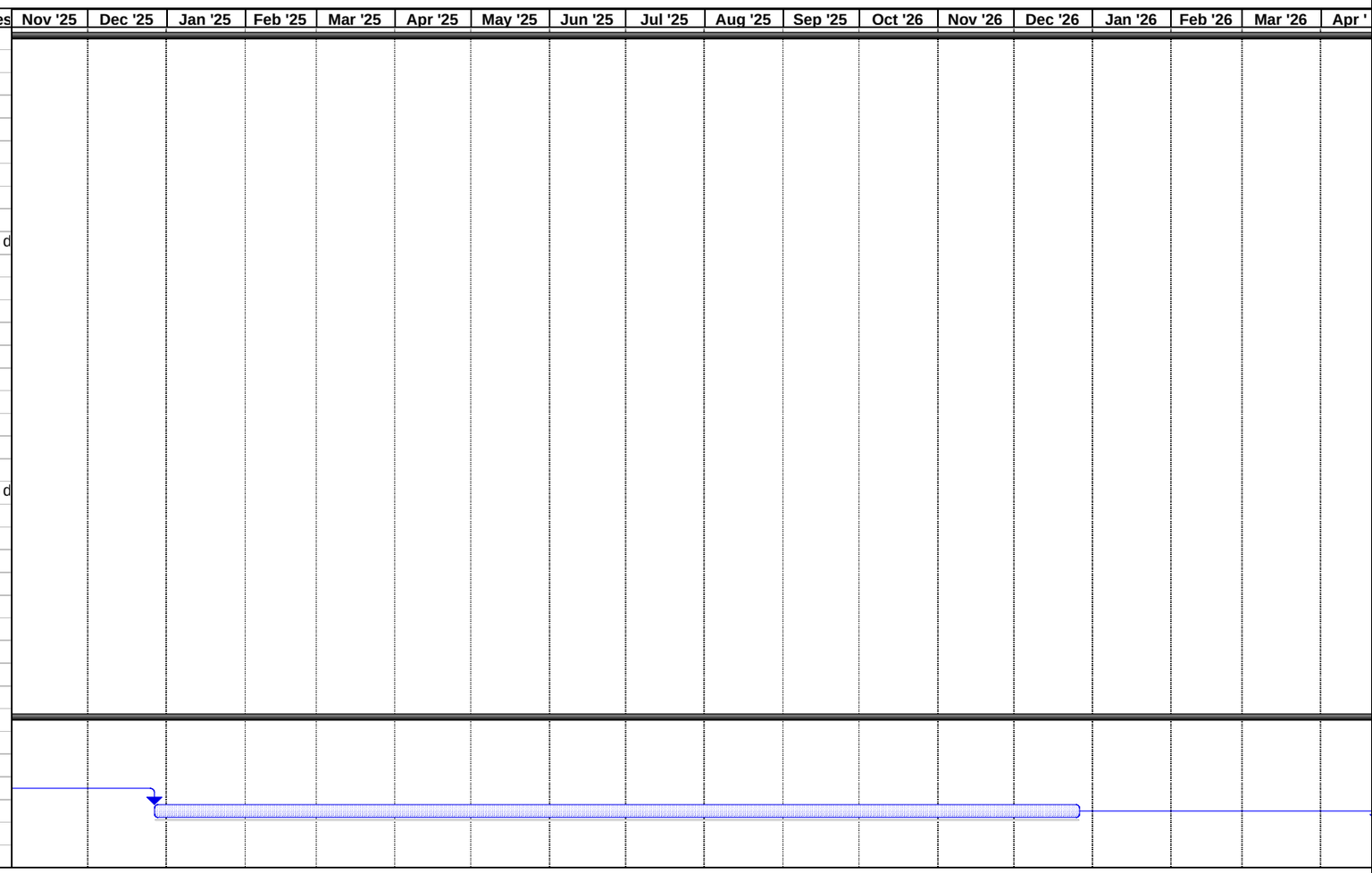
27	Test & Train	5 days	Wed 12/13/17	Tue 12/19/17	26
28	Rain Delay	12 days	Wed 11/22/17	Thu 12/7/17	20
29	Demob	5 days	Wed 12/20/17	Tue 12/26/17	28,27
30	Construction Complete	0 days	Tue 12/26/17	Tue 12/26/17	29,26
31	**Post Construction Monitoring**	**2608.88 days**	**Thu 12/27/18**	**Tue 12/26/28**	
32	Year 1	260.88 days	Thu 12/27/18	Thu 12/26/19	30FF
33	Year 3	260.88 days	Mon 12/28/20	Mon 12/27/21	32
34	Year 5	260.88 days	Tue 12/27/22	Tue 12/26/23	33
35	Year 7	260.88 days	Fri 12/27/24	Fri 12/26/25	34
36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
37	Project complete	0 days	Tue 12/26/28	Tue 12/26/28	36



Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

ID	Task Name	Duration	Start	Finish	Predeces
1	**Mokuhinia - Alt 8A/B**	**3759.88 days**	**Wed 7/30/14**	**Tue 12/26/28**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
3	**PED Start**	**611 days**	**Wed 10/1/14**	**Wed 2/1/17**	
4	Design	522.88 days	Wed 10/1/14	Fri 9/30/16	2
5	Real Estate Acquisition	364.88 days	Mon 8/3/15	Fri 12/23/16	2
6	Solicit	3.25 mons	Fri 9/30/16	Fri 12/30/16	4
7	Award	1 day	Wed 2/1/17	Wed 2/1/17	6,5
8	**Construction**	**234 days**	**Wed 2/1/17**	**Tue 12/26/17**	
9	NTP	0 days	Wed 2/1/17	Wed 2/1/17	7
10	Construction Start	0 days	Tue 2/21/17	Tue 2/21/17	9SS+14 d
11	Submittals	4 mons	Wed 2/22/17	Tue 6/13/17	10
12	Contractor Sensitivity Training	3 days	Wed 6/14/17	Fri 6/16/17	11
13	Public Meeting	1 day	Mon 6/19/17	Mon 6/19/17	12
14	Ground Breaking/Blessing Cere	1 day	Tue 6/20/17	Tue 6/20/17	13
15	Mob	3 days	Wed 6/21/17	Fri 6/23/17	14
16	BMPs / Contractor's Storage Are	5 days	Mon 6/26/17	Fri 6/30/17	15
17	Demolition (structures; utilities)	20 days	Mon 7/3/17	Fri 7/28/17	16
18	Clear & Grub	2 days	Mon 7/31/17	Tue 8/1/17	17
19	Excavate for pond	35 days	Wed 8/2/17	Tue 9/19/17	18
20	Drying Soil	80 days	Wed 8/2/17	Tue 11/21/17	19SS
21	Load & Haul	100 days	Mon 7/10/17	Fri 11/24/17	17SS+5 d
22	Liner	5 days	Wed 9/20/17	Tue 9/26/17	19
23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
25	Landscaping	20 days	Wed 10/25/17	Tue 11/21/17	24,23
26	Permanment Fencing	15 days	Wed 11/22/17	Tue 12/12/17	25
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36	Year 10	261.88 days	Mon 12/27/27	Tue 12/26/28	35
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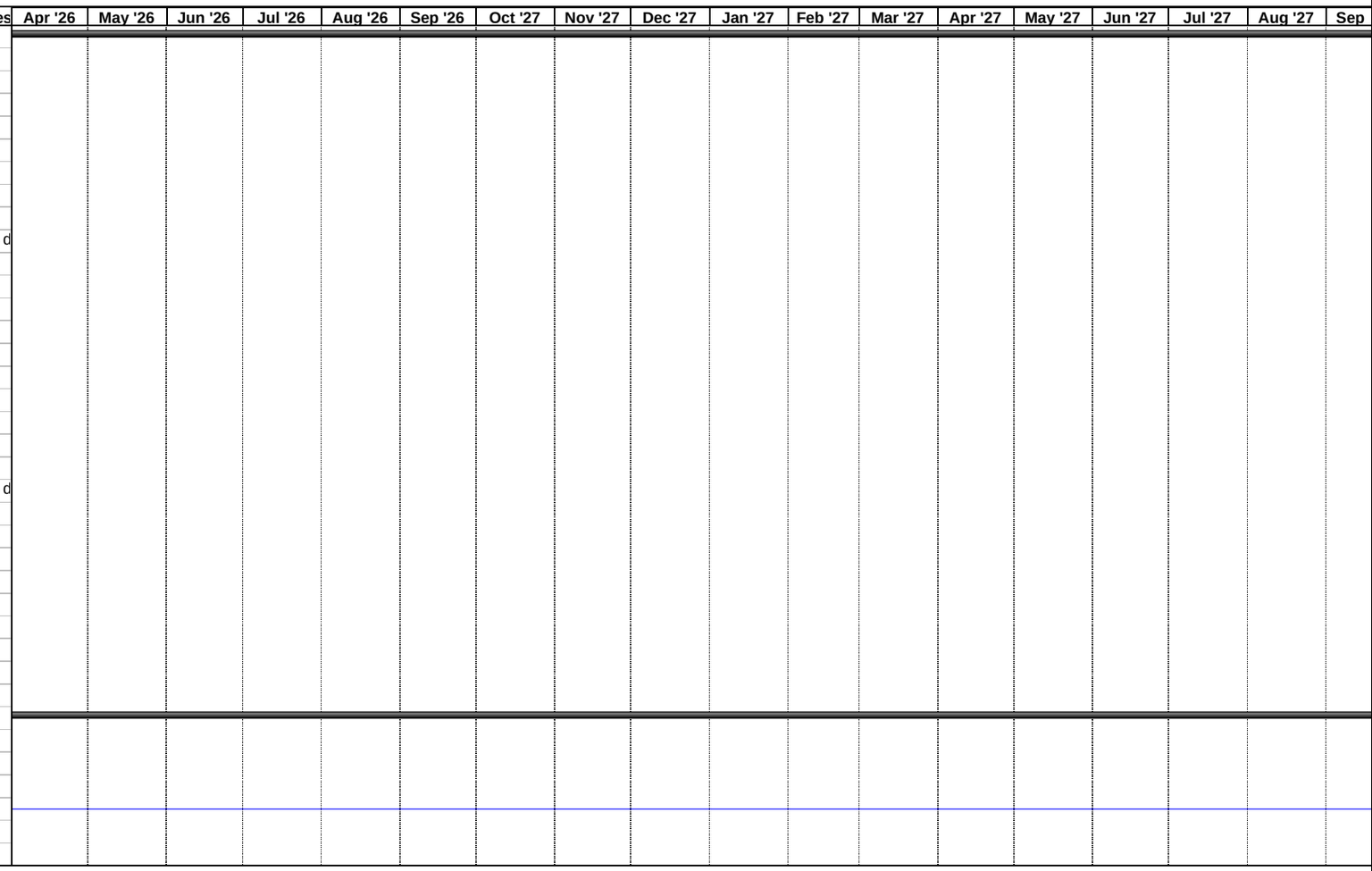

Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

Mokuhinia-Alt 8A/B

ID	Task Name	Duration	Start	Finish	Predeces
1	**Mokuhinia - Alt 8A/B**	**3759.88 days**	**Wed 7/30/14**	**Tue 12/26/28**	
2	Sign PPA	1 day	Wed 7/30/14	Wed 7/30/14	
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23	Create Microtopography	10 days	Wed 9/27/17	Tue 10/10/17	22
24	Well	10 days	Wed 10/11/17	Tue 10/24/17	23
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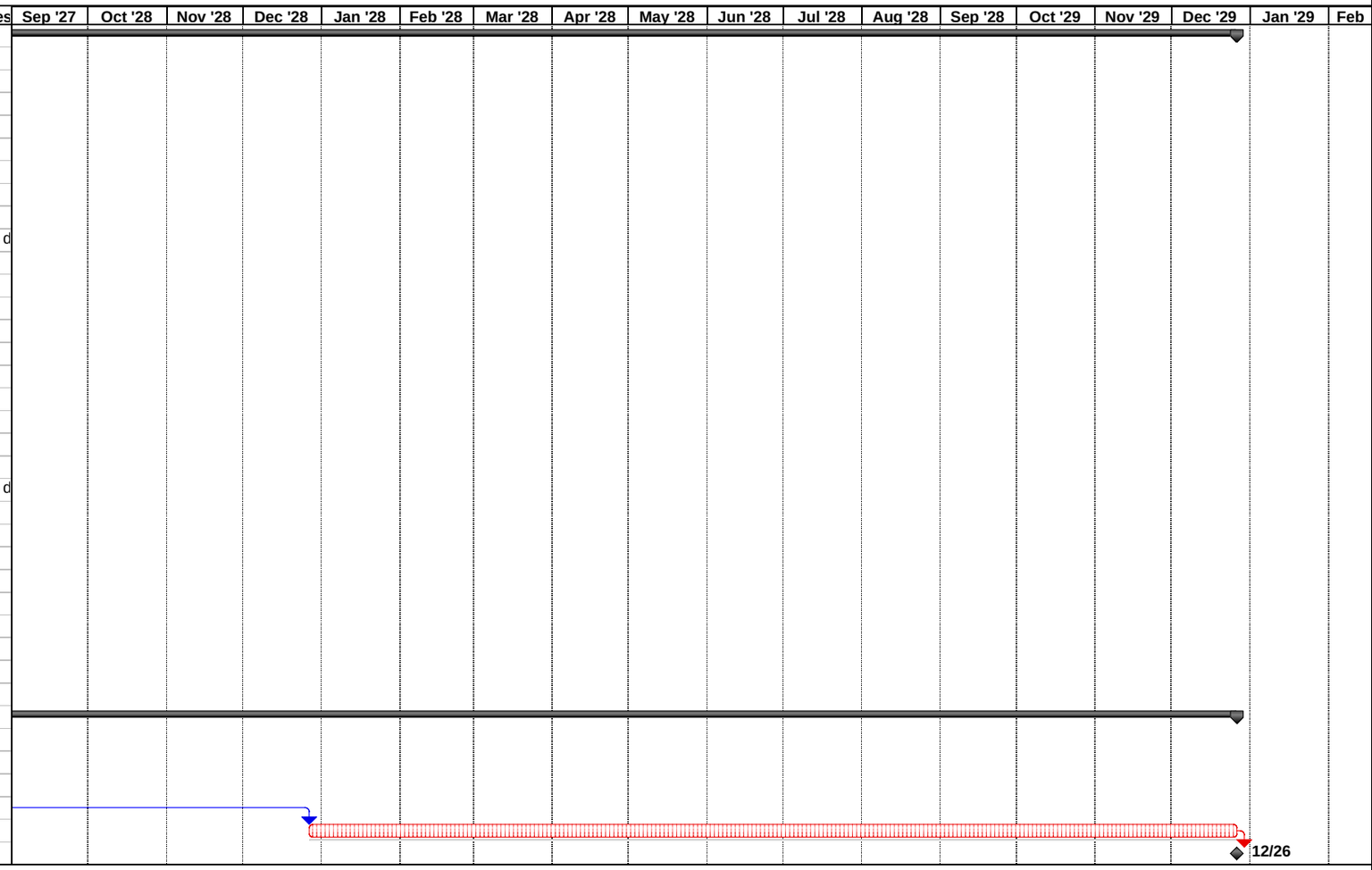

Mokuhinia - Alt 8A/B
Lahaina, Maui
Date: Mon 6/3/13

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External MileTask | Critical Task | Progress

APPENDIX F

Real Estate Planning Report

Real Estate Planning Report

Section 206 Continuing Authorities Program

Mokuhinia Ecosystem Restoration Project

Lāhainā, Maui, Hawaii

Prepared for
Honolulu District, USACE

Prepared by
Jim Doing, Real Estate Appraiser, HQ, RAO
6 August 2013

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EXECUTIVE SUMMARY

The subject project is authorized under section 206 of the Water Resources Development Act (WRDA), 1996. This continuing authority act provides the Secretary of Army authority to carry out aquatic ecosystem restoration studies, and to construct those works that are in the government's best interest.

The County of Maui has requested USACE assistance in the restoration of Mokuhinia, an historic wetland located in Lāhainā along the west side coastal wetlands. This approximately 17 acres wetland pond has historical, cultural, religious, and biological significance to the area.

The wetland was filled circa 1913 and is currently a recreational park with limited development around the perimeter. It is mostly an open sparsely vegetated field with a baseball backstop, tennis courts, a basketball court, public restroom and small paved parking lot in the southwest corner of the property. As early as 1918 a large portion of the area was set aside as a public park. Additional areas were later incorporated as a portion of the public park known as Malu'ulu o Lele Park.

The State of Hawaii is the record owner of all the land involved in the proposed project with the exception of two small parcels that are owned by the Salvation Army. This State owned land has been turned over to the County of Maui for control, operation and maintenance of the Malu'ulu o Lele Park. The two Salvation Army parcels are improved with older improvements consisting of two residences, a chapel and a thrift store for local residences. These two parcels will require acquisition by the local sponsor and removal of the improvements. The State of Hawaii will also be involved since it is the legal owner of the remaining land required for the project. The current recreational facilities will be removed but will not be relocated as sufficient replacement facilities have been recently constructed in the area.

A total of approximately 11.23 acres are currently proposed for the project; however, approximately one acre of this acreage is being considered for cultural development by the Friends of Moku'ula. In that case, that one acre parcel would not be eligible to be included in the Federal project.

The project will involve excavation of the previously filled material and restoration of the wetland. The project manager indicates that all project features and activities will be confined to the project footprint discussed in the report. A formal assessment of the sponsor's acquisition capability has not been performed for this project, however, the sponsor has been rated fully capable on other cost sharing projects. The sponsor has been advised of the risks involved in early acquisition on the two Salvation Army parcels.

The information provided in this report meets the requirements of ER 405-1-12, Chapter 12, Section 12-16c.

1. AUTHORITY/PURPOSE

The project is being investigated under the authority of Section 206 of the 1996 Water Resources Development Act (WRDA), as amended. Section 206 authorizes the Secretary of the Army to carry out a program of aquatic ecosystem restoration with the objective of restoring degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition, considering the ecosystem's natural integrity, productivity, stability and biological diversity. This authority is primarily used for manipulation of the hydrology in and along bodies of water, including wetlands and riparian areas. It is a Continuing Authorities Program (CAP), which focuses on water resource related projects that are relatively small in terms of scope, cost and complexity.

In a letter dated April 22, 2003, the County of Maui Department of Planning requested the assistance of the USACE with the restoration of Mokuhinia. A Preliminary Restoration Plan (PRP) was prepared to assess the federal interest in the project, based on the anticipated costs and benefits associated with the proposed restoration plan. The PRP was approved by USACE Pacific Ocean Division (POD) on September 22, 2004, and served as the decision document that allowed the project to proceed to a feasibility study. Currently the project is in the Plan Formulation Stage in preparation of a selected NER plan for implementation.

Historically, Loko o Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the western shoreline of Maui. Within the pond was the island of Moku`ula, which was the preferred residence of high ranking *ali`i* (chiefs) of Maui through the mid-1800s. This area also had great religious and cultural significance as the residence of Kihawahine, a *mo`o akua* (lizard-like goddess) and spiritual guardian of the royal family. Over time, alterations to the hydrologic regime resulted in
stagnation of the pond and, in 1913, Lāhainā businessmen filled the pond for hygienic and development purposes. A 1918 Executive Order turned the area over to the County of Maui for the establishment of Malu`ulu o Lele Park. Mokuhinia and Moku`ula currently lie approximately two to three feet under the ground surface of the park. The project specifically addresses the restoration of Mokuhinia, which is one component of a larger effort by the County of Maui and the Friends of Moku`ula to preserve and restore
the overall Moku`ula/Mokuhinia site. The purpose of the project is to restore the aquatic ecosystem functions and processes of Mokuhinia to the extent feasible, given the current development and alteration in the project area.

This REPR will be included as a part of the Engineering Documentation Report.

2. DESCRIPTION

The proposed project is located in Lāhainā, Hawaii, which is a small historic town on the northwest coast of Maui. Lāhainā is approximately 21 miles northwest of Kahului, the center of business and location of the main airport and harbor. Year around population is estimated at approximately 12,000, but peak tourism season can increase this to over 40,000. Lāhainā is primarily a tourist town now, but is the historic capital of the Kingdom of Hawaii and dates back to the early 1800's as a whaling center. King Kamehameha III constructed a palace in Lāhainā on the subject site and it served as the capital from about 1820 to 1835, when it was moved to Honolulu. Although nothing remains of the palace, much of the town is designated as a National Historic Site, and there are many other historical buildings. Front Street dates to 1820 and now is a favorite tourist attraction with numerous shops and restaurants.

Honoapilani or highway 30 runs along the west coast of Maui and provides the primary access to Lāhainā and connects it to Kahului and the towns to the north. Highway 31 connects to provide access to Kihei and towns to the south. The coastline is a very narrow bench at the foot of the West Maui Mountains and most of the development is makai of the highway. It is a very arid climate with only about 10 inches of rainfall per year. From northern Lāhainā up the coast about 6 miles to Napili there are numerous resort developments with large hotels, golf courses, residential neighborhoods and tourist activities. Lāhainā proper is not a destination location and most tourist stay in the area to the north or Kihei to the south.

Most of the 11.23 acre area of the project is devoted to an open park space consisting of baseball fields, tennis courts and basketball courts, and simply unused vacant land. Although a fee simple interest is generally required for the project footprint as the standard estate for ecosystem restoration projects, ER 405-1-12, Section 12-9.b(6) provides that " a lesser, or easement estate, may be appropriate based on the extent of interest required for the operation or requirements of a project." Although the County of Maui does not have a fee simple interest (deriving its control and management over the subject parcels from gubernatorial Executive Orders and Hawaii state law), the Honolulu District of USACE has determined, in accordance with ER 405-1-12, Section 12-10.c, that the lesser interest the County possesses, particularly in combination with an acknowledgment and concurrence by the State in the use of the parcels for the project, will provide the minimum interest in the subject real property required to support the project. See the Determination and Findings on this issue by CEPOH-PP-R dated 5 August 2013 attached hereto, which is incorporated herein.

A shallow pond will be created on the previously filled area and this excavated material will be used on site or disposed of in a commercial disposal facility. According to the project manager there will be no requirement for a LERRD spoil area and any material not suitable for use on the project features will be disposed of in a commercially available disposal site.

The tracts required for the project are as follows:

Parcel	TMK	Owner	Area in Square Feet
1	2-4-6-7-2	State of Hawaii	326,700
2	2-4-6-7-36	State of Hawaii	40,437
3	2-4-6-7-1	State of Hawaii	87,555
4	2-4-6-7-37	Salvation Army	16,674
5	2-4-6-7-38	Salvation Army	17,686
Total			489,052

3. SPONSOR'S REAL ESTATE INTERESTS

The County of Maui has administrative control over all but two parcels required for the project.

Parcel 1 was set aside for public purposes as a "public park at Lāhainā, Maui" by Executive Order 52 signed by the Governor of the Territory of Hawaii 25 April 1918. The dedication was for a park and it has been used as such since that time. Improvements consist of two lighted tennis courts, a lighted basketball court and a baseball field.

Parcel 2 is the southwest corner of the project site and State owned but set aside by Executive Order 02889 signed by the Governor of the State on 6 February 1978 "for use as a park site, to be under the control and management of the County of Maui." This is a level corner parcel that fronts on Front Street on the west and Shaw Street on the south. It is currently improved as a parking lot that is under the management of the Friends of Moku'ula.

Parcel 3 is the southeast corner of the project site and is State owned but set aside by Executive Order 3430 signed by the Governor of the State on 9 October 1989 "for park purposes, to be under the control and management of the County of Maui,… being that certain parcel of land designated as 'Addition to Malu-Ulu-O-Lele Park.'" The parcel is level vacant land that fronts on Shaw Street on the south.

These three parcels, although under the control of the county by virtue of the previously discussed Executive Orders, are legally owned by the state and not the local Maui County sponsor. It is also our understanding that the State is barred from transferring title to the sponsor, since these are ceded lands. However, as noted above, the Honolulu District of USACE has determined in the Determination and Findings on this issue by CEPOH-PP-R dated 5 August 2013 attached hereto that the County's interest in the parcels is sufficient for the project's purposes.

Based on information provided by the project manager, preliminary discussions with both the sponsor and State indicate that the State is in support of the project and both entities agree that the project purposes of ecosystem restoration are in agreement with the intent of the Executive Orders, in that the restored wetland will provide passive recreational and educational opportunities for the public.

As stated in the Determination and Findings, USACE recommends that the State acknowledge and concur in the use of the parcels for the project. The State will not be required to be a co-sponsor of the project and will have no liability for the project. It would only be required to demonstrate to the County and USACE that it is the fee owner of the parcels and has no objection to the County making the lands available for the proposed project. USACE can then certify that the lands are available.

It is also noted that parcel 3 is not shown to be a part of the restoration project but is to be developed for support facilities by the Friends of Moku'ula. This parcel may not be a part of the ecosystem restoration project and if not may not be suitable for inclusion in the project LERRD for cost sharing purposes.

Parcels 2-4-6-7-37 and 38 are small properties owned by the Salvation Army and consist of an estimated two residences, thrift store and chapel. These modest improvements will need to be acquired, the improvements removed, and the land made available for the project.

4. ESTATES TO BE ACQUIRED

Fee

The fee simple title to (the land described in Schedule A) (Tracts Nos. , and), subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

Only the fee interest has been requested at this time as that is the typical estate required for environmental restoration projects. Information from the project manager is that all site features can be accommodated on the fee footprint of the project. If final project design proves differently, the real estate needs will require modification.

As noted above and as set forth in the attached Determination and Findings by Honolulu District of USACE, the nearly but not quite fee simple interest held by the County in the three parcels legally titled in the State has been determined to be a sufficient interest, which satisfies the criteria set forth in ER 405-1-12, Section 12-10.c.

5. FEDERAL PROJECTS/OWNERSHIP

There are no federal projects or federal lands within the project area.

6. NAVIGATION SERVITUDE

Mokuhinia was historically a coastal wetland, located within a larger network of coastal wetlands along the western shoreline of Maui. Data obtained through archaeological investigations indicate that it was a naturally occurring pond.
Groundwater springs were the primary source of water, although it is thought that surface flow supplemented water volumes. At one time there appears to have been an outlet to the ocean to the west, but there is no evidence remaining. There is no record of this pond ever being used for commerce or any navigational use. Navigation Servitude does not appear to apply.

7. MAPS

Maps depicting the State of Hawaii and Island of Maui, the project area, and the impacted parcels are attached in the addendum.

8. FLOODING

Most of the subject parcels were historically a wetland and as such were subject to periodic low level flooding. After filling the area in circa 1913, the wetlands no longer exist and the area is not subject to period flooding. Flood plain maps indicate that the only portion of the subject parcels within the 100 year flood is approximately 25% of parcel 2 in the extreme southwest corner.

9. BASELINE COST ESTIMATE FOR REAL ESTATE

The procedure followed to arrive at the value was to do a real estate cost estimate as defined in EC 405-1-04, para. 4-19 and 4-20. This type of estimate is typically done for Continuing Authorities Projects. A written cost estimate was developed based on comparable sales in the area.

Fee Title…….$ 1,086,500

Perpetual Channel Improvement Easement……$ 0

Perpetual Joint Use Road Easement……..$ 0

Temporary Work Area Easement……$ 0

Improvements……..$ 210,000

Hazard Removals…….$ 0

Mineral Rights……..$ 0

Damages……..$ 0

Contingencies……..$ 259,300

Relocations……..$ 0

Uniform Relocation Assistance (PL 91-646)……$ 65,000

Acquisition Administrative Costs……..$ 50,000

TOTAL COST……$ 1,670,800

10. PL 91-646 RELOCATION BENEFITS

Public Law 91-646, The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, commonly called the Uniform Act, is the primary law for acquisition and relocation activities on Federal or federally assisted projects and programs. The local sponsor is required to follow the guidance in this public law.

The two Salvation Army properties will be eligible for PL 91-646 benefits. A cursory investigation suggests that both residential and business relocations will be applicable. Preliminary investigation suggests that there are two occupied residences, a thrift store, and a chapel/counseling facility on the two privately owned parcels. The number of displaced persons cannot be determined without site specific investigations that will occur during the acquisition of the parcels, or without owner contact. Both parcels are owned in the name of the Salvation Army and it is not known who occupies the residences. For planning purposes it is assumed that the residences will qualify for the maximum benefit of up to $22,500/dwelling. The thrift store and chapel may qualify independently as businesses and if so could qualify for the maximum business benefit of $10,000/business.

Sufficient comparable housing is available in the community so as not to require housing of last resort.

11. MINERALS

There are no surface of subsurface minerals known that would impact the project or acquisition.

12. ASSESSMENT OF SPONSOR'S ACQUISITION CAPABILITY

An assessment of the sponsor's acquisition capabilities to acquire the land necessary for this project has not been completed at this time. Maui County, however, has been rated as fully capable for other cost shared projects in the county and as such is considered fully capable.

13. ZONING

The subject properties are all zoned R-2, which is a residential zoning. The zoning allows one dwelling per 7,500 square feet. It also allows a park use of the land and as such it appears that all the uses are legal.

14. MILESTONES

The sponsor will begin preliminary acquisition work approximately 6 months prior to PCA execution as follows:

Survey/Maps/Title	90 Days
Legal Descriptions	30 Days
Appraisals	90 Days

Final Feasibility Report and EA are anticipated in the fall of 2014. No projected date is available for the PCA execution. The sponsor will complete acquisition of LERRD within 180 days after the PCA execution as follows:

Documentation	120 Days
Negotiations	60 Days
Final Subdivision	60 Days
Payments	90 Days

LERRD certification	21 Days

15. PUBLIC UTILITIES RELOCATIONS

Public utility lines run along the streets and serve the improvements to include the Salvation Army, public restrooms and tennis and basketball court lighting. It does not appear that these utilities will require relocation. The public recreation facilities have been increased on

neighboring recreational developments to meet the need of the facilities being lost with the project, and no relocation of these facilities is required.

16. ENVIRONMENTAL IMPACTS

Environmental impacts, if any, are discussed in other sections of the Engineering Documentation Report.

17. ATTITUDES OF LANDOWNERS

There is considerable support for the project from the Friends of Moku'ula, the County of Maui and the State in general as well as other cultural resource entities. There are only two parcels to be acquired from the Salvation Army and their interest or opposition is unknown. Most of the land has been in low intensity recreational use for an extended period and as such little opposition is anticipated.

18. NOTIFICATION TO SPONSOR

The non-Federal sponsor, Maui County, has been notified in writing about the risks of acquiring the LERRD for the project prior to the PPA execution and the Government's formal notice to proceed.

ADDENDUM

Subject Property

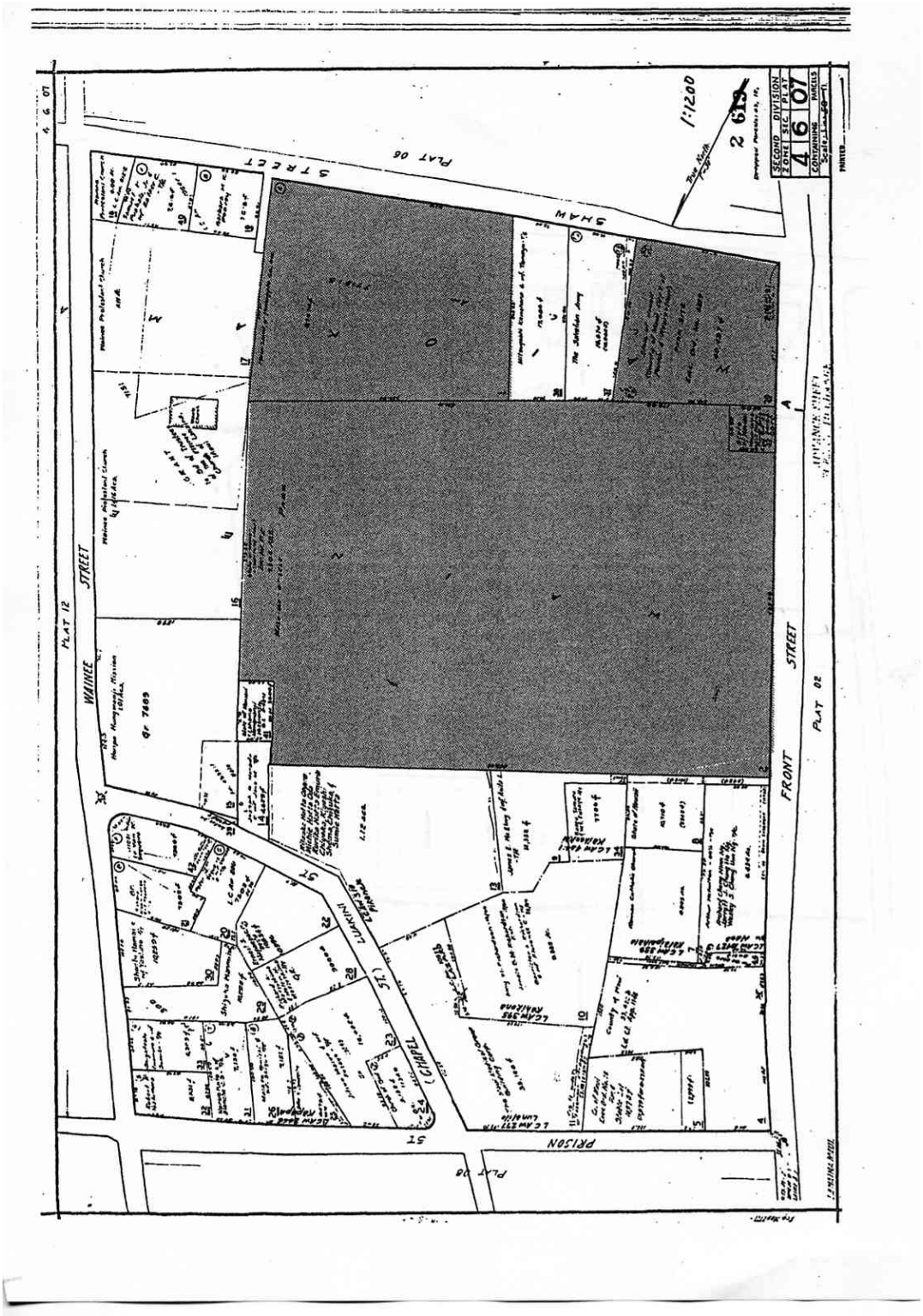
TMK Map

Executive Orders

Subject Photos

Subject Property

TMK Map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PLAT 12
WAINEE
STREET
FRONT
STREET
PLAT 02
CHAPEL
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PRISON
ST
PLAT 08

Executive Order No. 52

Setting Aside Land for Public Purposes.

I, Lucius E. Pinkham, Governor of the Territory of Hawaii, by virtue of the authority vested in me by the last paragraph of Section 5 of the Act of Congress approved May 27, 1910, entitled "An Act to Amend an Act Entitled 'An Act to Provide a Government for the Territory of Hawaii,' approved April Thirtieth, Nineteen Hundred," and every other authority me hereunto enabling, do hereby order that the following described land be and the same is hereby set aside for public purposes, to-wit, for a public park at Lahaina, Maui.

Beginning at a point at the West corner of this piece and on the mauka side of Main Street, the coordinates of said point of beginning referred to Government Survey Trig. Station "Launiupaka" being 10659.6 feet North and 14333.6 feet West, as shown on Government Survey Registered Map No. 1193, and running by true azimuths:

1.	243° 50'	643.5	feet along Land of Pakala;
2.	335° 30'	27.0	feet along L.C.A. 4533 to Uale;
3.	245° 20'	45.0	feet along L. C.A. 4533 to Uale;
4.	334° 45'	453.0	feet along Government Lot 21 (the Hospili House Lot) and the Waimoe Church Lot;
5.	62° 10'	450.0	feet along the land of Waiokama;
6.	64° 30'	232.0	feet along the land of Waiokama;
7.	154° 00'	492.0	feet along Main Street to the point of beginning.

AREA 7.67/100 ACRES.

In Witness Whereof, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

Done at the Capitol at Honolulu this twenty fifth day of April, Nineteen Hundred and 18

Lucius E. Pinkham

By the Governor,

Curtis P. Iaukea

Secretary of Hawaii.

Executive Order No. 02389

Setting Aside Land for Public Purposes

By this Executive Order, I, the undersigned, Governor of the State of Hawaii, by virtue of the authority in me vested by Section 171-11, Hawaii Revised Statutes, and every other authority me hereunto enabling, do hereby order that the public land hereinafter described be, and the same is, hereby set aside for the following public purposes:

FOR USE AS A PARK SITE, to be under the control and management of the County of Maui, Department of Parks and Recreation, situate at Waiokama, Lahaina, Maui, State of Hawaii, containing an area of 40,437 square feet, being more particularly described in Exhibit "A" and delineated on Exhibit "B", both of which are attached hereto and made parts hereof, said exhibits being, respectively, a survey description and survey map prepared by the Survey Division, Department of Accounting and General Services, State of Hawaii, both being designated C.S.F. No. 18,170 and dated November 28, 1977.

Said parcel was acquired by Deed dated February 16, 1976, from Maui Land and Pineapple Company, Inc., and recorded in the Bureau of Conveyances in Liber 11649, at page 219, and filed in the land office as Deed No. S-26640.

SUBJECT to disapproval by the legislature by two-thirds vote of either the Senate or the House of Representatives or by majority vote of both, in any regular or special session next following the date of this Executive Order.

In Witness Whereof, I have hereunto set my hand and caused the Great Seal of the State of Hawaii to be affixed.

Done at the Capitol at Honolulu this 6th day of February, Nineteen Hundred and 78.

George R. Ariyoshi
Governor of the State of Hawaii

Approved as to form:

Glenn M. Okebado
Deputy Attorney General

Dated: January 5, 1978

Executive Order No. 3430

Setting Aside Land for Public Purposes

By this Executive Order, I, the undersigned, Governor of the State of Hawaii, by virtue of the authority in me vested by Section 171-11, Hawaii Revised Statutes, and every other authority me hereunto enabling, do hereby order that the public land hereinafter described be, and the same is, hereby set aside for the following public purposes:

FOR PARK PURPOSES, to be under the control and management of the County of Maui, a political subdivision of the State of Hawaii, being that certain parcel of land designated as "Addition to Malu-Ulu-O-Lele Park," situate at Waiokama, Lahaina, Maui, Hawaii, containing an area of 87,474 square feet, more particularly described in Exhibit "A" and delineated on Exhibit "B," both of which are attached hereto and made parts hereof, said exhibits being respectively, a survey description and survey map prepared by the Survey Division, Department of Accounting and General Services, State of Hawaii, both being designated C.S.F. No. 21,014 and dated July 20, 1989.

SUBJECT to disapparoval by the Legislature by two-thirds vote of either the Senate or the House of Representatives or by majority vote of both, in any regular or special session next following the date of this Executive Order.

In Witness Whereof, I have hereunto set my hand and caused the Great Seal of the State of Hawaii to be affixed.

Done at the Capitol at Honolulu this 9th day of October, Nineteen Hundred and 89

Governor of the State of Hawaii

Approved as to form:

Deputy Attorney General

Dated: 9/6/89

Southeast Corner of Subject

Northeast Area of Subject

Parking Lot on Southwest Corner

Basketball and Tennis Courts on West Side

Central Area of Subject

Baseball Field in Central Area

Salvation Army Parcel 2-4-6-7-37

Salvation Army Parcel 2-4-6-7-38

CEPOH-PP-R 5 August 2013

DETERMINATION AND FINDINGS

Upon the basis of the following findings, I have determined that the County of Maui, as the non-Federal cost-sharing sponsor of the Section 206 Continuing Authorities Program Mokuhinia Ecosystem Restoration Project, in Lāhainā, Maui, Hawaii, has the minimum interest in the subject real property required to support the project, and I approve the non-standard estate described below.

FINDINGS

1. The County of Maui has requested USACE assistance in the restoration of Mokuhinia, an historic wetland located in Lāhainā. The subject project is authorized under section 206 of the Water Resources Development Act (WRDA), 1996, which provides the Secretary of Army authority to carry out aquatic ecosystem restoration studies, and to construct those works that are in the government's best interest.

2. ER 405-1-12 in Chapter 12, Section 12-16.c.(3) states that a Real Estate Plan should include:

> For cost shared projects, a description of all LER [land, easements and rights-of-way] required for the project that is already owned by the non-Federal sponsor, the acreage and interest owned, and whether the existing estates are sufficient and available for the project. Because unique aspects of state or local law may be involved, a sufficiency determination should be made by the Government only after full consultation with the non-Federal sponsor.

3. Among the tracts required for the project are as follows:

Parcel	TMK	Record Owner	Area in Square Feet
1	2-4-6-7-2	State of Hawaii	326,700
2	2-4-6-7-36	State of Hawaii	40,437
3	2-4-6-7-1	State of Hawaii	87,555

4. The three parcels are ceded lands (i.e., lands ceded to the United States by the Republic of Hawaii under the Joint Resolution of Annexation, not otherwise disposed of by the United States prior to the lands' transfer to the State of Hawaii pursuant to section 5(b) of the Admission Act), legal title to which remains in the State of Hawaii, but subject to a public trust under Section 5(f) of the Admission Act which precludes the State from freely selling or transferring title.

5. Over time, control and management of the three parcels was transferred by the State to the County of Maui by a series of Executive Orders, as follows:

(a) Parcel 1 was set aside for public use purposes as a "public park at Lahaina, Maui" by Executive Order 52 signed by the Governor of the Territory of Hawaii 25 April 1918. The parcel has been used as a park since that time.

(b) Parcel 2 is the southwest corner of the project site and State owned, but set aside by Executive Order 02889 signed by the Governor of the State on 6 February 1978 "FOR USE AS A PARK SITE, to be under the control and management of the County of Maui."

(c) Parcel 3 is the southeast corner of the project site and is State owned, but set aside by Executive Order 3430 signed by the Governor of the State on 9 October 1989 "FOR PARK PURPOSES, to be under the control and management of the County of Maui, ... being that certain parcel of land designated as 'Addition to Malu-Ulu-O-Lele Park.' "

6. Although legal title to the parcels remains in the State, the 1978 and 1989 Executive Orders (for Parcels 2 and 3) explicitly conferred to the County "control and management" of the parcels for park purposes, citing in the Orders to the authority to do so vested in the Governor by Hawaii Revised Statute (HRS) §171-11. The 1918 Executive Order, covering Parcel 1, did not cite to HRS §171-11, since the statute (and the state) did not yet exist. However, HRS §171-11 provides that "Any public lands set aside by the governor prior to the enactment of this chapter, or any public lands set aside by the governor of the Territory of Hawaii, shall be subject to the provisions of this section."

7. HRS §171-11 also provides that the Governor may "set aside public lands to any ... county ... of the State for public use or purpose. ... Lands while so set aside for such use or purpose ... shall be managed by the ... county, ... unless otherwise provided by law. Such ... county ... in managing such lands shall be authorized to exercise all of the powers vested in the [state] board [of land and natural resources] in regard to the issuance of leases, easements, licenses, revocable permits, concessions, or rights of entry covering such lands for such use as may be consistent with the purposes for which the lands were set aside on the same terms, conditions, and restrictions applicable to the ***disposition of public lands***, as provided by this chapter all such ***dispositions*** being subject to the prior approval of the board..." [emphasis added; bracketed explanatory material inserted]

8. In turn, HRS §171-13 lists the various methods of "disposition of public lands," those methods being by fee simple, lease, license, permit, and easement. None of the prescribed methods of disposition is contemplated in this project. Rather, the County as the controlling/managing entity will partner with the Federal government to implement a type of its management and control over the subject parcels pursuant to the Executive Orders; i.e., restoring wetlands as a type of park use for the benefit of the public. The County is not "disposing" of any interest or estate in the parcels, but rather as a non-Federal sponsor will

be retaining its interest under the Executive Orders and HRS §171-11. Therefore, the "disposition" provisions of HRS §§171-11 and 171-13 will not come into play, and formal approval of the project by the State Board of Land and Natural Resources is not required.

9. Per ER 405-1-12, Section 12-9.a, "It is the policy of USACE to acquire, or to require a non-Federal sponsor to provide, the ***minimum interest*** in real property necessary to support a project. The interests described in the following paragraphs have been determined to represent the minimum interest ***generally required*** to support the described purposes or features and must be utilized unless otherwise approved as described in subparagraph e of this paragraph. ***Greater or lesser interests may be appropriate*** depending upon the purposes of a project or other circumstances relating to project requirements or a particular acquisition."

10. ER 405-1-12, Section 12-9.b(6) states that ***generally*** fee title to the subject land must be provided by the non-Federal sponsor for an ecosystem restoration project. However, subsection (6) goes on to state that "***a lesser, or easement estate, may be appropriate based on the extent of interest required for the operation or requirements of a project.***"

11. In a 2003 opinion addressing the broad extent of authority vested in entities for whom the State has set aside ceded lands under statutes such as HRS §171-11, the Hawaii Attorney General cited to a Hawaii Supreme Court case (*Paterson v. Rush*, 34 Haw. 881, 892-93 (1938)), which explained that the word "owner" "has no fixed meaning applicable to all circumstances alike .... 'Owner may refer to the owner of the fee or one of a lesser estate [i.e., the holder of a leased interest, or a license or a permit] .... The word 'owner' is not infrequently used to describe one who has dominion of land, title to which is in another." Department of the Attorney General, State of Hawaii, Opinion No. 03-03 (April 11, 2003) ["Re: Legal Title to Biogenetic Resources from Public Lands"].

12. I find that, although it lacks fee simple title, the County has, in accordance with ER 405-1-12 Section 12-9.b(6), a sufficient interest in the parcels required for the operation and requirements of the project, given the extent of the managerial control over the subject parcels vested in the County by the Executive Orders and HRS §171-11 (which, per the Attorney General opinion cited above, all but equates to ownership).

13. Per ER 405-1-12, Section 12-10.b, "Once the appropriate interest is determined through application of the requirements of paragraph 12-9 of this chapter, the corresponding standard estate must be used if it is among those listed in Chapter 5."

14. Per ER 405-1-12, Section 12-10.c, "Where there is no corresponding standard estate for the interest to be required, or where changes to the corresponding standard estate (or previously approved non-standard estate) are desired, a non-standard estate must be drafted and approved. The District Chief of Real Estate may approve non-standard estates if they serve the intended project purpose, substantially conform with and do not materially

deviate from the corresponding standard estate contained in Chapter 5, and do not increase the costs nor potential liability of the Government."

15. There being no standard estate in Chapter 5 of ER 405-1-12 perfectly corresponding to the nearly but not quite fee simple interest held by the County in the subject parcels, I find it appropriate to approve the County's interest as a non-standard estate, the criteria set forth in ER 405-1-12, Section 12-10.c being satisfied as follows:

(a) The setting aside to the County of the subject parcels by the Governor for park purposes by the Executive Orders and HRS §171-11 serves the project's purpose of restoring the wetlands and providing passive recreational opportunities to the public;
(b) The managerial control over the subject parcels vested in the County by the Executive Orders and HRS §171-11 (which, per the Attorney General opinion cited above, all but equates to ownership) substantially conforms with and does not materially deviate from the corresponding fee simple standard estate contained in Chapter 5.
(c) Approving the County's interest as a non-standard estate will not increase the costs or potential liability of the Government. In fact, obtaining (as I recommend be done) a simple acknowledgment and concurrence of the State in the County's use of the subject parcels to partner with the Government in the project will save considerable costs and time, in contrast with attempting to obtain fee simple title from the State (an onerous process with little prospect of success).

DETERMINATION

Based upon the foregoing findings, I have determined that the County of Maui possesses and can provide the minimum interest in the subject real property required to support the project, and, pursuant to ER 405-1-12, Section 12-10.c, I approve the non-standard estate described above and authorize the inclusion and/or incorporation by reference of this Determination and Findings into the Real Estate Plan Report to be incorporated into the project's Feasibility Report.

STEPHEN N. CAYETANO
Chief, Real Estate Branch
U.S. Army Corps of Engineers
Honolulu District

APPENDIX G

Economic Appendix

REVISED DRAFT

Economic Appendix

Mokuhinia Ecosystem Restoration Project

Contract No. W9128A-08-D-0007, Task Order 0005

U.S. Army Corps of Engineers, Honolulu District

July 2013

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1.0 Introduction

As outlined in the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G) (U.S. Water Resources Council, 1983), alternative plans should be evaluated based on four primary criteria: completeness, effectiveness, efficiency, and acceptability. Economic analyses are important primarily in the evaluation of efficiency. Economic analyses also play a role in the evaluation of the acceptability of an alternative, based on its estimated implementation cost, and the completeness of an alternative, based on identifying all potential costs that could result from implementation.

The U.S. Army Corps of Engineers (USACE) Institute for Water Resources (IWR) Planning Suite tool was developed in response to the intricacies of environmental and ecosystem restoration planning studies and performs cost-effectiveness and incremental cost analyses (CE/ICA) on combinations of water resources alternatives. The CE analysis is employed to eliminate "production inefficient" solutions, or alternatives plans with the same level of output that can be provided at a lesser cost than another plan, and "production ineffective" solutions, or alternative plans with less output than a plan that has a lesser or equal cost. The ICA evaluates the incremental cost of cost-effective alternatives to determine which are "best buy" alternatives, or which provide the greatest increase in output for the least increase in cost.

To identify the alternative(s) that would provide the greatest benefit compared to cost for the Mokuhinia Ecosystem Restoration Project, CE/ICA were conducted to compare predicted future benefits (quantified by average annual habitat units) to estimated average annual costs for each alternative identified in the Integrated Feasibility Report and Environmental Assessment ("main report"). The IWR planning suite evaluates the cost-effectiveness and efficiency of these alternatives, and the results are used to guide decision makers in identifying a plan that maximizes net national ecosystem restoration (NER) benefits as they pertain to ecosystem restoration measures as required by the P&G document.

This analysis is based on and follows guidance from the USACE IWR publication, *Evaluation of Environmental Investment Procedures Manual, Interim: Cost Effectiveness and Incremental Analyses*, May 1995, IWR Report #95-R-1 and *Cost Effectiveness Analysis for Environmental Planning: Nine Easy Steps*, October 1994, IWR Report 94-PS-2. The organization of this appendix follows the steps outlined in IWR Report #95-R-1k:

Plan Formulation Steps

- **Step 1:** Display Outputs and Costs of Management Measures
- **Step 2:** Identify Management Measure Relationships
- **Step 3:** Add Costs and Outputs of Combinations

Cost Effectiveness Analysis Steps

- **Step 4:** Identify "Production Inefficient" Solutions
- **Step 5:** Identify "Production Ineffective" Solutions

Incremental Cost Analysis Step

- **Step 6:** Calculate and Display Incremental Costs

Additional Analytical Steps to Assist in Scale Selection

- **Step 7:** Calculate Change in Unit Cost from No-Action Plan to All Other Plans
- **Step 8:** Recalculate Change in Unit Cost from Last Selected Plan
- **Step 9:** Tabulate and Display Incremental Costs of Selected Plans

2.0 Plan Formulation Steps

Steps 1 through 3 of environmental plan formulation and evaluation are related to plan formulation and include an analysis of all possible combinations of the management measures identified for restoration. In the context of the USACE planning process, management measures are defined as actions that can be implemented to cause a desirable change relative to the planning objective; they are individual features or activities that serve as the building blocks of alternative plans. Plan formulation is detailed in Section 5.0 of the main report and summarized below, with a focus on alternative plan outputs and costs.

2.1 Step 1: Display Outputs and Costs of Management Measures

The first step of plan formulation, as it relates to analysis of cost-effectiveness and incremental cost, is to estimate the cost and outputs of various management measures. However, because of the nature of the project, incremental management measures were not evaluated. As detailed in Section 5.3 of the main report, given the planning objectives and constraints for this project, the only scale that was carried forward in the plan formulation process was one in which wetland habitat was reestablished across the entire project site. A larger scale (for example, reestablishment of wetland habitat beyond the project site) was not considered a feasible option as the adjacent land is not available for use as part of the project; a smaller scale was also not considered a feasible option as it would not be entirely consistent with the planning objectives and constraints.

Since management measure increments were not evaluated, it was not logical to quantify the outputs and costs of individual management measures. Rather, the outputs and costs of alternatives were quantified (see Step 3), since these alternatives comprised the only plans evaluated for the restoration project.

2.2 Step 2: Identify Management Measure Relationships

Step 2 of plan formulation and evaluation is to identify potential groupings of management measures, based on their dependency to each other. The identification and screening of management measures for the project is detailed in Section 5.3 of the main report. Those measures that passed screening were retained for further consideration. They were categorized as required, supplemental, or mutually exclusive. This categorization provided the foundation for the development of alternative plans that achieve the planning objectives.

Table 1 summarizes the measures that were identified, the results of the screening process, and the relationship of the measures that were carried forward in the plan formulation process. Specifically, measures that are needed to provide basic wetland functions were identified as required components of any alternative; in other words, these measures must be combined as part of any alternative plan. Supplemental measures were identified as those that would enhance wetland function; these were generally considered to be measures that could be added or combined with the set of required measures. Although no measures were defined as mutually exclusive, it was determined that the measure for providing internal water circulation (for example, through use of a surface water pump or aerator) was required if an alternative plan did not include a groundwater pump. These relationships are used in Step 3 to develop alternative plans.

2.3 Step 3: Derive Combinations and Calculate Costs and Outputs

In Step 3, management measures are combined, according to the management measure dependency relationships, to form alternative plans; these plans are then reformulated, as necessary. Average annual costs

TABLE 1
Identification and Screening of Conceptual Restoration Measures

Measure Category	Measure	Definition	Screening Results	Measure Relationships for Plan Formulation
Excavation	Excavate to accommodate wetland hydrology (via groundwater interception and/or groundwater pump)	Excavation as needed to accommodate appropriate hydrologic conditions for sustaining wetland; excavation depth should consider seasonal fluctuations existing in groundwater levels; deeper excavation may allow for increased interception of groundwater; shallower excavation may allow site to be drained for maintenance; depending on excavation depth, groundwater pump may be required to supplement existing groundwater levels; clay liner may be required for shallow excavation depths to increase retention of pumped ground water	Carried forward for additional analysis. Meets screening criteria.	Required
Grading	Rough grading of steep slopes around wetland edge	Grounding-moving to form steep (<3:1) slopes around the edge of wetland	Eliminated from further analysis. Does not meet habitat requirements for Hawaiian waterbirds.	N/A
	Rough grading of shallow slopes around wetland edge	Grounding-moving to form shallow (>3:1) slopes around the edge of wetland	Carried forward for additional analysis. Meets screening criteria.	Required
	Fine grading to provide microtopographic variation	Refinement of wetland topography (including slopes, edges, and bottom areas) to provide habitat variation	Carried forward for additional analysis. Meets screening criteria.	Required
Hydrologic input	Install groundwater pump	Use of groundwater pump to supplement existing groundwater-based wetland hydrology; pump would also contribute to site management	Carried forward for additional analysis. Meets screening criteria.	Supplemental
	Surface water inlet	Creation of an inlet feature that would direct surface water to wetland; surface water inputs would supplement wetland hydrology; any input of stormwater runoff would require appropriate levels of treatment	Eliminated from further analysis. No reliable source of surface water that is reasonable to obtain.	N/A
Water circulation	Surface water pump (aerator)	Utilize surface water pump (for example, aerator) to maintain internal flow and circulation within wetland	Carried forward for additional analysis. Meets screening criteria.	Supplemental; required if no groundwater pump
Surface water outlet	Tie into adjacent ditch (which flows to ocean)	Install slide gate (or other outlet feature) that provides overflow drainage from wetland into adjacent ditch along northern edge of project site	Carried forward for additional analysis. Meets screening criteria.	Supplemental
	Install outlet that drains directly to ocean	Creation of an outlet feature that would drain the wetland to the ocean, would require crossing under Front Street and the adjacent shoreline properties	Eliminated from further analysis. Cost of building a new outlet to ocean is beyond project capacity.	N/A
	Drain to force main	Provide mechanism for overflow drainage from wetland into the force main system located along Front Street	Eliminated from further analysis. Outlet to force main is not consistent with County policies and regulations.	N/A
Wetland vegetation	Install wetland vegetation	Install assemblage of characteristic wetland species on wetland edges and slopes, using planted stock and/or seed	Carried forward for additional analysis. Meets screening criteria.	Required
Predator control	Predator control fence	Install fence around perimeter of wetland to provide a barrier to entry for predators of wildlife species that may utilize the wetland, particularly endangered waterbirds	Carried forward for additional analysis. Meets screening criteria.	Supplemental

NOTE: Required measures are those that must be combined as part of any alternative plan. Supplemental measures are those that can be added or combined with the set of required measures.

and outputs of alternatives, over the planning study's period of analysis, are calculated for use in CE/ICA. The various components of Step 3 are detailed below.

2.3.1 Derive Combinations to Develop Alternative Plans

Developing an alternative plan involves applying a specific combination of management measures to a problem area. Alternative development utilizes the management measures dependency relationships (as listed in Table 1) and site-specific problems and opportunities. Alternative formulation for the project is detailed in Section 5.3 of the main report. Table 2 summarizes the alternatives that were carried through to the CE/ICA steps of the planning process. Note that the restoration alternatives (Alternative 4, 8A, and 8B) are different combinations of management measures applied to the same location. Therefore, these alternatives are mutually exclusive and will be analyzed as so in the remaining steps of CE/ICA.

TABLE 2
Mokuhinia Ecosystem Restoration Alternatives

Management Measure	Management Measures Included						
	Excavate and Grade Wetland	Install Vegetation	Surface Water Pump	Groundwater Pump	Outlet to Ditch	Perimeter Fence	Install Liner
No Action							
Alternative 4	✓	✓	✓		✓	✓	
Alternative 8a	✓	✓		✓	✓	✓	
Alternative 8b	✓	✓		✓	✓	✓	✓

2.3.2 Estimate Alternative Costs

After alternative plans are developed, planning level cost estimates are developed for use in CE/ICA. The two main cost elements of ecosystem restoration projects are (1) implementation costs (explicit costs) and (2) opportunity costs of foregone National Economic Development (NED) benefits (implicit costs).

For this project, it is assumed that the implicit costs (i.e., loss of the recreation benefits associated with Malu`ulu o Lele Park) are negligible, and the total project cost is equal to the implementation cost. As described in Section 7.7 of the main report, Malu`ulu o Lele Park is not heavily used and the County of Maui has been working to address the future displacement of the existing recreation facilities at the park with similar or improved facilities within a short distance of the project site, such that impacts to recreation are expected to be minimal. Furthermore, lost recreational benefits would be equivalent for each alternative. For these reasons, the implicit cost of the loss of recreation benefits were not quantified for the CE/ICA.

Section 4.4.2 of the main report (and associated technical appendices) details the preliminary (that is, planning-level) estimates of the fully funded project costs, and assumptions used to develop these estimates. Based on this information, the base project costs were identified for use in the CE/ICA, as summarized in Table 3 below. The base project costs differ from the fully funded costs in that they do not include escalation, but do include Operation, Maintenance, Repair, Rehabilitation, & Replacement (OMRR&R) costs and interest during construction.

Cost estimate were developed as bottom rolled-up type estimates at the conceptual (10%) design level, using FY2013 unit prices. The costs shown in Table 3 were developed based on broad assumptions for the purpose of conducting the CE/ICA and selecting a recommended plan for implementation. They are expected to be reasonable estimates that provide the relative cost differences between the alternatives, thereby providing a justifiable basis for the CE/ICA. Based on input from the Project Development Team (PDT) and Major Subordinate Command (MSC), it was determined that although the preliminary costs exceed the project cost limit (based on the federal participation limit and cost-sharing percentages for this project), they should be used

to conduct the CE/ICA, and the costs for the tentatively selected plan should be further refined, with this threshold in mind.[1]

As part of the CE/ICA, environmental outputs and cost estimates should be annualized across the period of analysis. To annualize the project costs, an implementation timeline must be developed to identify initial costs, investment costs, and future costs. So that project costs can be evaluated in present value, the implementation timeline is used to categorize cost components as investment costs or future costs. For each alternative, the total project cost is equal to the investment cost plus future costs, in present value terms.

For the project, all project costs with the exception of those for monitoring and OMRR&R are assumed to be incurred in Year 0. The IWR Planning Suite Annualizer was used to calculate the average annual cost of each alternative. The average annual cost assumes a 50-year period of analysis and a federal discount rate of 3.75%, which is the federal discount rate established for the evaluation of water resources development projects in fiscal year (FY) 2013. Table 3 shows the average annual costs of the ecosystem restoration alternatives. A detailed breakdown of the present value cost for each of the 50 years of analysis is provided as an attachment to this appendix.

TABLE 3
Summary of Estimated Costs for CE/ICA (FY2013 Price Level)

Implementation Cost Component	**Alternative 4**	**Alternative 8A**	**Alternative 8B**
Mobilization and Demobilization [1]	$662,623	$662,623	$662,623
Other Construction Costs [1]	$3,529,252	$3,489,594	$4,731,284
Lands, Easements, Rights-of-way, Relocations, and Dredge Disposal areas (LERRDs) [2]	$1,412,000	$1,412,000	$1,412,000
Preconstruction Engineering, and Design [3]	$758,000	$758,000	$758,000
Construction Management [4]	$467,000	$467,000	$467,000
Post-construction Monitoring [5]	$61,150	$61,246	$61,246
OMRR&R [6]	$1,904,250	$2,206,177	$2,460,108
Interest During Construction[7]	$92,320	$91,385	$118,623
Contingency [1]	$1,215,000	$1,252,000	$1,592,000
Estimated Cost for CE/ICA	**$10,158,610**	**$10,436,135**	**$12,187,378**
Average Annual Cost [8]	**$405,514**	**$410,401**	**$482,217**

[1] See Cost Estimate (Appendix I of the main report)
[2] See Real Estate Planning Report (Appendix J of the main report)
[3] Assumed as a percentage of mobilization and demobilization, habitat facilities, and post-construction monitoring costs
[4] Assumed as a percentage of mobilization and demobilization, habitat facilities, and post-construction monitoring costs
[5] Includes 5 monitoring events for ecosystem restoration success criteria during Years 1, 3, 5, 7, and 10
[6] Includes 50 years of OMRR&R, with monitoring and maintenance every year and equipment replacement every 10 years
[7] Assumes 9 consecutive months of construction for Alternative 4 and 11 consecutive months of construction for Alternatives 8a and 8b, estimated using 3.75% discount rate
[8] Calculated using IWR Planning Suite annualizer: discount rate = 3.75% and period of analysis = 50 years

2.3.3 Estimate Alternative Outputs

The benefits of ecosystem restoration are non-monetary, and therefore outputs must be quantified based on a unit of habitat improvement (that is, habitat units). To evaluate the ecosystem restoration potential of the alternatives, a spreadsheet model was developed based on concepts used in standard ecosystem modeling approaches, tailored to the project objectives and constraints. Specifically, model development was focused on

[1] As specified in Appendix F of ER 1105-2-100, the CAP legislative authorities identify specific federal financial participation limits for each project implemented under a CAP authority. Under Section 206, the federal participation limit is $5 million per project; based on the cost-share percentages for this project, this equates to a project cost limit of approximately $7.6 million.

the wetland functions that are anticipated for the range of alternative plans, particularly as related to providing suitable foraging habitat for Hawaiian stilt and coot and migratory/shorebird species. Model variables were identified that relate these functions to habitat characteristics; the variables also incorporate components of long-term site management (such as vegetation management and predator control), as these activities are recognized as key to maintaining suitable habitat for endangered waterbird species. Each variable is scored on a scale ranging from 0 to 1, with scoring based on the best available information and professional judgment relative to the species' habitat requirements. The variables are averaged then multiplied by wetland size (to normalize the output), resulting in an overall score of habitat benefits (habitat units). The overall modeling framework, the list of variables, and the approach to scoring were iteratively developed and refined in coordination with the PDT and U.S. Fish and Wildlife Service staff. The final list of model variables is presented Section 5.4 of the main report.

The variable scores and calculation of habitat units for each of the alternatives plans is presented in Table 4. The habitat units provided by the alternatives range from 0 (No Action) to 6.03 (Alternative 8B). In order for proper comparison of costs and benefits, the habitat units were annualized over the period of analysis. Average annual habitat units were calculated using the IWR Planning Suite annualizer, based on estimated habitat units at selected years. Figure 1 demonstrates the anticipated rate of change of the habitat units post-construction, across the 50 year period of analysis. Based on this projection, the average annual habitat units range from 0 (No Action) to 5.911 (Alternative 8B) (Table 4).

TABLE 4
Calculation of Habitat Units for Final Array of Alternative Plans

Metric	No Action	Alternative 4	Alternative 8A	Alternative 8B
Flooding regime and water depth - summer	0	0.80	0.83	0.94
Flooding regime and water depth - winter	0	0.80	0.83	0.94
Water quality and circulation	0	0.5	1.0	1.0
Predator control	0	1.0	1.0	1.0
Vegetation cover – wetland slopes	0	1.0	1.0	1.0
Vegetation – emergent zone [a]	0	0.0 to 1.0	0.0 to 1.0	0.0 to 1.0
Plant species composition	0	1.0	1.0	1.0
Invasive species control	0	0.5	1.0	1.0
Total Score	0	5.60 to 5.90	6.66 to 7.66	6.88 to 7.88
Average Score	0.00	0.70 to 0.83	0.83 to 0.96	0.86 to 0.99
Wetland Area (acres)	0	6.1	6.1	6.1
Habitat Units	0	4.29 to 5.05	5.10 to 5.86	5.27 to 6.03
Average Annual Habitat Units [b]	0	4.954	5.729	5.911

[a] The success of this metric is expected to increase over the first 5 years, as cover of emergent vegetation increases.

[b] Calculated using the IWR Planning Suite annualizer, based on linear interpolation between defined points.

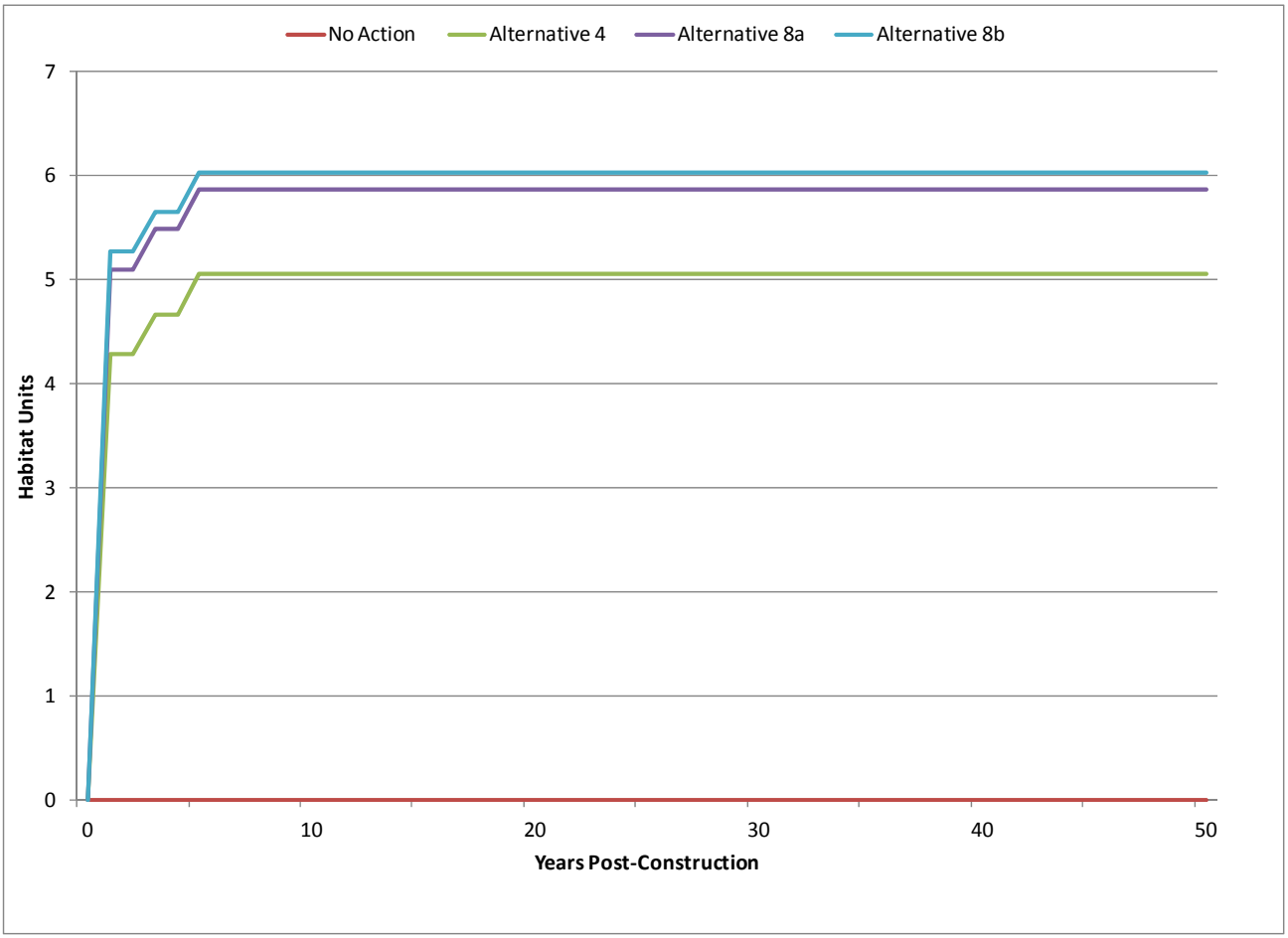

FIGURE 1
Projected Habitat Units over Period of Analysis

2.3.4 Summary of Alternative Outputs and Costs

Table 5 summarizes the outputs and costs of the alternatives. Costs are displayed in average annual costs, and outputs are displayed in average annual habitat units. These values are used in CE/ICA, as detailed in the remainder of this Economic Appendix.

TABLE 5
Summary of Alternative Outputs and Costs

Alternative	Output (Average Annual Habitat Units)	Cost (Average Annual Cost)
No Action	0	0
Alternative 4	4.954	$405,514
Alternative 8A	5.729	$410,401
Alternative 8B	5.911	$482,217

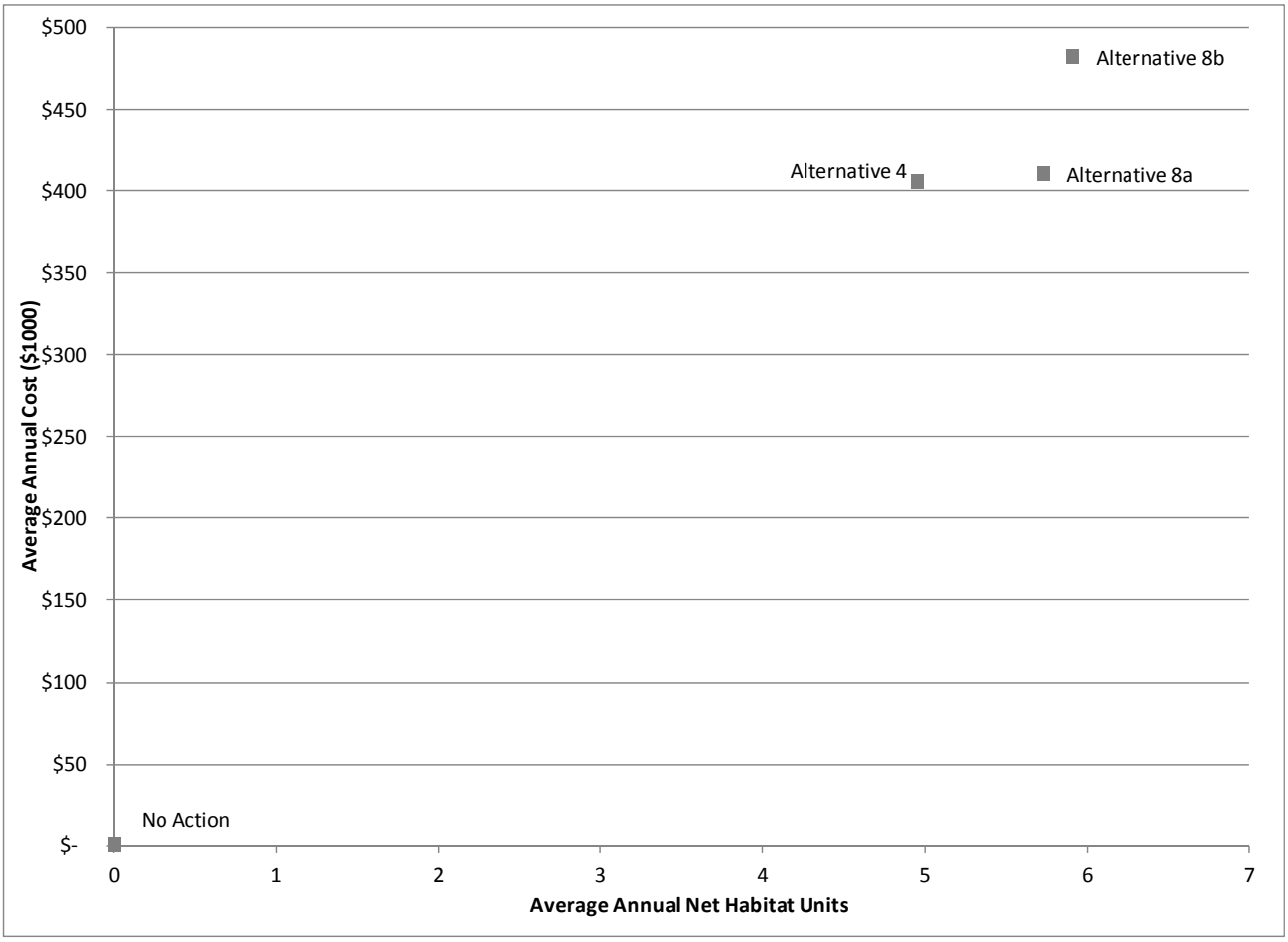

FIGURE 2
Cost and Output of Alternative Plans

3.0 Cost Effectiveness Analysis

The following section details the CE analysis, which is conducted to eliminate the least economically effective restoration alternatives. The inputs to the IWR Planning Suite include the predicted average annual habitat units (output) and the average annual cost for each alternative, each based on a 50-year period of analysis. For each level of output, only the least expensive alternative is cost-effective. As demonstrated in the following section, each of the four alternatives are considered cost-effective and were carried forward to the ICA.

3.1 Step 4: Identify "Production Inefficient" Solutions

In Step 4, "production inefficient" solutions are identified. Production inefficient solutions are defined as alternative plans with the same level of output that can be provided at a lesser cost than another plan. Since none of the alternatives have the exact same level of output (or, average annual habitat units), there are no production inefficient solutions. This is demonstrated in Table 6.

TABLE 6
Identification of Production Inefficient Solutions

Alternative	Average Annual Habitat Units	Average Annual Cost	Less than Cost of Alternative with Same Output?
No Action	0.0	$ 0	N/A
Alternative 4	4.954	$405,514	N/A
Alternative 8A	5.729	$410,401	N/A
Alternative 8B	5.911	$482,217	N/A

3.2 Step 5: Identify "Production Ineffective" Solutions

In Step 5, "production ineffective" solutions are identified. Production ineffective solutions are defined as plans with less output than a plan that has a lesser or equal cost. To demonstrate analysis conducted to identify these plans, the alternatives are ordered by increasing output, and a plan is removed from further consideration if its cost is more than a plan with greater output. As shown in Table 7, since there are no plans that have a greater output but lesser cost than any other plan, there are no production ineffective solutions. Figure 3 demonstrates the results of the CE analysis (Steps 4 and 5). All of the alternatives are considered cost-effective.

TABLE 7
Identification of Production Ineffective Soultions

Alternative	Average Annual Habitat Units	Average Annual Cost	Less than Cost of all Alternatives in Subsequent Rows?
No Action	0.0	$ 0	Yes
Alternative 4	4.954	$405,514	Yes
Alternative 8A	5.729	$410,401	Yes
Alternative 8B	5.911	$482,217	Yes

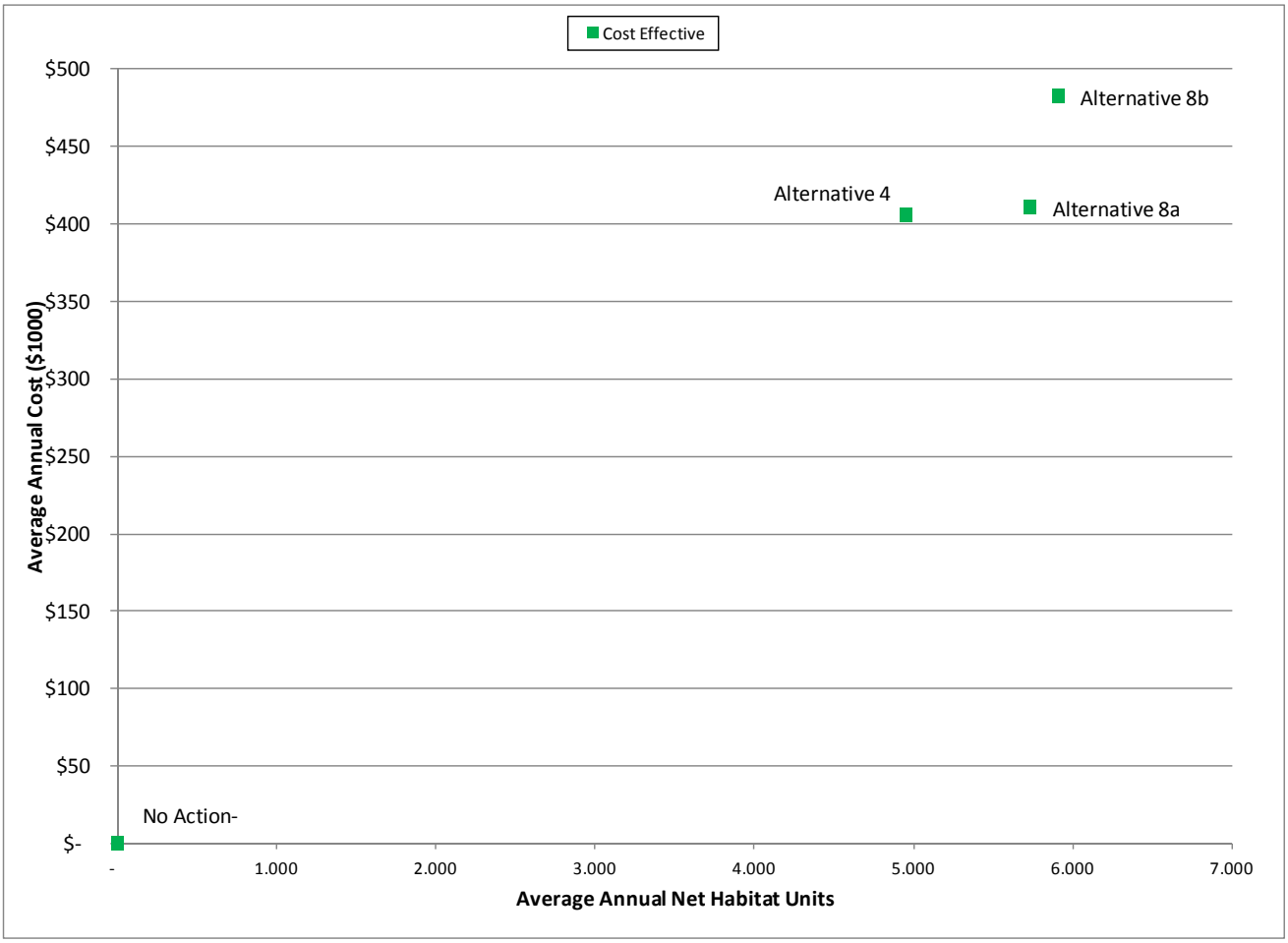

FIGURE 3
Costs and Outputs of Cost Effective Plans

4.0 Incremental Cost Analysis

The following section outlines the ICA conducted for the project. ICA is conducted on the cost-effective alternatives to determine which alternatives provide the greatest increase in output for the least increase in average annual cost. ICA serves to eliminate less economically effective solutions and determine which are best buy alternatives, or which provide the greatest increase in output for the least increase in cost. ICA is used to compare increases in average annual cost to increases in benefits, which are quantified in habitat units, among the alternatives being considered. The No Action Alternative does not have an associated cost and is therefore always considered a best buy alternative. As demonstrated in the following section, of the four cost-effective alternatives, three are considered best buy alternatives and were carried forward for further consideration.

4.1 Step 6: Calculate and Display Incremental Costs for Cost-Effective Plans

As previously mentioned, ICA is conducted on only the cost-effective plans identified in Steps 4 and 5. Since all of the alternatives are considered cost-effective, the incremental cost of all alternatives will be analyzed. In Step 6, the incremental cost of implementing each successive cost-effective plan is calculated (Table 8). While this step is not conducted to remove any alternatives, it identifies whether Steps 7 through 9 need to be completed. If the results of Step 6 show that the incremental cost per unit increases as the level of output increases, for all alternatives, the remainder of the steps do not need to be completed. However, this ideal situation is often not the case in planning studies. For the cost-effective alternatives identified in Section 3.0, the incremental cost per unit does not increase with increasing output (Table 9); therefore, Steps 7 through 9 must be employed.

TABLE 8
Summary of Incremental Costs per Unit (Step 6)

Alternative (Cost-Effective Solutions)	Average Annual Habitat Units	Average Annual Cost	Incremental Output from Last Selected Plan	Incremental Cost from Last Selected Plan	Incremental Cost Per Unit Output from Last Selected Plan	Less than Incremental Cost of Alternative in All Subsequent Rows?
No Action	0.0	$ 0	0	$ 0	$ 0	Yes
Alternative 4	4.954	$405,514	4.954	$405,514	$81,856	No
Alternative 8a	5.729	$410,401	0.775	$4,887	$6,306	Yes
Alternative 8b	5.911	$482,217	0.182	$71,816	$394,593	Yes

4.2 Step 7: Calculate and Display Incremental Costs per Unit from No Action Plan

In Step 7, alternative plans that have a higher incremental cost of implementation over the No Action Plan than an alternative with a higher output level are removed. As shown in Table 9, Alternative 4 has a higher incremental cost per unit over the No Action Plan than do alternatives with a greater output (Alternatives 8A and 8B); therefore, Alternative 4 is not considered a best buy plan and is removed from further consideration. After alternatives are removed based on this analysis, the incremental cost of remaining alternatives should increase with increasing cost (Table 9). In Step 7, only Alternative 4 was removed.

TABLE 9
Summary of Incremental Costs per Unit (Step 7)

Cost-Effective Alternatives	Average Annual Habitat Units	Average Annual Cost	Incremental Output from No Action	Incremental Cost from No Action	Incremental Cost Per Unit Output from No Action	Less than Incremental Cost of Alternative in All Subsequent Rows?
No Action	0.0	$ 0				N/A
Alternative 4	4.954	$ 405,514	4.954	$ 405,514	$81,856	No
Alternative 8A	5.729	$ 410,401	5.729	$ 410,401	$71,636	Yes
Alternative 8B	5.911	$ 482,217	5.911	$ 482,217	$81,580	Yes

Note: Shaded alternative was removed as potential best buy plan.

4.3 Step 8: Recalculate Incremental Cost from Last Selected Plan

In Step 8, the remaining alternatives (No Action, Alternative 8A, and Alternative 8B) are evaluated, and the final best buy plans are identified. The incremental cost of implementing each plan over the plan with the next lower output is calculated (Table 10). Any alternative plan that has higher incremental cost of implementation over the previous plan than an alternative with a higher output level is removed. After alternatives are removed based on this analysis, the incremental cost of remaining alternatives should increase with increasing cost (Table 10). In Step 8, no alternatives were removed. Therefore, the No Action Plan, Alternative 8A, and Alternative 8B are all considered best buy plans.

TABLE 10
Summary of Incremental Costs per Unit (Step 8)

Cost-Effective Alternatives	Average Annual Habitat Units	Average Annual Cost	Incremental Output from Last Selected Plan	Incremental Cost from Last Selected Plan	Incremental Cost Per Unit Output from Last Selected Plan	Less than Incremental Cost of Alternative in All Subsequent Rows?
No Action	0.0	$ 0				N/A
Alternative 8a	5.729	$410,401	5.729	$410,401	$71,636	Yes
Alternative 8b	5.911	$482,217	0.182	$71,816	$394,593	Yes

4.4 Step 9: Tabulate and Graph Incremental Costs

In Step 9, the incremental costs of implementing each alternative over the No Action Plan are tabulated and graphed. The purpose of Step 9 is to clearly display the CE/ICA results to be used in the selection of the tentatively selected plan. Since no alternatives were removed in Step 8, the incremental costs do not change (Table 11). Table 11 also provides the average cost per habitat unit, which is often an additional consideration by decision makers.

TABLE 11
Summary of Incremental Costs per Unit (Step 9)

Alternative (Cost-Effective Solutions)	Average Annual Habitat Units	Average Annual Cost	Average Cost per Output	Incremental Output from Last Selected Plan	Incremental Cost from Last Selected Plan	Incremental Cost Per Unit Output from Last Selected Plan
No Action	0.0	$ 0	$ 0			
Alternative 8a	5.729	$410,401	$71,636	5.729	$410,401	$71,636
Alternative 8b	5.911	$482,217	$81,580	0.182	$71,816	$394,593

Figure 4 displays the average annual cost and average annual habitat units of the alternatives. Figure 5 shows the incremental cost of implementing each successive best buy alternative, and the average annual cost of each best buy alternative. As shown, the average annual costs of Alternatives 8A and 8B differ by approximately $72,000; however, the incremental cost differences are much higher. The cost of implementing Alternative 8B rather than Alternative 8A is $394,593 per habitat unit, while the cost of implementing Alternative 8A rather than the No Action Plan is only $71,636 per habitat unit. These values, along with factors identified in the system of accounts and tradeoff analysis are used by decision makers to identify the tentatively selected plan, as outlined in Sections 5.5.1 and 5.5.2 of the main report.

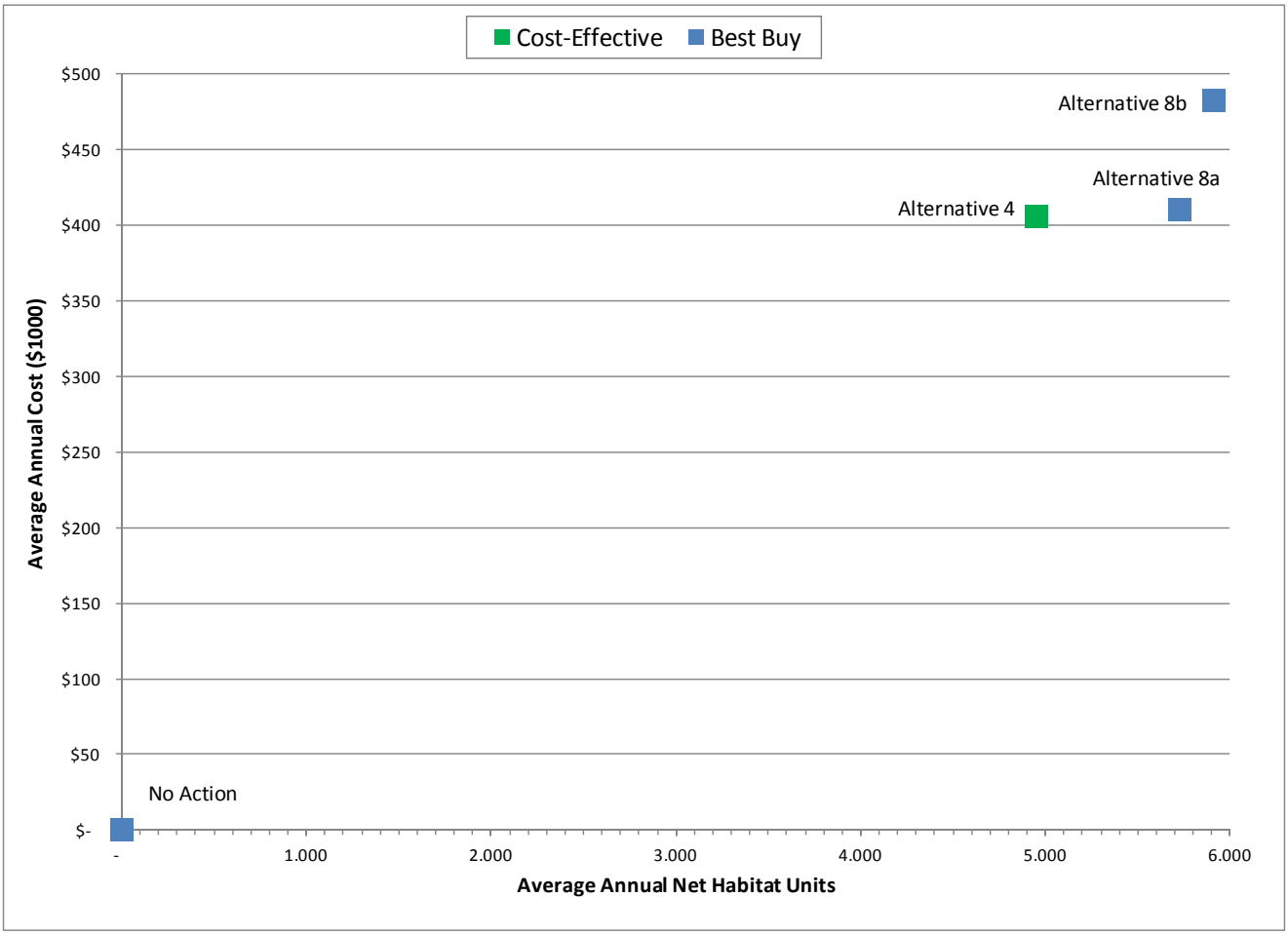

FIGURE 4
Costs and Outputs of Cost Effective and Best Buy Plans

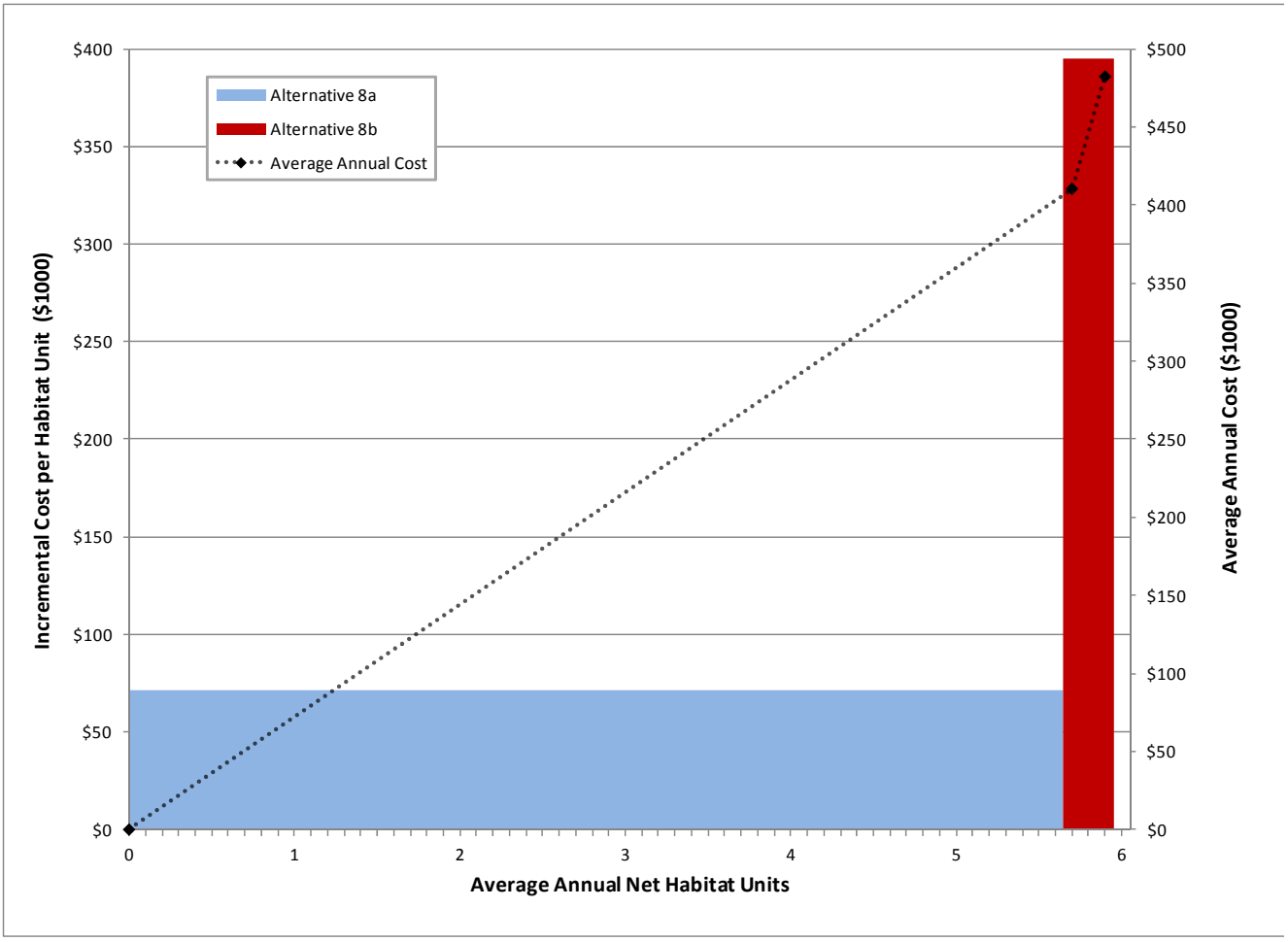

FIGURE 5
Incremental Cost of Best Buy Plans

5.0 References

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Attachment 1
IWR Planning Suite Detailed Cost Output

Annualized Cost for Alternative 4

8/9/2013 9:35:49AM

Initial terms:

Discount rate %: 3.75 Period of analysis: 50 Capital recovery factor: 0.044574218 Avg annual cost: $405,513.93

Total initial cost:

Construction $4,953,768.0 + Real Estate $1,671,384.0 + Monitoring $0.00 + Other $558,367.00 = $7,183,519.00

Total Investment cost:

Total Initial Cost $7,183,519.00 + PED $906,300.00 + IDC $92,320.30 = $8,182,139.30

Initial investment:

Total Investment Cost $8,182,139.3 PV Factor 1.000000 Present Value = $8,182,139.30

Year	Cost	PV Factor	Present Value
0	$8,182,139.30	1.0000	$8,182,139.30
1	$55,833.00	0.9639	$53,814.94
2	$37,870.00	0.9290	$35,181.88
3	$51,872.00	0.8954	$46,448.18
4	$37,870.00	0.8631	$32,684.58
5	$51,872.00	0.8319	$43,151.16
6	$37,870.00	0.8018	$30,364.54
7	$51,872.00	0.7728	$40,088.17
8	$37,870.00	0.7449	$28,209.18
9	$37,870.00	0.7180	$27,189.57
10	$51,872.00	0.6920	$35,896.49
11	$40,120.00	0.6670	$26,760.35
12	$37,870.00	0.6429	$24,346.58
13	$37,870.00	0.6197	$23,466.59
14	$37,870.00	0.5973	$22,618.40
15	$37,870.00	0.5757	$21,800.86
16	$37,870.00	0.5549	$21,012.88
17	$37,870.00	0.5348	$20,253.38
18	$37,870.00	0.5155	$19,521.33
19	$37,870.00	0.4969	$18,815.74
20	$37,870.00	0.4789	$18,135.65
21	$40,120.00	0.4616	$18,518.71
22	$37,870.00	0.4449	$16,848.33
23	$37,870.00	0.4288	$16,239.36
24	$37,870.00	0.4133	$15,652.39
25	$37,870.00	0.3984	$15,086.64
26	$37,870.00	0.3840	$14,541.34
27	$37,870.00	0.3701	$14,015.75
28	$37,870.00	0.3567	$13,509.16
29	$37,870.00	0.3438	$13,020.88
30	$37,870.00	0.3314	$12,550.24
31	$40,120.00	0.3194	$12,815.33
32	$37,870.00	0.3079	$11,659.39
33	$37,870.00	0.2968	$11,237.97
34	$37,870.00	0.2860	$10,831.78
35	$37,870.00	0.2757	$10,440.27
36	$37,870.00	0.2657	$10,062.91
37	$37,870.00	0.2561	$9,699.19
38	$37,870.00	0.2469	$9,348.62
39	$37,870.00	0.2379	$9,010.71
40	$37,870.00	0.2293	$8,685.03
41	$40,120.00	0.2210	$8,868.47
42	$37,870.00	0.2131	$8,068.54
43	$37,870.00	0.2054	$7,776.90
44	$37,870.00	0.1979	$7,495.81
45	$37,870.00	0.1908	$7,224.88
46	$37,870.00	0.1839	$6,963.74
47	$37,870.00	0.1772	$6,712.04
48	$37,870.00	0.1708	$6,469.43
49	$37,870.00	0.1647	$6,235.60
50	$37,870.00	0.1587	$6,010.22

Net Totals: Cost: $10,158,610.30 Present Value: $9,097,499.39 Avg Annual Cost: $405,513.93

Annualized Cost for Alternative 8a

8/9/2013 9:38:23AM

Initial terms:

Discount rate %: 3.75 Period of analysis: 50 Capital recovery factor: 0.044574218 Avg annual cost: $410,401.02

Total initial cost:

Construction $4,903,726.0 + Real Estate $1,671,384.0 + Monitoring $0.00 + Other $549,865.00 = $7,124,975.00

Total Investment cost:

Total Initial Cost $7,124,975.00 + PED $942,545.00 + IDC $91,385.39 = $8,158,905.39

Initial investment:

Total Investment Cost $8,158,905.3 PV Factor 1.000000 Present Value = $8,158,905.39

Year	Cost	PV Factor	Present Value
0	$8,158,905.39	1.0000	$8,158,905.39
1	$60,576.00	0.9639	$58,386.51
2	$42,875.00	0.9290	$39,831.62
3	$56,651.00	0.8954	$50,727.48
4	$42,875.00	0.8631	$37,004.26
5	$56,651.00	0.8319	$47,126.70
6	$42,875.00	0.8018	$34,377.60
7	$56,651.00	0.7728	$43,781.52
8	$42,875.00	0.7449	$31,937.38
9	$42,875.00	0.7180	$30,783.02
10	$56,651.00	0.6920	$39,203.65
11	$58,044.00	0.6670	$38,715.79
12	$42,875.00	0.6429	$27,564.29
13	$42,875.00	0.6197	$26,567.99
14	$42,875.00	0.5973	$25,607.70
15	$42,875.00	0.5757	$24,682.13
16	$42,875.00	0.5549	$23,790.00
17	$42,875.00	0.5348	$22,930.12
18	$42,875.00	0.5155	$22,101.32
19	$42,875.00	0.4969	$21,302.48
20	$42,875.00	0.4789	$20,532.51
21	$58,044.00	0.4616	$26,792.12
22	$42,875.00	0.4449	$19,075.06
23	$42,875.00	0.4288	$18,385.60
24	$42,875.00	0.4133	$17,721.06
25	$42,875.00	0.3984	$17,080.54
26	$42,875.00	0.3840	$16,463.17
27	$42,875.00	0.3701	$15,868.11
28	$42,875.00	0.3567	$15,294.57
29	$42,875.00	0.3438	$14,741.75
30	$42,875.00	0.3314	$14,208.92
31	$58,044.00	0.3194	$18,540.70
32	$42,875.00	0.3079	$13,200.33
33	$42,875.00	0.2968	$12,723.21
34	$42,875.00	0.2860	$12,263.33
35	$42,875.00	0.2757	$11,820.08
36	$42,875.00	0.2657	$11,392.85
37	$42,875.00	0.2561	$10,981.06
38	$42,875.00	0.2469	$10,584.15
39	$42,875.00	0.2379	$10,201.59
40	$42,875.00	0.2293	$9,832.86
41	$58,044.00	0.2210	$12,830.54
42	$42,875.00	0.2131	$9,134.90
43	$42,875.00	0.2054	$8,804.72
44	$42,875.00	0.1979	$8,486.48
45	$42,875.00	0.1908	$8,179.74
46	$42,875.00	0.1839	$7,884.08
47	$42,875.00	0.1772	$7,599.12
48	$42,875.00	0.1708	$7,324.45
49	$42,875.00	0.1647	$7,059.71
50	$42,875.00	0.1587	$6,804.54

Net Totals: Cost: $10,436,136.39 Present Value: $9,207,138.79 Avg Annual Cost: $410,401.02

Annualized Cost for Alternative 8b

8/9/2013 9:39:13AM

Initial terms:

Discount rate %: 3.75 Period of analysis: 50 Capital recovery factor: 0.044574218 Avg annual cost: $482,217.36

Total initial cost:

Construction $6,365,298.0 + Real Estate $1,671,384.0 + Monitoring $0.00 + Other $558,367.00 = $8,595,049.00

Total Investment cost:

Total Initial Cost $8,595,049.00 + PED $942,545.00 + IDC $118,623.11 = $9,656,217.11

Initial investment:

Total Investment Cost $9,656,217.1 PV Factor 1.000000 Present Value = $9,656,217.11

Year	Cost	PV Factor	Present Value
0	$9,656,217.11	1.0000	$9,656,217.11
1	$65,601.00	0.9639	$63,229.88
2	$47,900.00	0.9290	$44,499.93
3	$61,676.00	0.8954	$55,227.05
4	$47,900.00	0.8631	$41,341.20
5	$61,676.00	0.8319	$51,306.89
6	$47,900.00	0.8018	$38,406.69
7	$61,676.00	0.7728	$47,664.99
8	$47,900.00	0.7449	$35,680.48
9	$47,900.00	0.7180	$34,390.82
10	$61,676.00	0.6920	$42,681.06
11	$63,739.00	0.6670	$42,514.40
12	$47,900.00	0.6429	$30,794.86
13	$47,900.00	0.6197	$29,681.79
14	$47,900.00	0.5973	$28,608.96
15	$47,900.00	0.5757	$27,574.90
16	$47,900.00	0.5549	$26,578.22
17	$47,900.00	0.5348	$25,617.56
18	$47,900.00	0.5155	$24,691.62
19	$47,900.00	0.4969	$23,799.15
20	$47,900.00	0.4789	$22,938.94
21	$63,739.00	0.4616	$29,420.84
22	$47,900.00	0.4449	$21,310.67
23	$47,900.00	0.4288	$20,540.41
24	$47,900.00	0.4133	$19,797.98
25	$47,900.00	0.3984	$19,082.39
26	$47,900.00	0.3840	$18,392.67
27	$47,900.00	0.3701	$17,727.87
28	$47,900.00	0.3567	$17,087.11
29	$47,900.00	0.3438	$16,469.50
30	$47,900.00	0.3314	$15,874.22
31	$63,739.00	0.3194	$20,359.82
32	$47,900.00	0.3079	$14,747.42
33	$47,900.00	0.2968	$14,214.38
34	$47,900.00	0.2860	$13,700.61
35	$47,900.00	0.2757	$13,205.41
36	$47,900.00	0.2657	$12,728.10
37	$47,900.00	0.2561	$12,268.05
38	$47,900.00	0.2469	$11,824.63
39	$47,900.00	0.2379	$11,397.23
40	$47,900.00	0.2293	$10,985.28
41	$63,739.00	0.2210	$14,089.41
42	$47,900.00	0.2131	$10,205.52
43	$47,900.00	0.2054	$9,836.64
44	$47,900.00	0.1979	$9,481.10
45	$47,900.00	0.1908	$9,138.41
46	$47,900.00	0.1839	$8,808.11
47	$47,900.00	0.1772	$8,489.74
48	$47,900.00	0.1708	$8,182.89
49	$47,900.00	0.1647	$7,887.12
50	$47,900.00	0.1587	$7,602.04

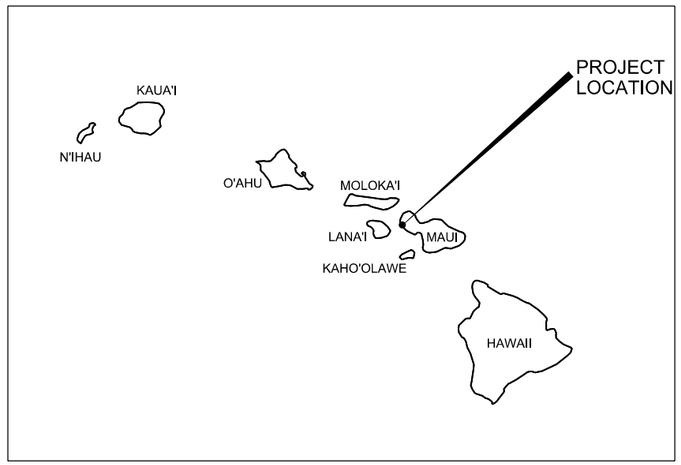
Net Totals: Cost: $12,187,378.11 Present Value: $10,818,302.11 Avg Annual Cost: $482,217.36

APPENDIX H

Preliminary Design Drawings for the Tentatively Selected Plan

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

PRELIMINARY DRAWINGS



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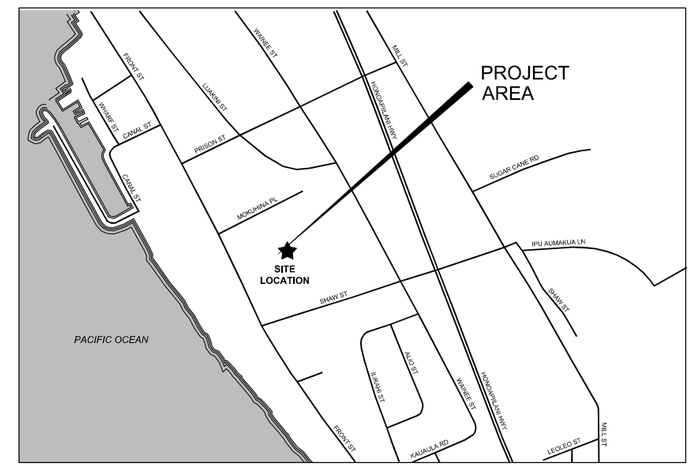
VICINITY MAP
NTS



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LOCATION MAP
NTS

SCHEDULE OF DRAWINGS

SHEET	DRAWING DESCRIPTION
G-01	TITLE SHEET AND SCHEDULE OF DRAWINGS
G-02	CIVIL GENERAL NOTES AND LEGEND
C-01	SITE PLAN
C-02	GRADING PLAN
C-03	CROSS SECTIONS FOR SECTIONS A, B, AND C
C-04	CROSS SECTIONS FOR D THROUGH G.
C-05	DETAILS
M-01	GROUNDWATER WELL PLAN AND SECTIONS
P-01	PLANTING PLAN
P-02	PLANTING CROSS SECTIONS

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U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DWN BY: GFB
CKD BY: LSK
SUBMITTED BY: L. KETTLEY
PLOT SCALE: NONE
PLOT DATE: 04/15/2013
DATE: 04/12/2013
SOLICITATION NO.: TASK NO: 005
CONTRACT NO.: W912BA-08-D-0007
FILE NUMBER: 0400-0-0-0203
SIZE: ANSI D
FILE NAME: G-01.dgn

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

TITLE SHEET
AND
SCHEDULE OF DRAWINGS

SHEET IDENTIFICATION
G-01
SHEET 1 OF 10

GENERAL SITE NOTES:

1. SOURCE OF TOPOGRAPHY SHOWN ON THE CIVIL PLANS ARE BASE MAPS PROVIDED BY THE US ARMY CORP OF ENGINEERS HONOLULU DISTRICT. EXISTING CONDITIONS MAY VARY FROM THOSE SHOWN ON THESE PLANS. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND ADJUST WORK PLAN ACCORDINGLY PRIOR TO BEGINNING CONSTRUCTION.
2. EXISTING TOPOGRAPHY, STRUCTURES, AND SITE FEATURES ARE SHOWN SCREENED AND/OR LIGHT-LINED. NEW FINISH GRADE, STRUCTURES, AND SITE FEATURES ARE SHOWN HEAVY-LINED.

   COORDINATE SYSTEM: NAD 1983, UTM ZONE 4N
3. MAINTAIN, RELOCATE, OR REPLACE EXISTING SURVEY MONUMENTS, CONTROL POINTS, AND STAKES WHICH ARE DISTURBED OR DESTROYED. PERFORM THE WORK TO PRODUCE THE SAME LEVEL OF ACCURACY AS THE ORIGINAL MONUMENT(S) IN A TIMELY MANNER, AND AT THE CONTRACTOR'S EXPENSE.
4. FOR LOCATION OF CONTROL POINT ON STRUCTURES, SEE CIVIL DRAWINGS.
5. STAGING AREA SHALL BE FOR CONTRACTOR'S EMPLOYEE OVERFLOW PARKING AND ON-SITE STORAGE OF MATERIALS.
6. PROVIDE FENCING AS NECESSARY TO MAINTAIN SECURITY AT ALL TIMES.
7. ELEVATIONS GIVEN ARE TO FINISH GRADE UNLESS OTHERWISE SHOWN.
8. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN.
9. UNLESS SHOWN ON THE PLANTING PLANS, ALL DISTURBED AREAS NOT RECEIVING A HARD SURFACE SHALL BE COVERED WITH GRASS.
10. CONTRACTOR SHALL SUBMIT A COMPLETE SOIL EROSION CONTROL PLAN FOR REGULATORY APPROVAL. CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING AND MAINTAINING EROSION CONTROL DEVICES DURING CONSTRUCTION. CONTRACTOR SHALL TAKE ALL OTHER MEASURES TO POSITIVELY PRECLUDE EROSION MATERIALS FROM LEAVING THE SITE.

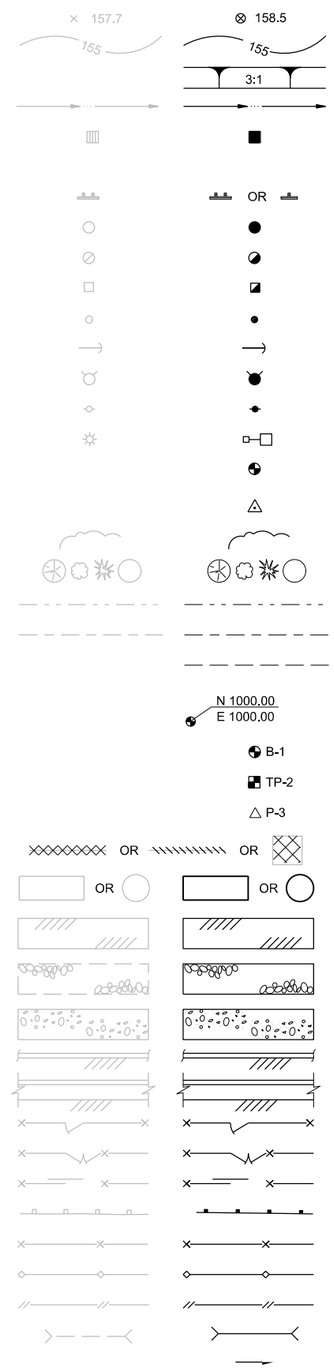
GENERAL YARD PIPING AND UTILITIES NOTES:

1. EXISTING UNDERGROUND UTILITIES OBTAINED FROM AS-BUILTS AND FROM FIELD SURVEY. CONTRACTOR SHALL POTHOLE AND FIELD VERIFY DEPTH AND LOCATION PRIOR TO EXCAVATION. PROTECT ALL EXISTING UTILITIES TO REMAIN DURING CONSTRUCTION.
2. FOR PIPING AND FLOW STREAM IDENTIFICATION, SEE DRAWING C-01.
3. EXISTING PIPING AND EQUIPMENT ARE SHOWN SCREENED AND/OR LIGHT-LINED. NEW PIPING AND EQUIPMENT ARE SHOWN HEAVY-LINED.
4. UNLESS OTHERWISE SHOWN ALL PIPING SHALL HAVE A MINIMUM OF 3' COVER.
5. ALL PIPES SHALL HAVE A CONSTANT SLOPE BETWEEN INVERT ELEVATIONS UNLESS A FITTING IS SHOWN.
6. ALL NEW WATER PIPES MUST BE PROPERLY FLUSHED, PRESSURE TESTED, CHLORINATED AND BACTERIOLOGICALLY TESTED, AS SPECIFIED.
7. FOR SURFACE RESTORATION OF ASPHALT CONCRETE MATCH EXISTING PAVEMENT.
8. MINIMUM ALLOWABLE CLEARANCE BETWEEN PIPES AT CROSSINGS SHALL BE 3".
9. ALL CONTROL POINTS SHOWN FOR GRAVITY UTILITY SYSTEM STRUCTURES ARE LOCATED AT CENTER OF MANHOLES, FACE OF CURB AT CENTERLINE OF CATCH BASINS, OR CENTER OF AREA DRAINS.
10. VERTICAL AND HORIZONTAL BENDS IN YARD PIPING MAY BE ACCOMPLISHED BY A COMBINATION OF STANDARD BENDS AND ALLOWABLE PIPE DEFLECTIONS.

GENERAL NOTE:

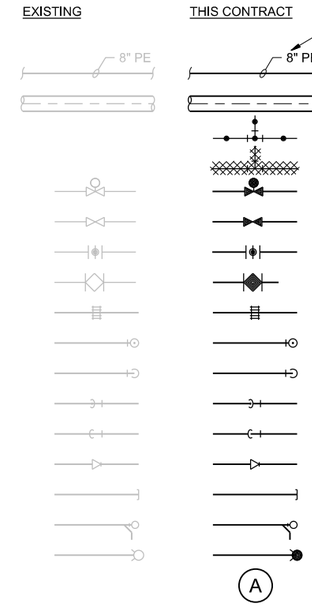
1. THIS IS A STANDARD LEGEND SHEET. THEREFORE, NOT ALL OF THE INFORMATION SHOWN MAY BE USED ON THIS PROJECT.

CIVIL LEGEND



SPOT ELEVATION
CONTOUR LINE
EMBANKMENT AND SLOPE
DRAINAGEWAY OR DITCH
CATCH BASIN OR INLET
TRENCH DRAIN
SIGN
MANHOLE
ELECTRICAL MANHOLE
ELECTRIC HANDHOLE
POST OR GUARD POST
GUY ANCHOR
FIRE HYDRANT
UTILITY POLE
LIGHT POLE
BENCH MARK
SURVEY CONTROL POINT OR POINT OF INTERSECTION
BRUSH/TREE LINE
TREE
PROPERTY LINE
CENTER LINE, BUILDING, ROAD, ETC.
FEATURE LINES AND AVERAGE SEASONAL WATER LEVELS
STRUCTURE, BUILDING OR FACILITY LOCATION POINT - COORDINATES
BORING LOCATION AND NUMBER
TEST PIT LOCATION AND NUMBER
PIEZOMETER LOCATION AND NUMBER
DEMOLITION
STRUCTURE, BUILDING OR FACILITY
ASPHALT CONCRETE PAVEMENT
GRAVEL SURFACING
CONCRETE PAVEMENT
CURB
CURB AND GUTTER
SINGLE SWING GATE
DOUBLE SWING GATE
SLIDING GATE
GUARD RAIL
CHAIN LINK FENCE
ARCHITECTURAL FENCE
WIRE FENCE
CULVERT
FLOW DIRECTION

YARD PIPING LEGEND



NOMINAL PIPE DIAMETER
PIPE USE IDENTIFICATION
PIPING < 30" DIAMETER
PIPING ≧ 30" DIAMETER
EXISTING PIPE TO BE ABANDONED
EXISTING PIPE TO BE REMOVED
INDICATOR POST VALVE
GATE VALVE AND VALVE BOX
BUTTERFLY VALVE AND VALVE BOX
PLUG VALVE AND VALVE BOX
FLEXIBLE COUPLING
90° ELBOW UP
90° ELBOW DOWN
BEND < 90° UP
BEND < 90° DOWN
CONCENTRIC REDUCER
CAP OR PLUG
CLEANOUT
FIRE HYDRANT
BACKFILL CLASS

ABBREVIATIONS

APPROX	APPROXIMATE
AVG	AVERAGE
B.F.	BUTTERFLY
°	DIAMETER
DIA	DIAMETER
EL	ELEVATION
ELEV	ELEVATION
EXST	EXISTING
FT	FOOT / FEET
GAL	GALLON
HDPE	HIGH DENSITY POLYETHYLENE
HP	HORSE POWER
N	NORTH
NTS	NOT TO SCALE
O.C.	ON-CENTER
PE	POLYETHYLENE
PVC	POLYVINL CHLORIDE
SQ FT	SQUARE FOOT
TYP	TYPICAL
W/	WITH

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DWN BY: GFB
CKD BY: LSK
SUBMITTED BY: L. KETTLEY
PLOT SCALE: AS NOTED
PLOT DATE: 04/09/2013
SIZE: ANSI D
FILE NAME: G-02.dgn
DATE: 04/12/2013
SOLICITATION NO.: TASK NO. 005
CONTRACT NO.: W912BA-08-D-0007
FILE NUMBER: HMR-04-005

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

CIVIL GENERAL NOTES AND LEGEND

SHEET IDENTIFICATION
G-02
SHEET 2 OF 10

N

0 50 100 150

Scale In Feet
1"=50' (22X34)
1"=100' (11X17)

SITE PLAN

NOTES:

1. THE PROJECT WILL INCLUDE A PERMANENT FENCE AROUND THE PERIMETER OF THE PROJECT AREA, AS NEEDED TO PROVIDE PREDATOR CONTROL. THE SPECIFIC DESIGN OF THE FENCE WILL BE DETERMINED DURING FINAL DESIGN PHASE, WITH CONSIDERATION GIVEN TO THE DESIGN STANDARDS FOR THE LAHAINA HISTORIC DISTRICT.
2. THE LOCATION OF THE GROUNDWATER WELL AND PUMP IS CONCEPTUAL, AND WILL BE REFINED IN THE FINAL DESIGN PHASE, IN COORDINATION WITH THE DESIGN EFFORT FOR THE FRIENDS OF MOKUULA SUPPORT FACILITIES.
3. THE SPECIFIC LOCATION OF COUNTY OF MAUI UTILITY LINES LOCATED WITHIN THE FRONT STREET RIGHT-OF-WAY (ROW) WILL BE DETERMINED AS PART OF THE NEXT PHASE: THE LOCATION OF THESE UTILITIES AND ANY ASSOCIATED SETBACK WILL BE REFLECTED IN THE FINAL DESIGN.
4. ALL UNITS ARE IN FEET.

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MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

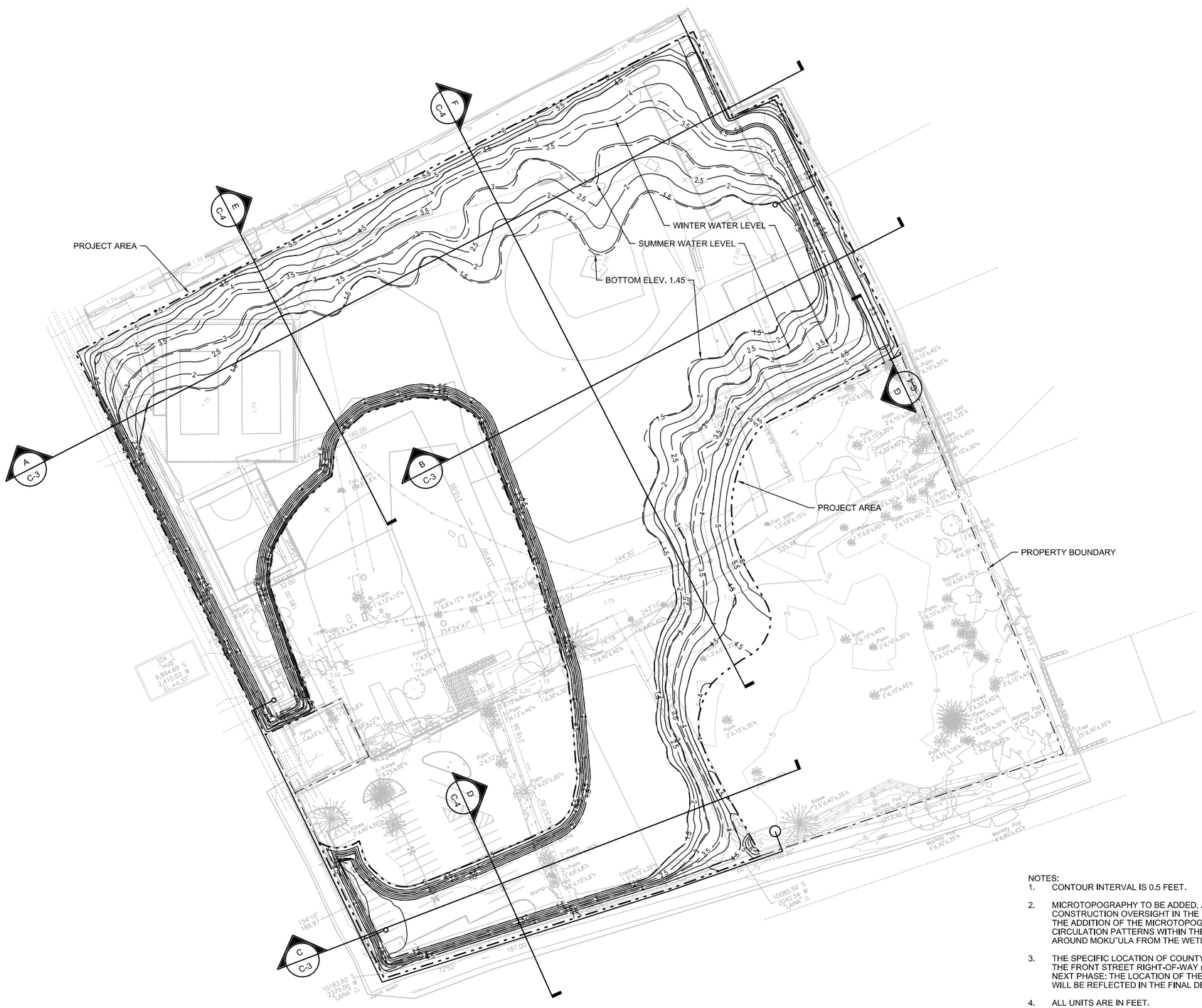
CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DATE: 04/12/2013
DWN BY: GFB
CKD BY: LSK
SOLICITATION NO.: TASK NO.:005
SUBMITTED BY: L. KETTLEY
CONTRACT NO.: W912BA-08-D-A07
PLOT SCALE: AS NOTED
PLOT DATE: 04/12/2013
FILE NUMBER: MMR-MA-003
SIZE: ANSI D
FILE NAME: C-01.dgn

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

SITE PLAN

SHEET IDENTIFICATION
C-01
SHEET 3 OF 10



N

0 50 100 150

Scale In Feet
1"=50' (22x34)
1"=100' (11x17)

NOTES:

1. CONTOUR INTERVAL IS 0.5 FEET.
2. MICROTOPOGRAPHY TO BE ADDED, AS PART OF FINAL DESIGN AND / OR CONSTRUCTION OVERSIGHT IN THE FIELD. TO THE EXTENT POSSIBLE, THE ADDITION OF THE MICROTOPOGRAPHIC FEATURES WILL CONSIDER CIRCULATION PATTERNS WITHIN THE WETLAND (e.g., PROMOTING FLOW AROUND MOKU'ULA FROM THE WETLAND INLETS TO THE OUTLET).
3. THE SPECIFIC LOCATION OF COUNTY OF MAUI UTILITY LINES LOCATED WITHIN THE FRONT STREET RIGHT-OF-WAY (ROW) WILL BE DETERMINED AS PART OF THE NEXT PHASE; THE LOCATION OF THESE UTILITIES AND ANY ASSOCIATED SETBACK WILL BE REFLECTED IN THE FINAL DESIGN.
4. ALL UNITS ARE IN FEET.

GRADING PLAN

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

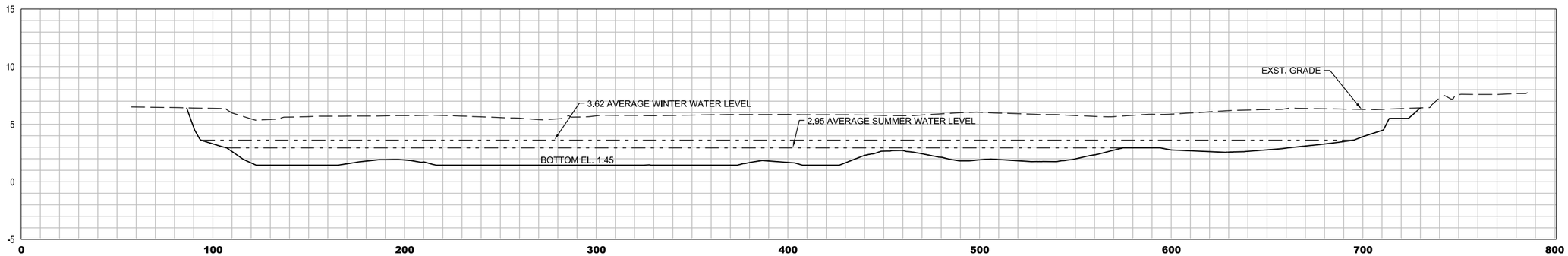
CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: N.EMOND
DWN BY: GFB
CKD BY: LSK
SUBMITTED BY: L.KETTLEY
PLOT SCALE: AS NOTED
PLOT DATE: 04/16/2013
SIZE: ANSI D
FILE NAME: C-02.dgn
DATE: 04/12/2013
SOLICITATION NO.: TASK NO.:005
CONTRACT NO.: W912BA-08-D-007
FILE NUMBER: MAKI-04-001

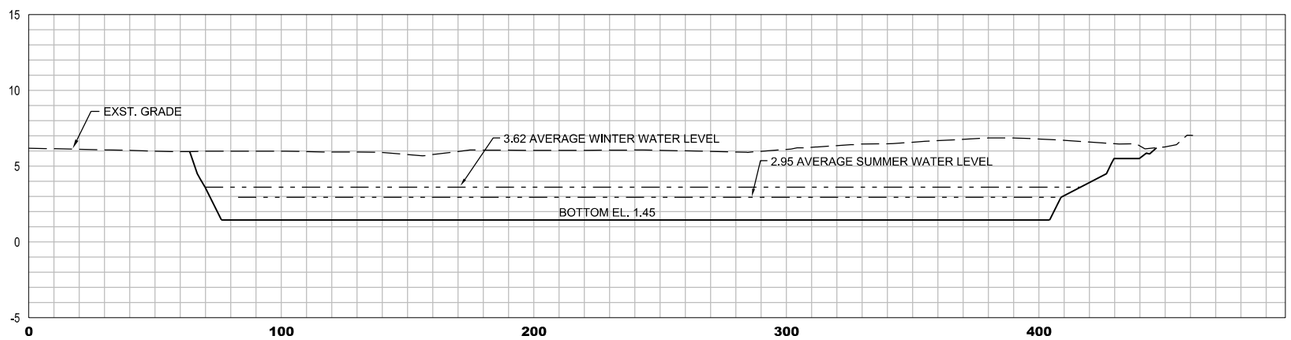
MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

GRADING PLAN

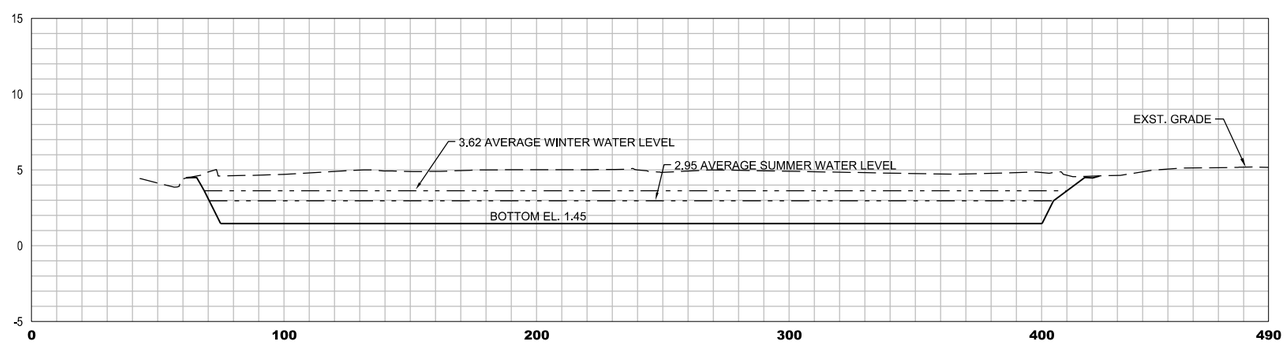
SHEET IDENTIFICATION
C-02
SHEET 4 OF 10



A SECTION
C-02



B SECTION
C-02



C SECTION
C-02

NOTE

1. MICROTOPOGRAPHY TO BE ADDED, AS PART OF FINAL DESIGN AND / OR CONSTRUCTION OVERSIGHT IN THE FIELD.
2. ALL UNITS ARE IN FEET.

0 5 10 15
VERTICAL SCALE
1"=5' (22x34)
1"=10' (11x17)

0 30 60 90
HORIZONTAL SCALE
1"=30' (22x34)
1"=60' (11x17)

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MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

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HONOLULU DISTRICT
FORT SHAFTER, HAWAII

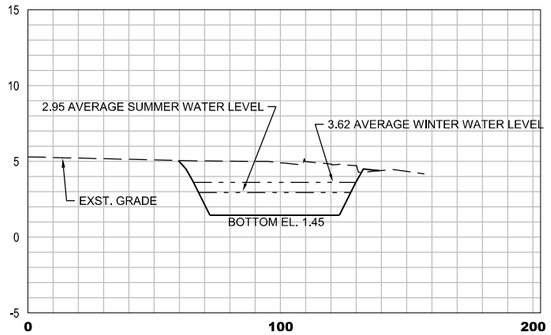
CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DWN BY: GFB
CKD BY: LSK
SUBMITTED BY: L. KETTLEY
PLOT SCALE: NOTED
PLOT DATE: 04/17/2013
SIZE: ANSI D
FILE NAME: C-03.dgn
DATE: 04/12/2013
SOLICITATION NO.: TASK NO.: 005
CONTRACT NO.: W912BA-08-D-007
FILE NUMBER: HAR-P-00128

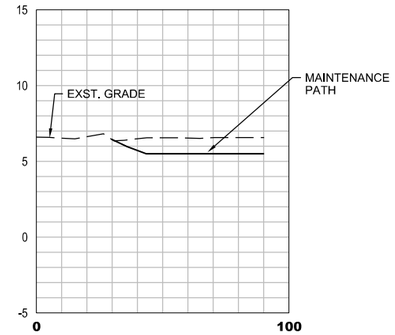
MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

CROSS SECTIONS
FOR SECTIONS A, B, AND C

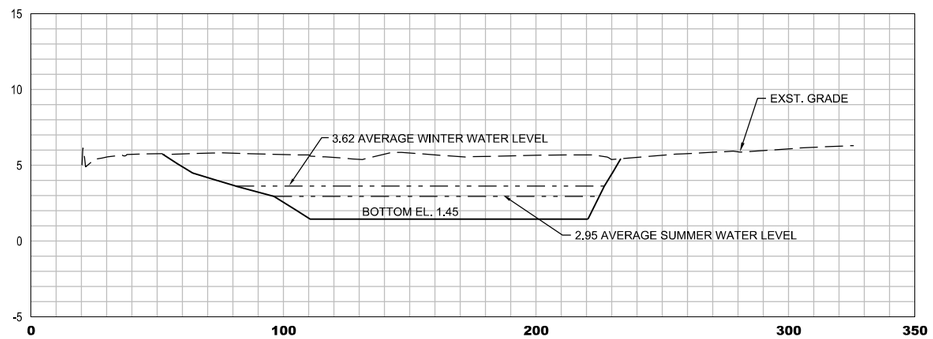
SHEET IDENTIFICATION
C-03
SHEET 5 OF 10



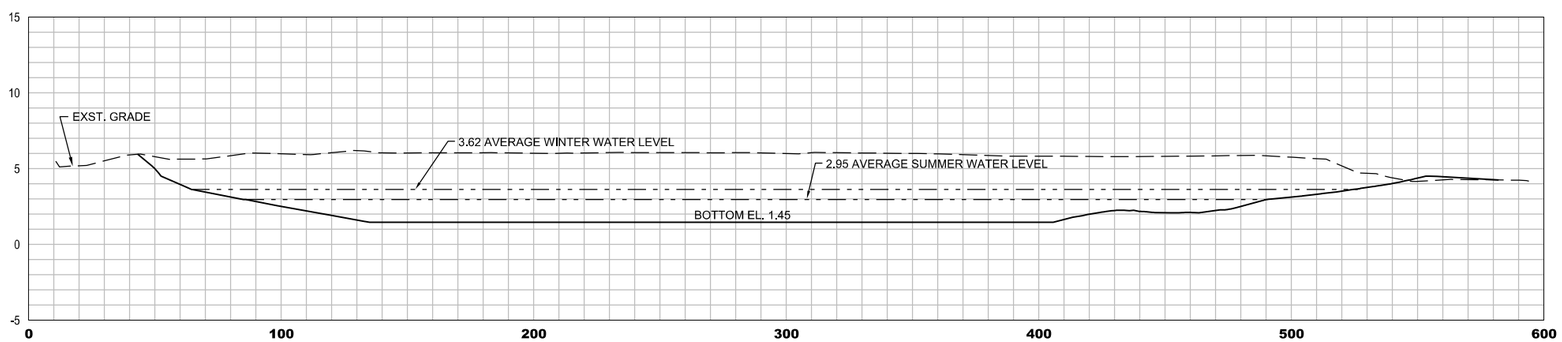
D SECTION
C-02



G SECTION
C-02



E SECTION
C-02



F SECTION
C-02

NOTE

1. MICROTOPOGRAPHY TO BE ADDED, AS PART OF FINAL DESIGN AND / OR CONSTRUCTION OVERSIGHT IN THE FIELD.
2. ALL UNITS ARE IN FEET.

0 5 10 15
VERTICAL SCALE
1"=5' (22x34)
1"=10' (11x17)

0 30 60 90
HORIZONTAL SCALE
1"=30' (22x34)
1"=60' (11x17)

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

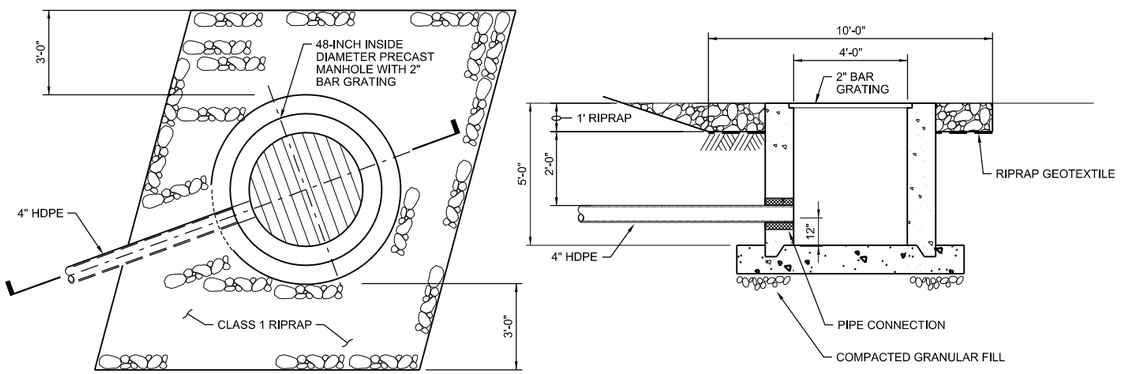
CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DWN BY: GFB
CKD BY: LSK
SUBMITTED BY: L. KETTLEY
PLOT SCALE: AS NOTED
PLOT DATE: 04/19/2013
SIZE: ANSI D
FILE NAME: C-04.dgn
DATE: 04/12/2013
SOLICITATION NO.: TASK NO.: 005
CONTRACT NO.: W912BA-08-D-0007
FILE NUMBER: MAR-04-005

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

CROSS SETIONS
FOR SECTIONS D THROUGH G

SHEET IDENTIFICATION
C-04
SHEET 6 OF 10



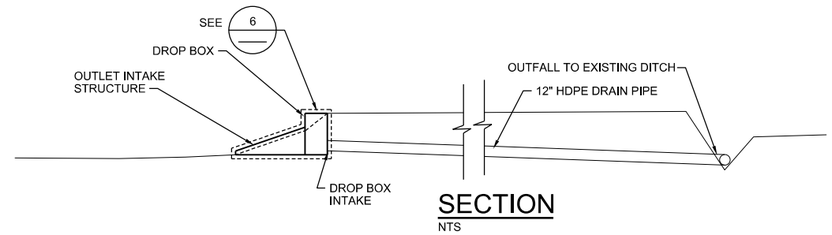
PLAN

SECTION

N

1 WETLAND INLET

3/8"=1'-0"

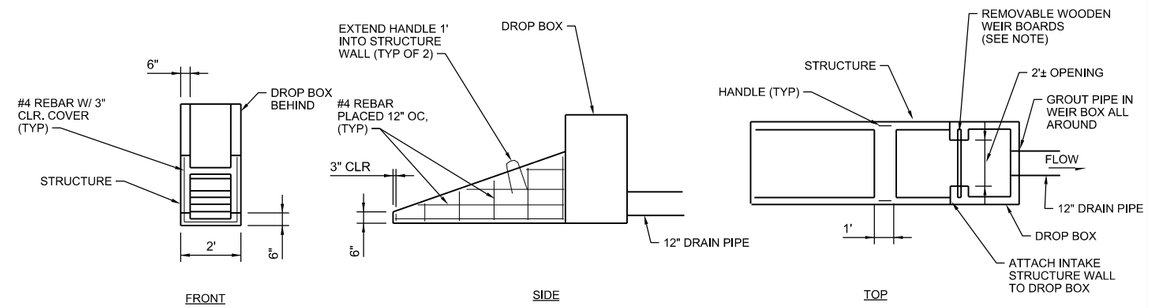


SECTION

NTS

5 WETLAND OUTLET AND DROP BOX STRUCTURE

NTS



FRONT

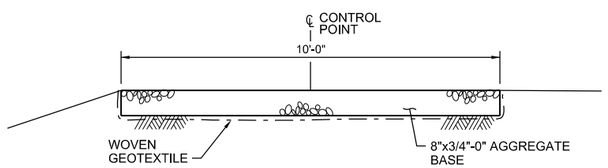
SIDE

TOP

NOTE:
WEIR BOARD SIZE TO BE DETERMINED IN FINAL DESIGN

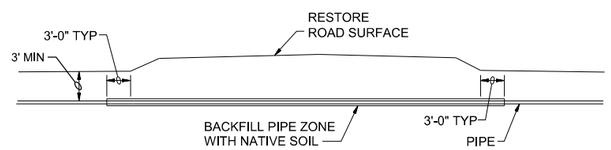
6 STRUCTURE DETAIL

NTS



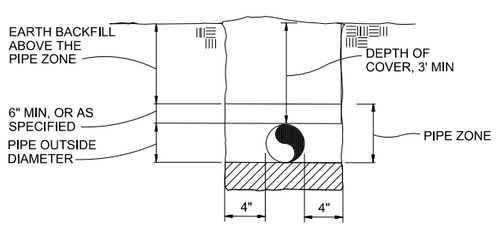
2 MAINTENANCE PATH

1/2"=1'-0"



4 BURIED PIPE UNDER SIDEWALK / ROAD

NTS



3 TYPICAL 1 PIPE TRENCH

NTS

NOTE:

1. ALL UNITS ARE IN FEET AND INCHES.

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FORT SHAFTER, HAWAII

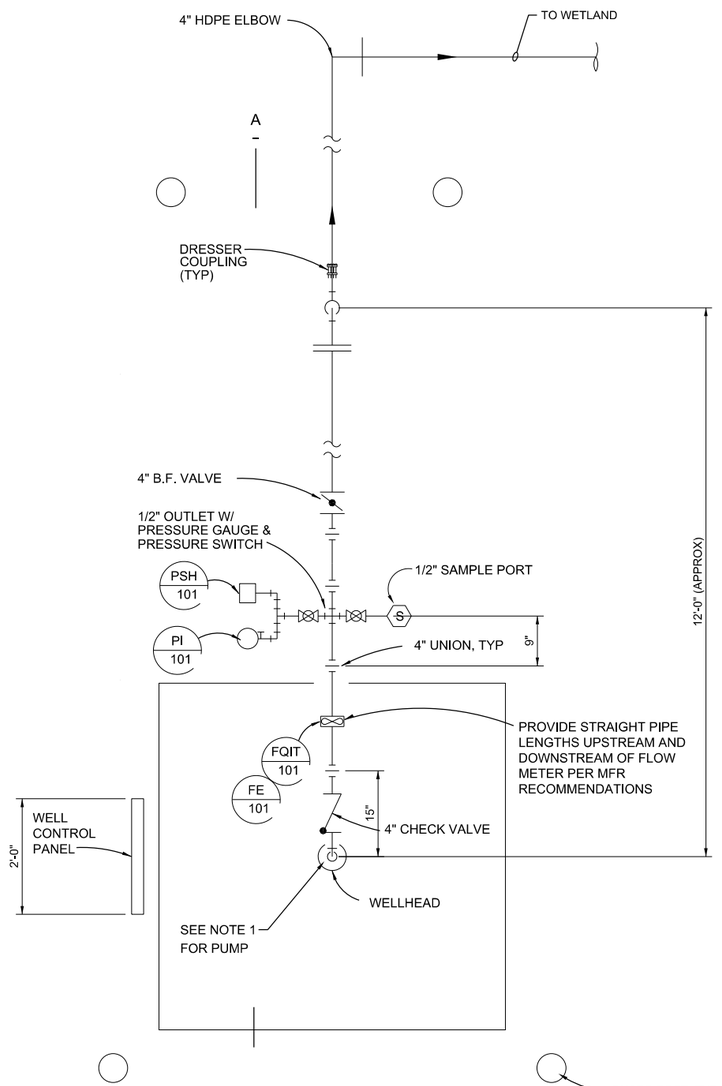
CH2M HILL, INC.
1132 BISHOP STREET, SUITE 1100
HONOLULU, HI 96813

DESIGNED BY: H. EMOND
DWN BY: GFB
CKD BY: LSK
SUBMITTED BY: L. KETTLEY
PLOT SCALE: NOT SCALED
PLOT DATE: 04/17/2013
DATE: 04/12/2013
SOLICITATION NO.: TASK NO.: 005
CONTRACT NO.: W912BA-08-D-007
FILE NUMBER: 0447-04-0202
SIZE: ANSI D
FILE NAME: C-05.dgn

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

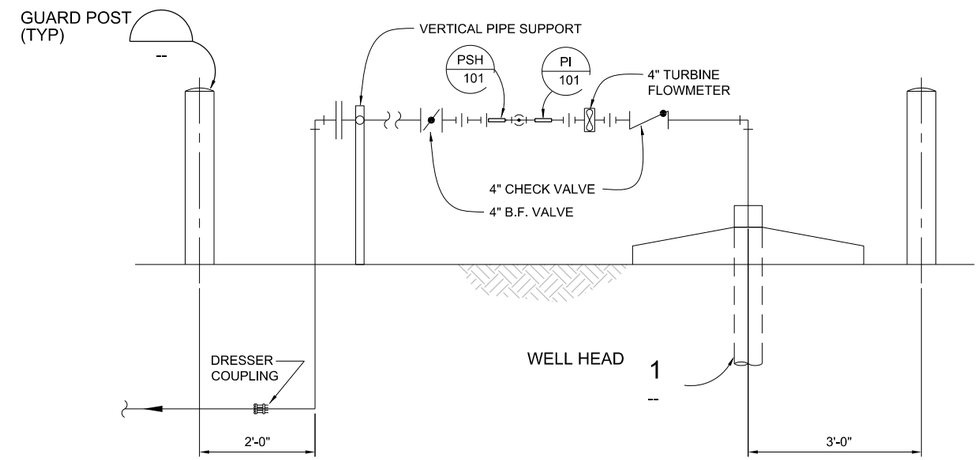
DETAILS

SHEET IDENTIFICATION
C-05
SHEET 7 OF 10

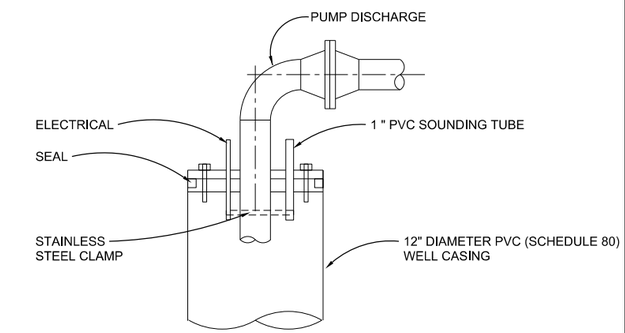


NOTE:
1. GRUNDFOS PUMP 85 S50-4 WITH 5 HP MS4000 MOTOR.

PLAN
NTS



SECTION A
NTS



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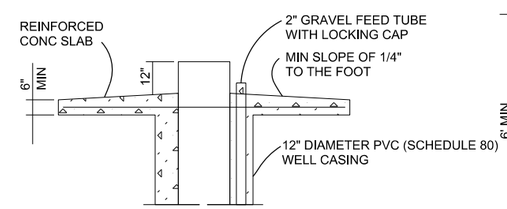

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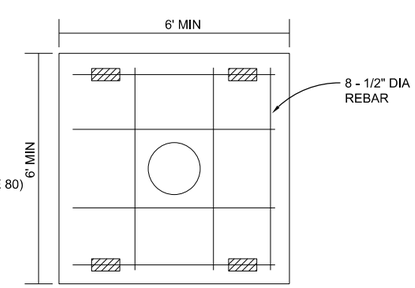

PLAN

SURFACE SLAB DETAILS
NTS

NOTES:
1. ALL UNITS ARE IN FEET AND INCHES.

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MARK	DESCRIPTION	DATE	APPR.

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FORT SHAFTER, HAWAII

DESIGNED BY: H. EMOND
DWN BY: GFB
CKD BY: LSK
SUBMITTED BY: L. KETTLEY
DATE: 04/12/2013
SOLICITATION NO.: TASK NO: 005
CONTRACT NO.: W912HA-08-D-007
PLOT SCALE: NOTED
PLOT DATE: 04/12/2013
FILE NUMBER: M4W-04-002
SIZE: ANSI D
FILE NAME: M-01.dgn

CH2M HILL, INC.
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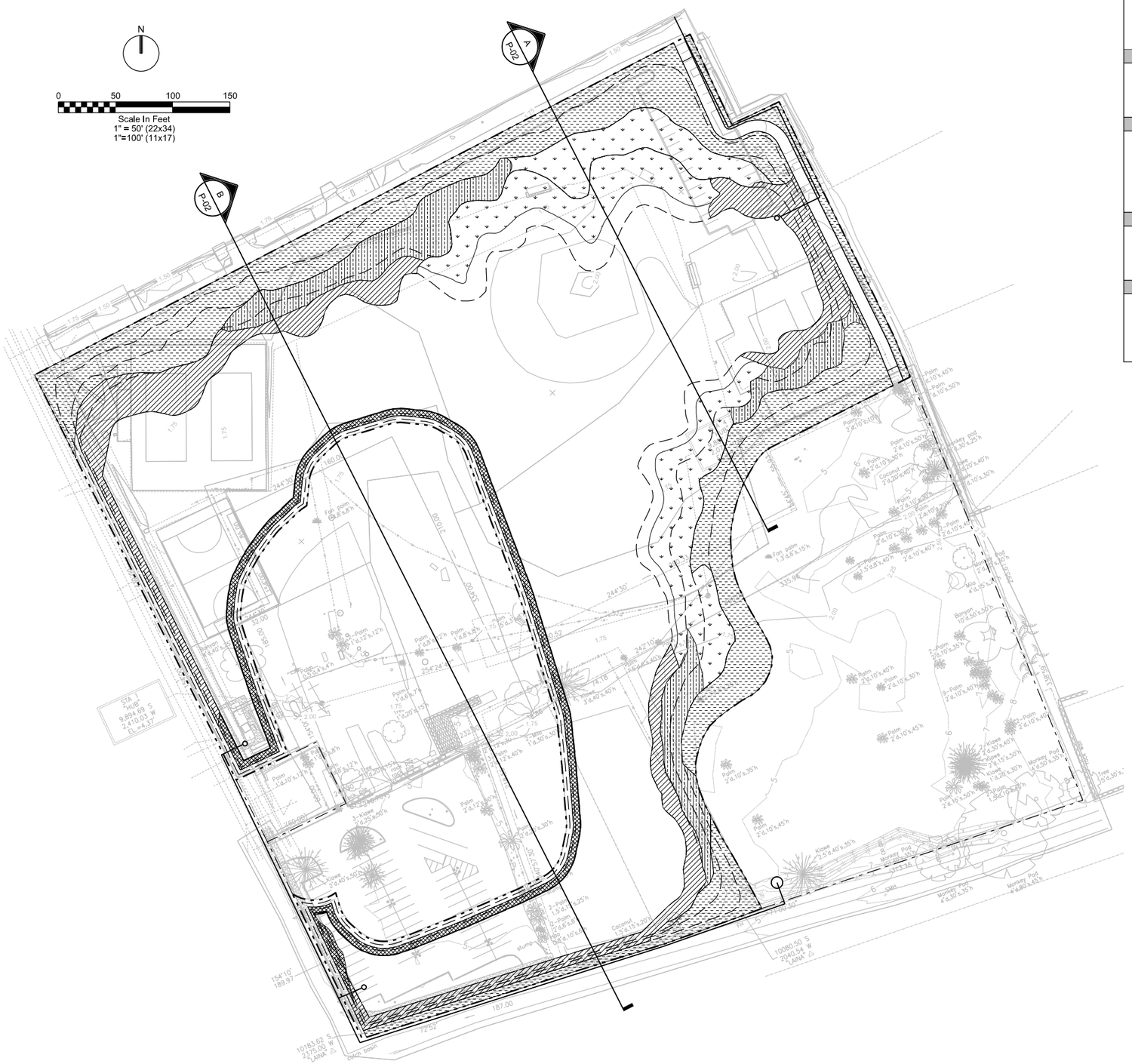
HONOLULU, HI 96813

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

GROUNDWATER WELL
PLAN AND SECTIONS

SHEET IDENTIFICATION
M-01
SHEET 8 OF 10



PLANTING PLAN

Planting Area A - top of slope						
Hawaiian Name	Common Name	Scientific Name	Type	Material	Spacing-Planting Density	Number
ahuawa	Javanese flatsedge	*Cyperus javanicus*	sedge	plug	3 ft o.c.	2621
ohelo kai	Hawaii desert-thorn	*Lycium sandwicense*	shrub	1 gal	3 ft o.c.	2621

Planting Area B - water's edge						
Hawaiian Name	Common Name	Scientific Name	Type	Material	Spacing-Planting Density	Number
makaloa	smooth flatsedge	*Cyperus laevigatus*	sedge	plug	2 ft o.c.	3062

Planting Area C - shallow water/gradual slopes						
Hawaiian Name	Common Name	Scientific Name	Type	Material	Spacing-Planting Density	Number
ae'ae	water hyssop	*Bacopa monieri*	forb	plug	2 ft o.c.	2139
akulikuli	sea purslane	*Sesuvium portulacastrum*	forb	plug	2 ft o.c.	2139
aki aki	seashore dropseed	*Sporobolus virginicus*	grass	plug	2 ft o.c.	2139

Planting Area D - shallow water/steep slope areas						
Hawaiian Name	Common Name	Scientific Name	Type	Material	Spacing-Planting Density	Number
kaluha, makai	saltmarsh bulrush	*Bolboschoenus maritimus*	rush	plug	2 ft o.c.	5182

Planting Area E - island perimeter						
Hawaiian Name	Common Name	Scientific Name	Type	Material	Spacing-Planting Density	Number
kaluha, makai	saltmarsh bulrush	*Bolboschoenus maritimus*	rush	plug	3 ft o.c.	452
makaloa	smooth flatsedge	*Cyperus laevigatus*	sedge	plug	3 ft o.c.	452

PLANTING LEGEND

- BACOPA MONNIERI (LOWER SLOPE) SESUVIUM PORTULACASTRUM AND SPOROBOLUS VIRGINICUS (UPPER SLOPE) (EACH 2 FT. O.C.) 25,662 SQ. FT.
- CYPERUS LAEVIGATUS (2 FT. O.C.) 12,246 SQ. FT.
- BOLBOSCHOENUS MARITIMUS (2 FT. O.C.) 20,726 SQ. FT.
- CYPERUS JAVANICUS AND LYCIUM SANDWICENSE (3 FT. O.C.) 47175 SQ. FT.
- BOLBOSCHOENUS MARITIMUS AND CYPERUS LAEVIGATUS (EACH 3 FT. O.C.) 8143 SQ. FT.

NOTES:

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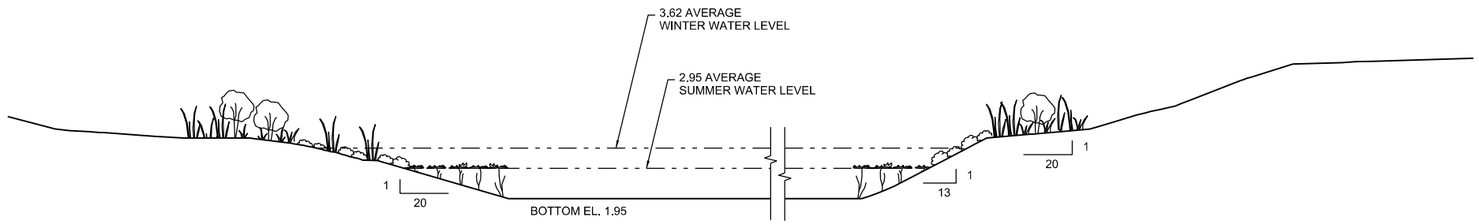
SIZE: ANSI D
PLOT SCALE: NOTED
PLOT DATE: 11/18/2013
FILE NUMBER: MMK-04-020
FILE NAME: P-01.dgn
DATE: 04/12/2013
SOLICITATION NO.: TASK NO.: 065
CONTRACT NO.: W912BA-08-3-0007

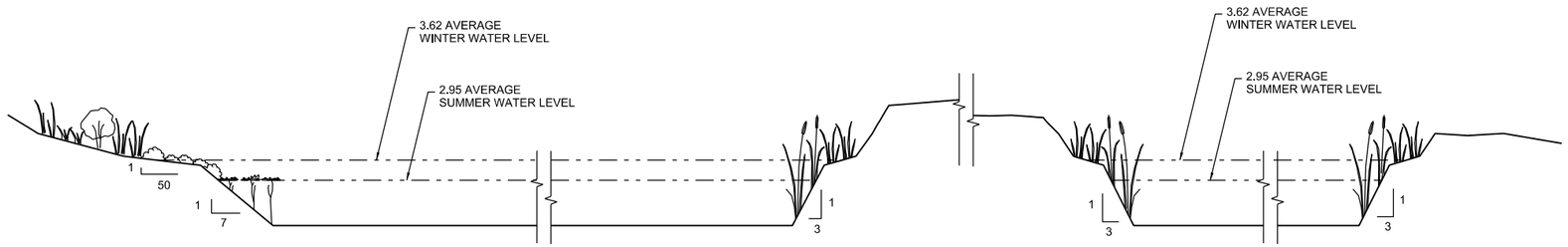
MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

PLANTING PLAN

SHEET IDENTIFICATION
P-01
SHEET 9 OF 10



A SECTION
P-01



B SECTION
P-01

NOTES:

1. ALL UNITS ARE IN FEET.

0 30 60 90
Scale In Feet
1"=30' (22x34)
1"=60' (11x17)

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HONOLULU DISTRICT
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CH2M HILL, INC.
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HONOLULU, HI 96813

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DWN BY: TL
CKD BY: H. EMOND
SUBMITTED BY: L. KETTLEY
SIZE: ANSI D
FILE NAME: P-02.dgn
PLOT SCALE: AS NOTED
PLOT DATE: 04/19/2013
DATE: 04/12/2013
SOLICITATION NO.: TASK NO. 005
CONTRACT NO.: W912BA-08-D-0007
FILE NUMBER: HAR-04-0420

MOKUHINIA
ECOSYSTEM RESTORATION PROJECT
LAHAINA, MAUI

PLANTING SECTIONS

SHEET IDENTIFICATION
P-02
SHEET 10 OF 10

APPENDIX I

Preliminary Monitoring and Adaptive Management Plan

Revised Draft

Preliminary Monitoring and Adaptive Management Plan

Mokuhinia Ecosystem Restoration Project

Contract No. W9128A-08-D-0007, Task Order 0005

U.S. Army Corps of Engineers, Honolulu District

July 2013

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1.0 Introduction

The regulations that govern ecosystem restoration projects implemented by the U.S. Army Corps of Engineers (USACE) specify that monitoring may be used to determine if the predicted outputs are being achieved and to provide feedback for future projects. Although the Planning Guidance Notebook (Engineer Regulation [ER] 1105-2-100) indicates that cost-shared post-implementation monitoring is rarely required, particularly for projects authorized under the Continuing Authorities Program (CAP), the most recent guidance confirms the need for post-construction monitoring and adaptive management. Specifically, *Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration* (dated August 2009) clarifies that a plan for monitoring restoration success should be developed as part of the feasibility study for an ecosystem restoration project, for both specifically authorized projects as well as those initiated under the CAP authority. Monitoring should focus on the systematic collection and analysis of data that that provides information useful for assessing project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain project benefits.

Section 2039 of WRDA 2007 specifically states “a monitoring plan shall (1) include a description of the monitoring activities to be carried out, the criteria for ecosystem restoration success, and the estimated cost and duration of the monitoring; and (2) specify that the monitoring shall continue until such time as the Secretary determines that the criteria for ecosystem success will be met.” The guidance further clarifies that the monitoring plan should be “described in the decision document and must include the rationale for monitoring, including key project specific parameters to be measured and how the parameters relate to achieving the desired outcomes or making a decision about the next phase of the project, the intended use(s) of the information obtained and the nature of the monitoring including duration and/or periodicity, and the disposition of the information and analysis as well as the cost of the monitoring plan, the party responsible for carrying out the monitoring plan and a project closeout plan.” In addition, the implementation guidance specifies that the information generated by the monitoring plan should be used to guide the decision-making for adaptive management. An adaptive management plan should be developed for all ecosystem restoration projects; it should address specified adjustments that may be required because of high uncertainty in achieving the desired results.

Consistent with the requirements outlined in this guidance, this monitoring and adaptive management plan has been developed for the Mokuhinia Ecosystem Restoration Project (the project). The development of this plan specifically incorporates technical input from the U.S. Fish and Wildlife Service (USFWS), whom the USACE identified as a primary technical resource for this project.

2.0 Project Description

At the request of the County of Maui, the USACE is conducting a feasibility planning study for the proposed Mokuhinia Ecosystem Restoration Project in the town of Lāhainā on the island of Maui, Hawaii. The study is authorized under Section 206 of WRDA 1996. The goal of the project is to restore a portion of the pond and associated wetlands of Mokuhinia to provide aquatic ecosystem functions and values, with consideration given to the subsequent cultural revitalization of Moku`ula by the native Hawaiian community. The specific project objectives are as follows:

- Re-establish wetland functions and values associated with Mokuhinia
- Maximize foraging habitat throughout the year for the endangered Hawaiian stilt and coot
- Provide habitat for migratory waterfowl and shorebird species

A detailed description of the alternatives formulation process and tentatively selected plan is provided in the Integrated Feasibility Report and Environmental Assessment (EA).

3.0 Performance Monitoring

As specified in the guidance, monitoring is intended to systematically evaluate information relative to project performance to determine whether restoration success has been achieved, and should focus on key indicators of project performance. Such that the specific parameters included in the monitoring plan best reflect the indicators of project performance, the following steps were taken to develop the monitoring approach for the proposed project:

- **Identification of Parameters of Monitoring Plan**: As the monitoring plan is intended to assess project performance relative to the desired outcomes of the restoration plan, it is logical that the components of the restoration plan and the output model used to evaluate habitat benefits should form the basis of the monitoring approach. As documented in the Integrated Feasibility Report and EA, these components were developed within the context of the overall project objectives, and based on a conceptual habitat model; specifically, they reflect the key requirements of wetland functions and habitat requirements for the Hawaiian stilt and coot, as well as a variety of migratory/shorebird species. Each component was evaluated to determine whether monitoring would yield useful information relative to the assessment of overall project performance.
- **Identification of Performance Criteria**: For each parameter included in the monitoring plan, performance criteria were identified. These criteria were generally developed based on the ecosystem output model, which serves to quantify habitat benefits relative to habitat quality, within the context of target conditions identified in the conceptual habitat model.
- **Identification of Monitoring Technique**: The proposed monitoring approach, as needed to assess the identified performance standards, was then identified.

Each of these is briefly described below.

3.1 Parameters of Monitoring Plan

In response to the overall project objectives, the tentatively selected restoration plan includes the following components: (1) excavation and grading to intercept groundwater and establish appropriate topography, (2) installation of a groundwater well and pump to supplement water levels, (3) construction of a surface water outlet, (4) planting of wetland vegetation, and (5) installation of a perimeter fence.

Based on feedback from USFWS, it was determined that the parameters of the monitoring plan should focus on the physical habitat characteristics that contribute to habitat quality, as these are the conditions that can be most closely controlled. Consideration will be given to the biological characteristics of the site in the overall decision-making process; as such, anecdotal information will be recorded as part of the overall monitoring effort (e.g., a log documenting observations of Hawaiian stilts and coots). However, these attributes were not considered for the basis of the monitoring plan, as they can be widely affected by other external factors.

Based on these considerations, the following parameters were evaluated for inclusion in the monitoring plan:

- **Extent of wetland function:** Included as key parameter in monitoring plan.
- **Topography:** Excluded as parameter in monitoring plan, as the appropriateness of topography will be determined through construction oversight and as-built documentation.
- **Substrate:** Excluded as parameter in monitoring plan, as (1) naturally-occurring pond sediments are known to still exist onsite within the approximate range of excavation and (2) evidence of relict hydric soils was found during wetland delineation.
- **Flooding regime and water depth:** Included as key parameter in monitoring plan.
- **Water quality:** Excluded as parameter in monitoring plan, as salinity levels identified during the groundwater assessment indicated conditions that are within range tolerated by target species. Based on monitoring data from other nearby sites (e.g., Kanaha Pond), salinity is not believed to be a limiting factor in habitat use, particularly for Hawaiian stilt.
- **Circulation:** Included as key parameter in monitoring plan.
- **Plant species composition:** Included as key parameter in monitoring plan.
- **Vegetation cover:** Included as key parameter in monitoring plan.
- **Protection from predation:** Included as key parameter in monitoring plan.

Collectively, these parameters are expected to represent the range of conditions that should be measured and assessed to determine if the proposed project is achieving the desired outcomes. This list of parameters is summarized in Table 1.

3.2 Performance Criteria

For each of the parameters in the monitoring plan, performance criteria were then established. To the extent possible, performance criteria were developed to be SMART: specific, measurable, achievable, relevant, and time-bound. The performance criteria include target values and ranges, as appropriate, and account for natural variability and management actions.

- **Extent of wetland function:** Establishment of approximately 6.0 acres of habitat that meets (or is on track to meet) the vegetative, hydrologic and soils criteria indicative of basic wetland function by the end of monitoring period.
- **Flooding regime and water depth:** Average water depths of 0 to 2 feet are maintained for at least 80 percent of the time, and reflect seasonal inundation and evaporation patterns.
- **Circulation:** Indicators of adequate circulation are achieved over at least 80 percent of the time.
- **Plant species composition:** At least 75 percent of dominant species are on target species list; list of dominant species does not include any species recognized as invasive.
- **Vegetation cover:** Maintain average cover of <60 percent on wetland slopes, and 40 to 60 percent in emergent zone
- **Protection from predation:** Evidence that predator control program is adequately responding to predation threats

In general, these criteria represent the desired conditions to be achieved by the end of the performance monitoring period, as needed to determine project success. Interim criteria that may be more appropriate indicators of success for the initial monitoring events will be determined during the final

design phase, as needed. These performance criteria are summarized, according to the parameters of the monitoring plan, as part of Table 1.

3.3 Monitoring Techniques

Based on the performance criteria, monitoring techniques were then defined for each parameter of the monitoring plan. In general, the monitoring techniques are consistent with standard monitoring approaches and/or techniques used at other similar wetland habitat types, per input provided by USFWS. For many of the parameters, the monitoring approach will incorporate data collected as part of the routine operations and maintenance (O&M) program; these include water level monitoring for assessment of the hydrologic regime and predator monitoring for assessment of predation. For the vegetation parameters (species composition and cover), monitoring will consist of quadrant sampling along established monitoring transects. Monitoring for circulation will consist of visual inspection, based on specified indicators. The monitoring approach for each parameter is summarized in Table 1.

3.4 Evaluation and Reporting

To provide the basis for evaluating project performance, the data collected as part of the above-described monitoring efforts will be compiled and analyzed. The analysis will use the performance criteria to evaluate whether the project is achieving restoration success. The results of the analysis will be presented in a report; a report will be produced annually for each year that monitoring is conducted (see Section 3.5 for a discussion of the monitoring schedule).

In the event that the evaluation indicates that the project has not met the performance criteria, the project sponsors will consider implementation of adaptive management actions as needed to attain the ecosystem objectives for the project. Considerations for the adaptive management approach are discussed in Section 4.0.

3.5 Monitoring Schedule

The implementation guidance for Section 2039 of WRDA 2007 specifies that monitoring will be initiated upon completion of construction of the ecosystem restoration project, and should continue until ecological success has been documented; the law allows for but does not require a 10-year cost-shared monitoring plan. If monitoring is required beyond the 10-year period, it will be the responsibility of the non-federal sponsor.

Based on technical input from USFWS (incorporating lessons learned from restoration of other similar wetland habitat types in Hawaii), and as allowed under the USACE guidance, it is assumed that monitoring would be conducted over a 10-year period, which would start upon completion of construction.[1] Within the 10-year monitoring period, a total of five monitoring events would occur. Based on the current design, it is assumed that monitoring would be conducted in Years 1, 3, 5, 7, and 10 (that is, in the first, third, fifth, seventh and tenth years following completion of construction); the exact timing and specific frequency of monitoring will be determined in the final design phase.

[1] In many cases, pre-project monitoring is conducted, as needed to establish the basis for measuring restoration success. As the project site does not currently support any aquatic habitat, no pre-project monitoring is proposed.

TABLE 1
Performance Standards and Monitoring Requirements

Mokuhinia Ecosystem Restoration Objective	Parameter[a]	Performance Criteria	Monitoring Approach	Considerations for Adaptive Management
Re-establish wetland functions and values associated with Loko o Mokuhinia	Extent of Wetland Function	Establishment of approximately 6.0 acres of wetland habitat that meets (or is on track to meet) the vegetative, hydrologic and soils criteria indicative of basic wetland function	Identification of extent of wetland function across site using standard assessment methods for vegetative, hydrologic and soils criteria	See below; it is assumed that parameters needed to establish wetland functions are reflected in the habitat parameters for stilt and coot (particularly those related to hydrology, soils and vegetation)
Maximize foraging habitat throughout the year for the endangered Hawaiian stilt and coot	Topography	None – appropriateness of topography to be determined through construction oversight and based on documentation for as-builts	N/A	Assumes no modifications relative to topography, as design targets are based on species' habitat requirements and the appropriateness of topography will be determined through construction oversight and as-built documentation.
	Substrate	None –appropriateness of substrate determined based on documentation of naturally-occurring pond sediments within project site and evidence of relict hydric soils during previous delineation	N/A	Assumes no modifications to soils, as naturally-occurring pond sediments are known to still exist onsite within the approximate range of excavation; evidence of relict hydric soils was found during wetland delineation.
	Flooding Regime and Water Depth	Maintain average water depths between 0 to 2 feet over 80 percent of the year	Quantitative analysis of water level records collected as part of routine O&M activities	If needed, modifications to flooding regime and water depth could be achieved through refined pumping regime; modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort.
		Maintain hydrologic regime that reflects seasonal and ephemeral inundation and evaporation patterns	Qualitative analysis of water level records collected as part of routine O&M activities, with comparison to available data from other managed wetland sites (e.g., Kealia and/or Kanaha Ponds)	
	Water Quality	None – salinity levels identified onsite during groundwater assessment indicated conditions that are well within range tolerated by species; based on monitoring at Kanaha Pond, salinity is not found to be a limiting factor for habitat use	N/A	Assumes no modifications to salinity, as species are known to tolerate wide range of salinities (stilt have been found to preferentially utilize hyper-saline habitat at Kanaha Pond).

TABLE 1
Performance Standards and Monitoring Requirements

Mokuhinia Ecosystem Restoration Objective	Parameter[a]	Performance Criteria	Monitoring Approach	Considerations for Adaptive Management
Maximize foraging habitat throughout the year for the endangered Hawaiian stilt and coot	Circulation	Indicators of adequate circulation are achieved at least 80 percent of the time; indicators include evidence of flowing water, with no pockets of stagnant water in designated observation locations	Visual inspection	If needed, improved circulation could be achieved through modifications to pumping regime (e.g., changes in the frequency and/or duration) and management of outlet; modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort.
	Plant Species Composition	At least 75 percent of dominant species are on target species list; list of dominant species does not include any species recognized as invasive	Tie to target species list Percent cover of invasive species	If needed, changes in plant species composition and/or vegetation cover could be achieved through modifications to vegetation management (e.g., increased weeding, transplanting, propagation, etc.); modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort.
	Vegetation Cover (wetland slopes)	Maintain average cover of <60 percent on wetland slopes	Quadrant sampling along established monitoring transects	
	Vegetation Cover (emergent zone)	Maintain average cover of 40-60 percent in emergent zone	Quadrant sampling	
	Protection from Predation	Evidence that predator control program is adequately responding to predation threats	Routine monitoring for tracks and other predator signs	If needed, increased protection from predation could be achieved through modifications to trapping program (e.g., increased number of traps, more frequent inspection, modified trap placement, different type of trap, etc.); modifications would fall within range of activities assumed for O&M, but would result in some costs associated with a higher level of effort.
Provide habitat for migratory waterfowl and shorebird species	Various	Captured as part of performance standards for stilt and coot (see above)	N/A	N/A

NOTES:

[a] The monitoring plan does not specifically address the biological characteristics of the site, as they may be widely affected by external factors that cannot be controlled as part of the project. However, anecdotal information will be recorded as part of the overall monitoring effort (e.g., a log documenting observations of Hawaiian stilts and coots), such that it may be considered in the decision-making process.

3.6 Monitoring Responsibilities and Cost

Consistent with the requirements of WRDA 2007, the cost of all monitoring events outlined in this plan will be included as part of the total project costs and be cost-shared, according to the specific cost-share requirements for this project. Any additional post-construction monitoring past the 10-year monitoring period will be entirely the responsibility of the non-federal sponsor. As the non-federal sponsor, Maui County will also be responsible for all long-term management and O&M of the restoration measures implemented as part of the tentatively selected plan.

The estimated cost for implementation of this monitoring plan is summarized in Table 2. As indicated, it is assumed that much of the data that will be used for monitoring will be collected as part of the overall O&M effort conducted by the County's management team. The costs summarized below do not include these costs, but reflect the effort to compile and analyze the data.

Table 2
Estimated Monitoring Costs

Parameter	Estimated Level of Effort (Per Monitoring Event)	Approximate Cost
Extent of wetland function	Assumes a total of 3 person-days per monitoring event; assumes the delineation can be coordinated with the other monitoring tasks	$750
Flooding regime and water depth	Assumes a total of 6 person-days per monitoring event (assumes compilation and use of water level data gathered as part of O&M)	$1,500
Circulation	Assumes a total of 2 person-days per monitoring event (assumes compilation and use of observations gathered as part of O&M)	$500
Vegetation (plant species composition and cover)	Assumes a total of 4 person-days per monitoring event	$1,000
Predator monitoring	Assumes a total of 2 person-days per monitoring event (assumes compilation and use of data gathered as part of O&M)	$500
General monitoring tasks (e.g., site photographs)	Assumes a total of 1 person-days per monitoring event	$250
Analysis and reporting	Assumes a total of 20 person-days per monitoring event; assumes $500 in expenses per monitoring event	$5,500
Total (per monitoring event)		**$10,000**
Project Total (assuming 5 monitoring events)		**$50,000**

4.0 Adaptive Management

Adaptive management is a structured process of learning and using newly-acquired knowledge to adjust and improve project implementation. The adaptive management process promotes flexible decision-making as outcomes from management actions are better understood. This approach helps to reduce the risk of not achieving ecosystem restoration goals. Implementation guidance for WRDA 2007 specifies that an adaptive management plan should be developed for all ecosystem restoration projects. Specifically, the information generated by the performance monitoring, as described in

Section 3.0 should be used by the project sponsors to guide decisions relative to operational or structural changes that may be needed to ensure that the ecosystem restoration project meets the success criteria. This decision-making process may depend on a number of variables, including the timing and/or spatial scale of the performance issue, the urgency with which the issue must be addressed, and/or the type of adjustment that is needed to respond to the issue. The guidance specifies that if an adjustment is anticipated due to high uncertainty in achieving the desired outputs/results, the nature and cost of such actions should be explicitly described as part of the decision document and expressed in each of the monitoring reports as they are performed.

To evaluate the adaptive management measures that may be required for the proposed project, the potential risk and uncertainty relative to achieving the performance standards was assessed for each of the monitoring parameters; for each, potential adaptive management measures were identified. Specific measures that were considered included changes to project-related structures, operations, and/or management. As part of the assessment, the extent to which these adaptive management measures could address the potential deficiencies was considered.

In general, this assessment considered that the key parameters that could require some form of adaptive management are those related to flooding regime and water depth, circulation, plant species composition, vegetation cover and protection from predation. Each of these parameters involves some degree of risk that the performance standards may not be achieved and that habitat benefits may not be fully recognized for the project site. However, as described in the Integrated Feasibility Report and EA, a robust O&M effort will be required for the project site, as the importance of management for Hawaiian waterbird habitat is widely recognized (USFWS, 2011). Specific management requirements that are widely accepted for this habitat type include management of water levels and predator control. The O&M effort also specifically addresses vegetation management. As such, it is anticipated that adaptive management requirements can be reasonably addressed through modifications to the O&M program, so that no major physical changes will be required. Specific considerations that were identified as part of the adaptive management approach are listed in Table 1; these include the following:

- Modifications to flooding regime and water depth could be achieved through refined pumping regime (e.g., changes in duration and/or frequency of pumping).
- Changes to plant species composition and/or vegetation cover could be achieved through modifications to the vegetation management effort (e.g., increased weeding, transplanting, and propagation).
- Improved circulation could be achieved through modifications to the pumping regime (e.g., changes in the frequency and/or duration of pumping) and/or through modifications to the management of the outlet (e.g., timing of opening/closing outlet).
- Increased protection from predation could be achieved through modifications to trapping program (e.g., increased number of traps, different type of traps, more frequent inspection, and modified trap placement).

In general, it is anticipated that these modifications would fall within the range of activities established for the O&M program; however, there would likely be some costs associated with a higher level of effort. As such, based on the assessed risk level associated with achieving the performance standards, the costs for adaptive management were estimated to be approximately 20 percent of the O&M cost. Any adaptive management costs incurred during the monitoring period would be cost-shared with the non-federal sponsor.

5.0 References

USACE (U.S. Army Corps of Engineers). 2000. “Planning Guidance Notebook.” Engineer Regulation 1105-2-100. April 22.

USACE (U.S. Army Corps of Engineers). 2009. *Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration*. August.

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APPENDIX J

NHPA Section 106 Correspondence

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

February 22, 2010

REPLY TO
ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Ms. Laura H. Thielen
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

Dear Ms. Thielen:

The U.S. Army Corps of Engineers, Honolulu District (POH) is proposing an undertaking, in partnership with the County of Maui, Hawaii, called an Ecosystem Restoration project on Maui's sacred island of Moku'ula including its complex freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui (Enclosures 1 and 2). The island and its ponds are now entirely contained within the present boundaries of Malu Ulu o Lele Park (TMK: 2-4-6-07:002; see Enclosures 3 and 4). The Park is bounded on its western side by Front Street; by Shaw Street on its southern edge; by an open ditch at its northern boundary; and at its eastern end by privately owned properties along Wainee Street. An 1884 map by S.E. Bishop depicts the Island of Moku'ula with its adjacent fishponds, which are located at the southeast corner of the parcel containing Loko o Mokuhinia (Enclosures 5 and 6). The purpose of the Mokuhinia/Moku'ula Ecosystem Restoration Project is to restore significant ecosystem function, structure, and dynamic processes that have been degraded over time.

POH is currently performing various studies for the restoration project to investigate its feasibility for construction. One such study includes a hazardous, toxic, and radioactive waste investigation to assess presence/absence of material hazardous to human health and safety in the project area. Based on a 2008 Oceanit study, arsenic was detected at a level higher than recommended by Hawaii State Department of Health for human exposure. POH is proposing a second site investigation and testing, using Oceanit once again, to characterize the nature and extent of the arsenic contamination. Oceanit has submitted a sampling analysis plan (SAP) for the second study, dated July 2009, which is enclosed for your information. The purpose of this letter is to initiate coordination and consultation for the second investigation as required under Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 CFR Part 800 (NHPA).

Loko o Mokuhinia is cited in Hawaiian mythology as the home of the lizard goddess, Kihawahine, the tutelary deity to the old Maui royal family line that gave rise to King Kamehameha III. From 1837 to 1845, Moku'ula Island was also the royal residence of King Kamehameha III when Lahaina became the capital of the Hawaiian kingdom. King Kamehameha III also built a mausoleum at the northern point of Moku'ula Island, and in the past, held the remains of Hawaiian royalty. As King Kamehameha IV grew into succession, the royal residence was later relocated to Honolulu, thus Moku'ula Island began losing its prominence and is eventually left abandoned. Moku'ula has historic significance on several levels and in May 1997, the island, along with Loko o Mohuhinia and Hale Piula (as contained within the TMKs, 2-4-6-07 and 2-4-6-02-23) were all placed on the National Register of Historic Places (NRHP) for their association with events that made a significant contribution to the broad patterns of our history, their association with the lives of persons significant in our past, and their yielding or likely to yield, information important in prehistory or history.

The dominance of sugarcane and sugarcane plantations above Lahaina in the late 19th century turned Loko o Mokuhinia into a marshy area covered with sedges by 1913. At that time, businessmen of Lahaina began a public project to fill in the stagnant remains of the old freshwater pond system with soils brought in from the Honokowai area to the north of Lahaina. Executive Order 52 gave way to the establishment of Malu Ulu o Lele County Park over the filled-in areas of the Loko o Mokuhinia, including areas of Moku'ula Island. The fill layer(s) now ranges in thickness of about a foot to 4 feet (30-120 cm).

Oceanit's sampling analysis plan for the second study calls for collecting 60 soil samples from 20 bore holes excavated down to a maximum depth of 6 feet below the grounds surface. In order to ensure representative sampling, the project area is divided into 9 cells. Two (2) bore holes each will be located in 7 of the 9 cells and three bore holes in the remaining 2, totaling 20 bore holes (see Enclosure 7). None of the bore holes will be drilled over the former location of Moku'ula Island. A truck mounted direct-push rig will be used to advance a 2.5-inch outside diameter split-spoon sampling bit for collecting the soil samples. The SAP also calls for the collection and analysis of 7 composite samples, composed of soils collected from 30-50 samples from the depth of 1-3 inches (2.54-7.62 cm) below the ground surface. Analysis of the composite samples will assist in determining the level of arsenic contamination throughout the project area.

The area of potential effect for the second study includes the entire site listed on the NRHP. In the opinion of POH, collections of the composite samples should have no impact on historic properties, as these will be confined to the upper 3 inches of the fill layer. The 2.5 inches in diameter bore hole drilling, on the other hand, is likely to penetrate through the Loko o Mokuhinia basal sediment layer (or layers) which is (or are) likely to contain information important in Hawaiian history and prehistory. Such information would include organic and inorganic remains, as well as cultural items that would provide evidence of environmental conditions in Hawaii covering periods potentially going back to pre-human occupation of the Hawaiian Island chain, as well as back to the more recent pre- and post-contact eras. Thus, it is our opinion, that the bore hole drilling has the potential to have an adverse impact on potentially significant cultural layers that are comprised at the bottom of the pond. This adverse impact may be countered by ensuring that an experienced archaeological monitor is present during the bore

hole drilling to record and collect soil samples in the auger from the ponds basal layer(s). The monitor will ensure that the existing stratigraphic sequence of the pond's basal layers, are recorded and described in detail using the Munsell Color Chart, and other basic soil description terminologies. Soil samples will also be retrieved, as appropriate, for cleaning in the laboratory, visual scanning for retrieval of cultural items such as charcoal, wood, artifacts, etc., and for preparation for submittal to appropriate laboratories for pollen and botanical analyses for documenting environmental landscape signatures. Datable samples such as charcoal, wood or shell remains shall also be retrieved and submitted to appropriate laboratories for radiocarbon dating to establish temporal indicators for the occupation/use of the ponds. The results of the fieldwork and laboratory analyses shall be documented in an archaeological report that will be submitted to your office for review and comment prior to the compilation of a final report.

POH is thus proposing a "no adverse effect to historic property" determination for Oceanit's second study based on the condition that an experienced archaeological monitor be present during the drilling of all bore holes to document presence/absence of pond sediment(s) and the performance of related analyses to document past environmental conditions and human occupation of the region. In compliance with the NHPA, your concurrence with this determination is kindly requested. POH is also consulting with the Office of Hawaiian Affairs, the History and Culture Branch of the Department of Land and Natural Resources, the Maui Island Burial Council, the Maui County Cultural Resources Commission, Friends of Moku'ula, and Lahaina Hawaiian Civic Club.

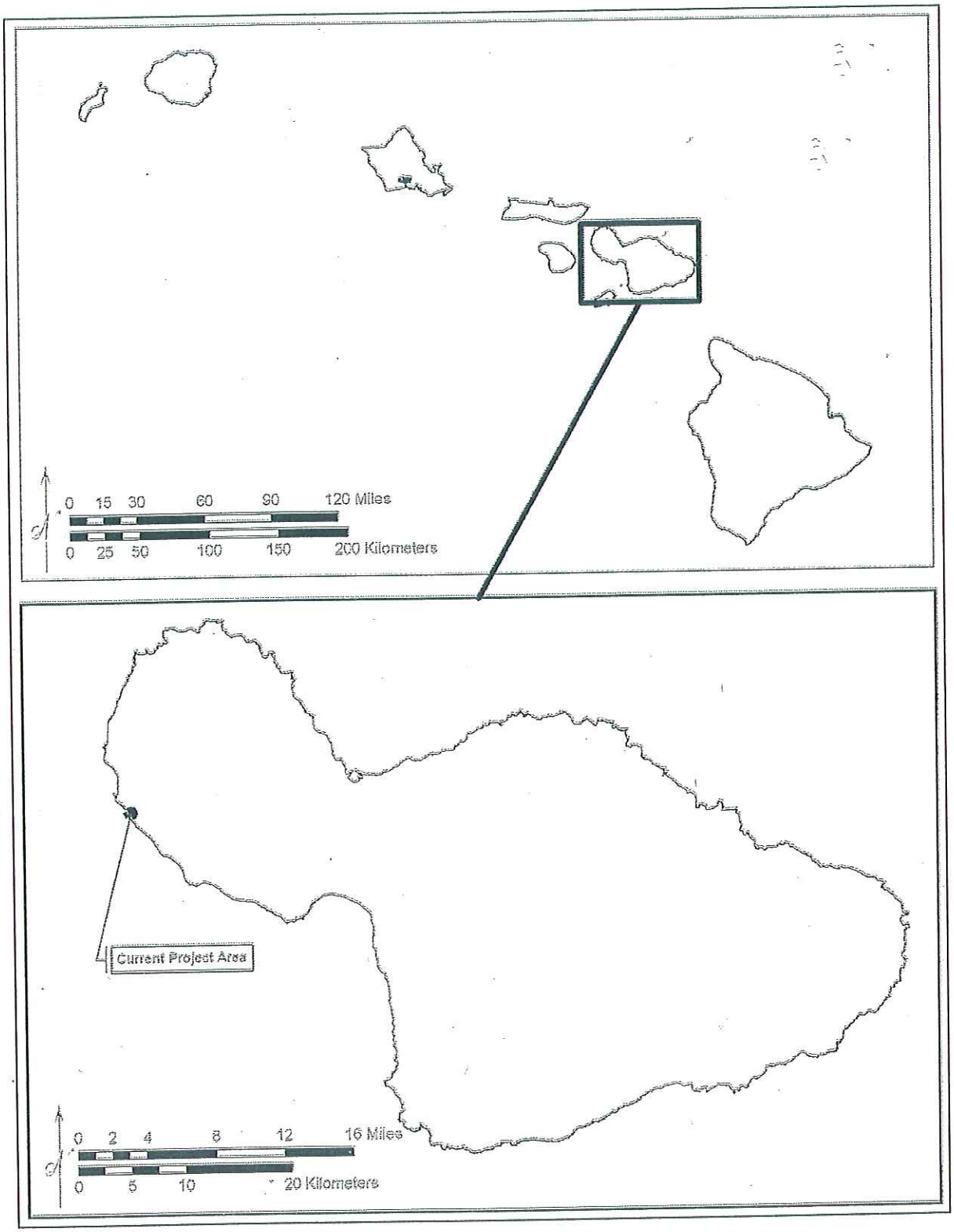
If you should have any questions, please contact Mr. Kanalei Shun, Lead Archaeologist of my Environmental Programs Branch by telephone at (808) 438-7000, or by facsimile at (808) 438-6930, or by e-mail at kanalei.shun@usace.army.mil.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

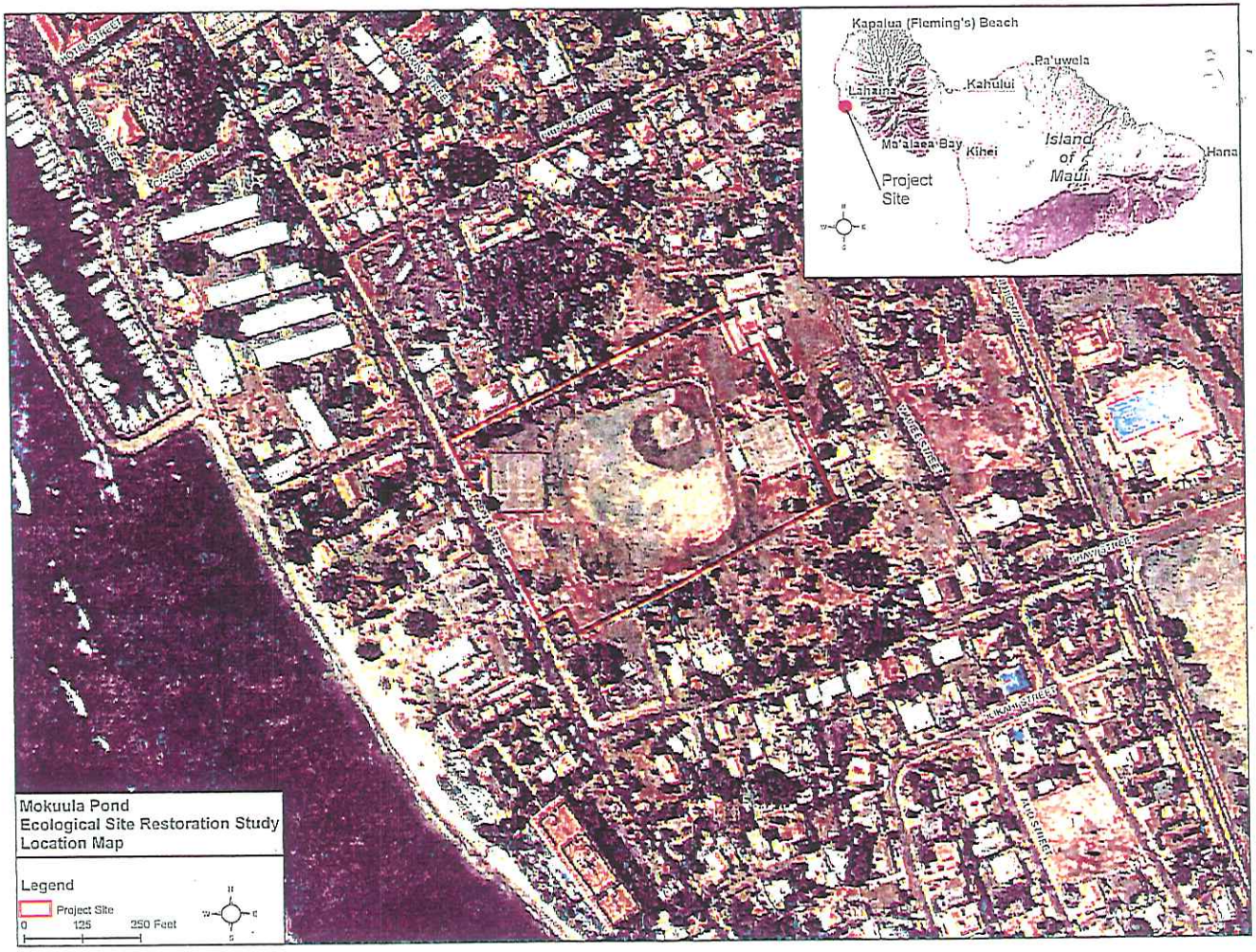
Enclosures

ENC. 1



Current project area location in relation to Maui Island and eight major islands of the State of Hawai'i.

ENC. 2



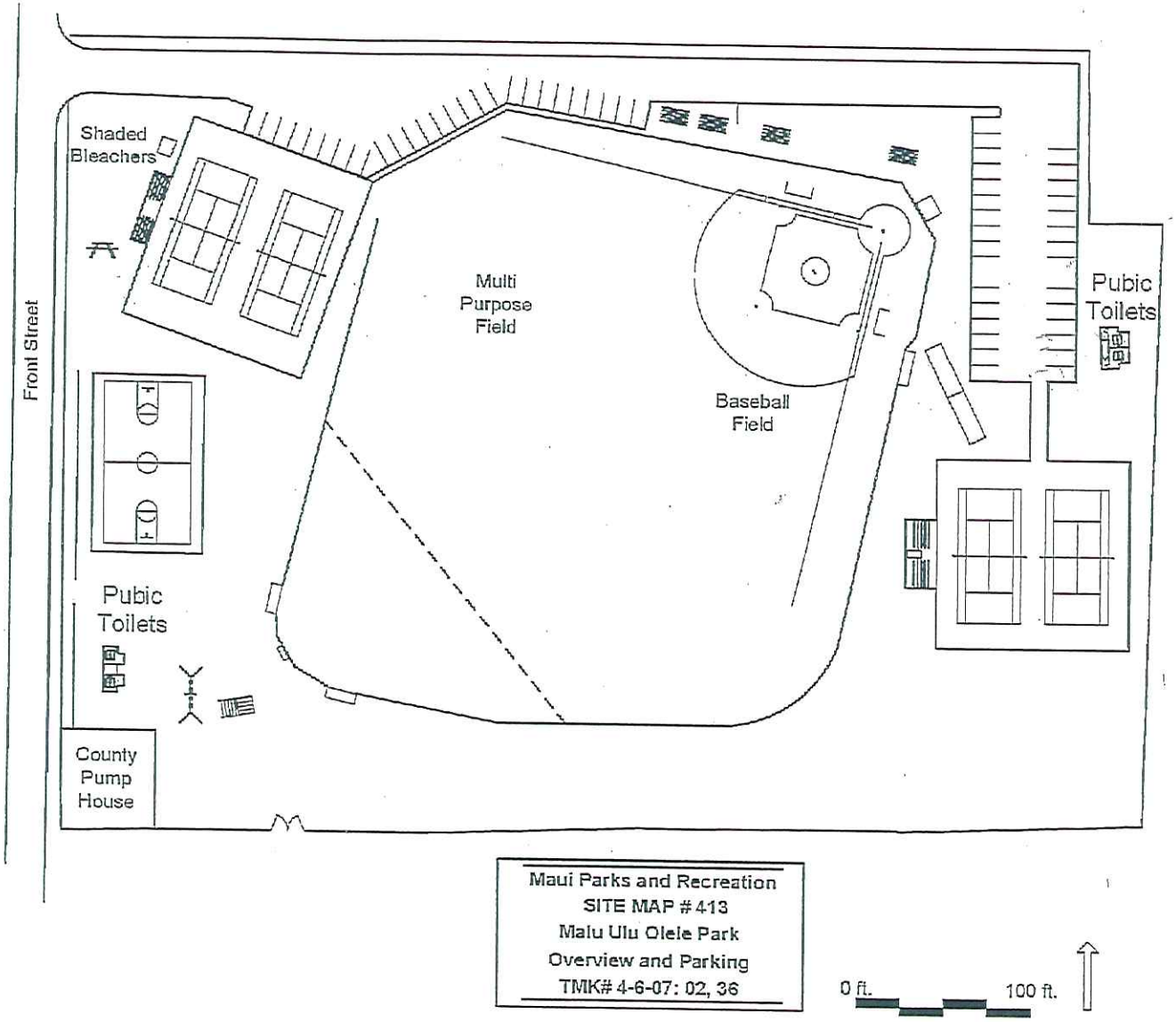
Aerial Map of Site Location.

ENC. 3

Moku'ula Pond TMK Map.

The topography of the site is flat, approximately three to six feet above sea level with few obstructions. The property is mauka of Front Street just across the street from the Kamehameha Iki County Park (Maui Historic Site #15 or Hale Piula

ENC. 4

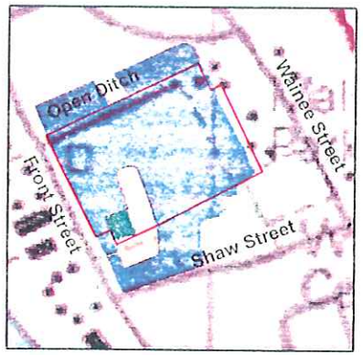


Parks Department Site Map, Including Layout of Fields, Courts, and Facilities.

ENC. 6

Map Key

- Loko o Mokuhinia Fishpond
- Loko o Mokuhinia
- Mokuula Island
- Project Area



Inset: Close up of project area showing street names

0 100 200 400 600 800 Meters

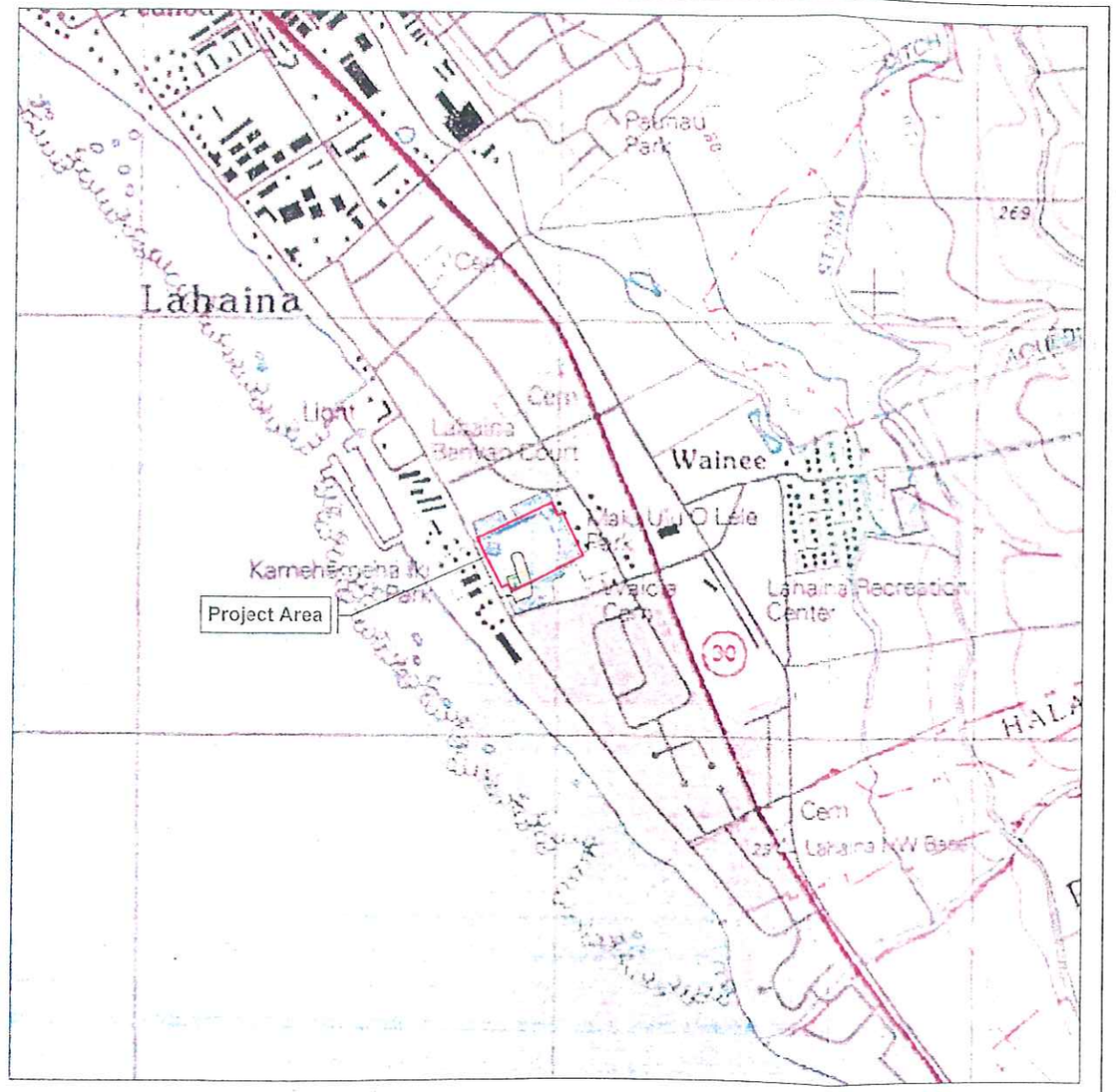
0 225 450 900 Yards

Projected Coordinate System: UTM, Zone 4 North
Datum: NAD 1983

Data Sources:
Features of Moku'ula -- Cultural Surveys Hawai'i*
Project Area -- mautmk, County of Maui 2008)
http://www.state.hi.us/dbedt/gis/tmk.htm
Base Map -- USGS 7.5' Topographic map, Lahaina Quadrangle (1992)**

*Features of Moku'ula created using Map of Lahaina Town (SE Bishop 884) that was georectified by mautmk and known points.

***Created with TOPO!, ©2003 National Geographic Maps, All Rights Reserved



A portion of the USGS 7.5 minute series topographic map, Lāhainā Quadrangle (1992), showing project area

ENC. 5

Map Key

- Project Area
- Loko o Mokuhinia
- Mokuula Island
- Loko o Mokuhinia Fishpond

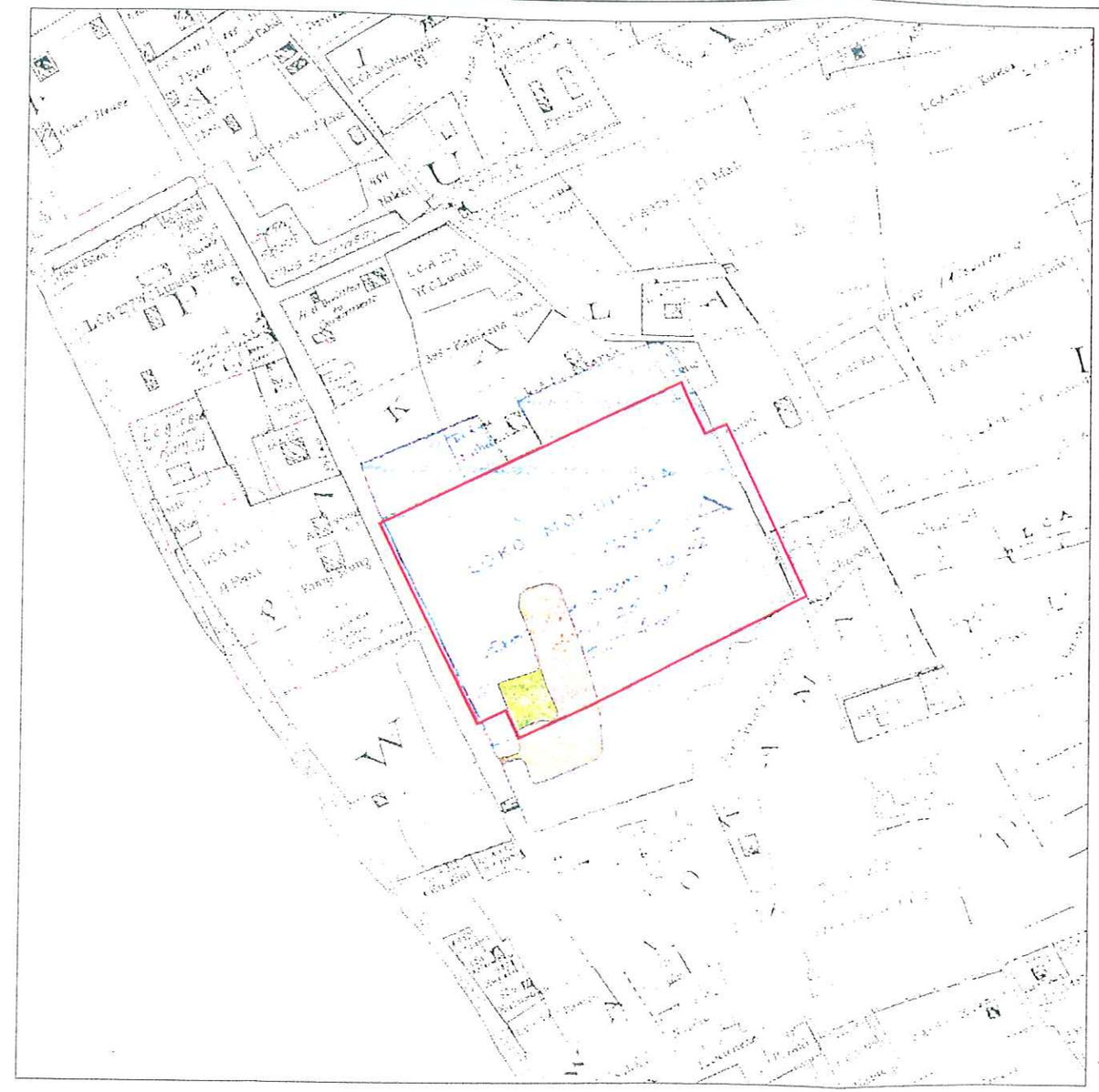
0 25 50 100 150 200 Meters

0 60 120 240 Yards

Projected Coordinate System: UTM, Zone 4 North
Datum: NAD 1983

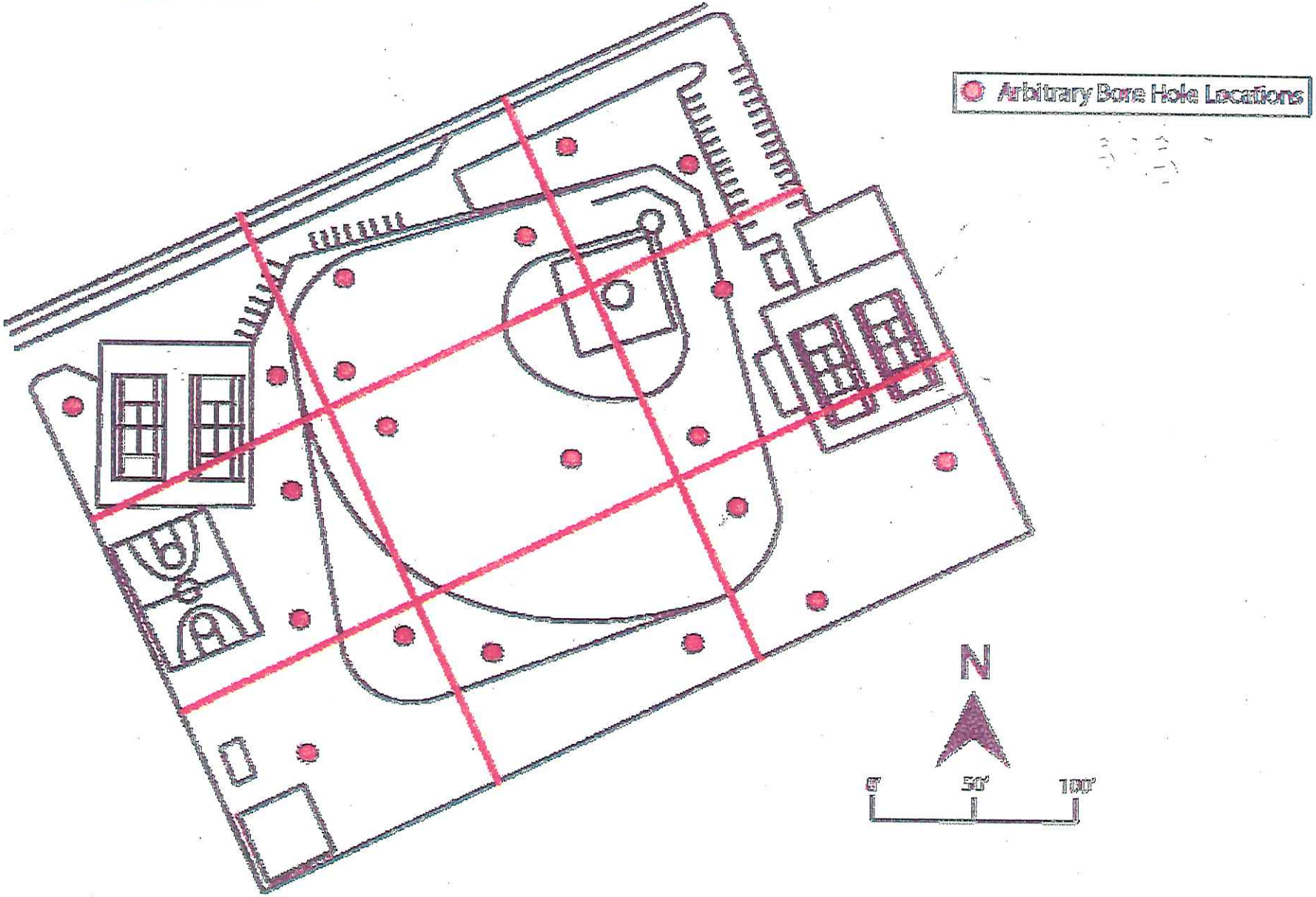
Data Sources:
Project Area -- mautmk, County of Maui 2006)
http://www.state.hi.us/dbedt/gis/tmk.htm
Base Map -- Town of Lahaina Maui (S.E. Bishop 1884), map on file at the State of Hawai'i Survey Office, Honolulu, HI.*

*Base map georectified using mautmk and known points.



portion of the S.E. Bishop 1884 map highlighting Loko o Mokuhinia, Moku'ula, and the associated fishpond.

ENC. 7



Conceptual layout of Nine Cells to Position Bore Holes. Note that actual locations will avoid Moku'ula Island and existing structures.

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

RECEIVED 4/20/10

PP-LV. copy.
PP-Z
PP-C

HRD10/4882

April 15, 2010

Anthony J. Paresa
Department of the Army
U.S. Army Corps of Engineers, Honolulu District
Fort Shafter, Hawaii 96858-5440

Re: Ecosystem Restoration project
Moku'ula Island and Loko o Mokuhinia
Lahaina, Maui

Aloha e Anthony J. Paresa,

The Office of Hawaiian Affairs (OHA) is in receipt of your February 25, 2010 letter initiating consultation pursuant to section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR) for a proposed undertaking to support a larger U.S. Army Corps of Engineers, Honolulu District (POH) ecosystem restoration project. It is our understanding the POH is proposing a study consisting of collecting soil samples from within the boundaries of the Loko o Mokuhinia complex. A total of 60 soil samples from 20 bore holes excavated to a maximum depth of six feet are proposed. A previous study conducted by your consultant, Oceanit, detected chemical contamination and this proposed undertaking seeks to characterize the nature and extent of this contamination.

The POH is engaged in a larger ecosystem restoration project involving Moku'ula Island and the surrounding freshwater pond complex known as Loko o Mokuhinia which are currently situated beneath fill material used to establish Malu Ulu o Lele County Park. This fill material ranges between 1-4 feet in depth.

OHA recognizes the significance of this project and applauds the efforts of all parties involved as work moves forward to restore these sacred sites. Historical accounts detail that Moku'ula Island was the residence of Kamehameha III from 1837-1845. At that time, Lahaina was the capital of the Hawaiian Kingdom and a mausoleum and certain structures were built on Moku'ula. Certain traditional accounts detail that Loko o Mokuhinia is the home of Kihawahine, an 'aumakua of the Maui royal family. During the time of Kamehameha IV, the capitol of the

Hawaiian Kingdom shifted to Honolulu and the challenges facing the Hawaiian people at the time resulted in this sacred place gradually falling into disrepair. Sugar cultivation and the interests of foreign businessmen soon dominated the area and the ponds and island were covered with fill material circa 1916. As of 1949, the area was a park with baseball fields and Malu Ulu o Lele County Park was eventually established.

Despite this series of historical events which covered Moku'ula and Loko o Mokuhinia to the casual observer, the significance and mo'olelo associated with these sites are perpetuated by families, individuals and organizations with a kuleana that connects them to this land. In 1997, these sites were recognized at the Federal level when they were placed on the National Register of Historic Places (NHRP) under multiple significance criteria. Multiple archaeological investigations have identified the boundaries of Moku'ula beneath the fill material and hydro geological studies of groundwater in the project area provide some indications that restoration of the freshwater ponds is a possibility.

Pursuant to 36 CFR §800.5(b), you have determined that this undertaking will have no adverse effect on these historic properties listed on the NRHP. We concur with your determination. We note that none of the soil samples will be taken from within the boundaries of Moku'ula Island. OHA strongly advocates that you maintain communication with the organizations who participated in consultation for this undertaking for the duration of project activities.

Thank you for the opportunity to provide comments. We look forward to seeing the larger restoration effort completed. Should you have any questions, please contact Keola Lindsey at 594-0244.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

C: OHA-Maui Community Outreach Coordinator

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

June 14, 2010

Civil and Public Works Branch
Programs and Project Management Division

Ms. Patty Nishiyama
Na Kupuna O Maui
320 Kaeo Place
Lahaina, Hawaii 96761

Dear Ms. Nishiyama:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Moku`ula, is proposing an undertaking called an ecosystem restoration project adjacent to Maui's sacred island of Moku`ula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The island and its ponds are now entirely contained within the present boundaries of Malu Ulu o Lele Park (Tax Map Key (TMK): 2-4-6-07:002) (see Enclosure 2). The Park is bounded on its westerly (or *makai*) side by Front Street; by Shaw Street on it southerly edge; by an open ditch at its northerly boundary; and at its easterly (or *mauka*) end by privately owned properties along Wainee Street. An 1884 map by S.E. Bishop shows the Island of Moku`ula with its adjacent fishponds to be located at the southeast corner of the parcel containing Loko o Mokuhinia (Enclosure 3). The purpose of the Mokuhinia/Moku`ula Ecosystem Restoration Project is to restore significant aquatic ecosystem function, structure, and dynamic processes of the fishpond that has been lost.

POH is currently performing various studies for the restoration project to investigate its feasibility for construction. One such study includes a hazardous, toxic, and radioactive waste (HTRW) investigation to assess presence/absence of material hazardous to human health and safety in the project area. The hydrology study, undertaken by Oceanit in 2008 under contract to POH, detected presence of arsenic at a level higher than recommended by the State of Hawaii, Department of Health, for human exposure. POH is proposing a second detailed site investigation and testing, using Oceanit again, to characterize the nature and extent of the arsenic contamination. Oceanit has submitted a sampling analysis plan (SAP) for the second study, dated July 2009 (Enclosure 4). Please note that some adjustments to the SAP as described below have been made based on comments received by the Maui Island Burial Council on April 29, 2010. The purpose of this letter is to initiate coordination and consultation for the second investigation as required under Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 Code of Federal Regulations Part 800 (NHPA).

Oceanit's SAP for the second study calls for collecting soil samples from 18 core holes excavated down to a maximum depth of 6-feet below ground surface. A truck mounted direct-push rig will be used to advance a 2.5-inch open-bit split-spoon sampler for collecting the soil samples. To ensure representative sampling, the project area is divided into seven (7) sampling units (see Enclosure 4). Per comments received from the Maui Island Burial Council, the following adjustments are made to the SAP. Two (2) to three (3) core holes each will be randomly located in five (5) of the seven (7) sampling units outlined in Enclosure 4. None of the core holes will be positioned over the former location of Moku`ula Island or the associated fishpond, indicated as units 2 and 4 on Enclosure 4. The borings will be cored 1-foot at a time. Soil samples will stop once the samples reach the bottom extent of the modern fill (6-feet or less in depth). After each foot of soil is cored, the split-spoon is inserted and the soil sample removed, and analyzed to ensure that no historically significant materials are embedded. Soil samples are then taken for each of these cores. The core sampling is estimated to take three (3) to four (4) days.

The SAP also calls for the collection and analysis of composite samples from 30 to 50 surface soils samples within a semi-random grid from depth of 1 to 3 inches (3 to 7.5 cm) from each of the seven sampling units in Enclosure 4, for a total of approximately 250 samples. These 30 to 50 samples will be collected using a spoon or similar sampling device. Analysis of the composite samples will assist in determining the level of arsenic contamination throughout the project area. Other non-ground disturbing activities such as topographic surveys and water sampling will occur as part of the site investigation activities. All activities on site, including core sampling, will be completed within 50 calendar days.

Loko o Mokuhinia is cited in Hawaiian mythology as the home of the lizard goddess, Kihawahine, the tutelary deity to the old Maui royal family line that gave rise to King Kamehameha III. From 1837 to 1845, Moku`ula Island was also the royal residence of King Kamehameha III of the Hawaiian Islands when Lahaina became the capital of the Hawaiian kingdom. King Kamehameha III also built a mausoleum at the northern point of Moku`ula Island that, at one occasion, held the remains of Hawaiian royalty. Moku`ula Island began losing its prominence, eventually becoming abandoned, when the royal residence was moved to Honolulu and upon the succession of King Kamehameha IV. Thus, Moku`ula has historic significance on several levels and, in May 1997, the island along with Loko o Mohuhinia and Hale Piula (as contained within the TMKs, 2-4-6-07 and 2-4-6-02-23) were all placed on the National Register of Historic Places (NRHP) for their association with events that made a significant contribution to the broad patterns of our history, their association with the lives of persons significant in our past, and their yielding, or likely to yield, information important in prehistory or history.

The dominance of sugarcane and sugarcane plantations above Lahaina in the late 19th century turned Loko o Mokuhinia into a marshy area covered with sedges by 1913. At that time, businessmen of Lahaina began a public project to fill in the stagnant remains of the old freshwater pond system with soils brought in from the Honokowai area to the north of Lahaina. Executive Order 52 allowed the establishment of Malu Ulu o Lele County Park over the filled-in

areas of the Loko o Mokuhinia, including areas of Moku`ula Island. The fill layer(s) now ranges in thickness of about 1-foot to 4-feet (30 to 120 cm).

The area of potential effect (APE) for the second study is the entire site listed on the NRHP. In the opinion of POH, collections of the composite sediment samples collected at the surface should have no impact on the historic properties as these will be confined to the upper 3 inches of the fill layer. The 2.5 inches diameter open barrel split spoon sampler is likely to penetrate through the Loko o Mokohinia basal sediment layer (or layers) which is (or are) likely to contain information important in Hawaiian history and prehistory. Such information would include organic and inorganic remains as well as cultural items that would provide evidence of environmental conditions in Hawaii covering periods potentially going back to pre-human occupation of the Hawaiian Island chain as well as back to the more recent pre- and post-contact eras. Thus, POH is of the opinion that the boring has the potential to have an adverse impact on potentially significant cultural layers that comprised the bottom of the pond. This adverse impact, however, may be countered by ensuring that an experienced archaeological monitor is present during the sampling to record and collect soil samples from the open barrel split spoon sampler to ensure that no historically important materials are extracted, and to extract important information from the soil samples with various laboratory analyses, e.g., pollen and radiocarbon, wood and artifact identification, etc.

POH understands the cultural significance of this site. Hokulani Holt Padila has offered to perform Native Hawaiian protocols both before the sampling is undertaken and after the sampling has been completed. POH has also been in consultation with her regarding the above described sampling process.

POH is thus proposing, based on information it has available, a "no adverse effect to historic property" determination for Oceanit's second study on the condition that an experienced archaeological monitor be present during the drilling of all bore holes to document presence/absence of pond sediment(s) and the performance of related analyses, as appropriate, to document past environmental conditions and human occupation of the region. POH is also very aware that it does not possess all the knowledge necessary to identify all cultural resources present in the project area and the APE. It is thus requesting guidance and assistance from you and members of the Maui Island Burial Council on other cultural resources located in the APE that may be impacted by this undertaking so that actions necessary to assure the protection and preservation of these cultural sites can be considered and implemented in compliance with the NHPA. POH does not anticipate presence of intact Native Hawaiian burial remains, or *iwi,* in the *loko's* basal layers or in the more recent overlying fill layer(s) in the project area.

POH has also initiated consultation with the Office of Hawaiian Affairs, the Lahaina Hawaiian Civic Club, the Maui County Cultural Resources Commission, the Friends of Moku`ula, Kaanapali Beach Hotel Po`okela Program, Kuleana Kuikahi, and Hui O Wa`a Kaula in an attempt to identify all significant cultural resources in the APE that may be impacted by this undertaking. It is also consulting with the State Historic Preservation Office and, because the

project area is listed in the NRHP, with the National Park Service, the U.S. government agency with jurisdiction over NRHP sites.

Any assistance from the members of your organization and the Maui Island Burial Council in facilitating this Section 106 consultation process is greatly appreciated. Should you require any additional information, please contact Ms. Athline Clark, Project Manager of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

for

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

June 14, 2010

Civil and Public Works Branch
Programs and Project Management Division

Ms. Uilani Kapu
President
Kuleana Kuikahi
P.O. Box 11524
Lahaina, Hawaii 96761

Dear Ms. Kapu:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Moku`ula, is proposing an undertaking called an ecosystem restoration project adjacent to Maui's sacred island of Moku`ula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The island and its ponds are now entirely contained within the present boundaries of Malu Ulu o Lele Park (Tax Map Key (TMK): 2-4-6-07:002) (see Enclosure 2). The Park is bounded on its westerly (or *makai*) side by Front Street; by Shaw Street on it southerly edge; by an open ditch at its northerly boundary; and at its easterly (or *mauka*) end by privately owned properties along Wainee Street. An 1884 map by S.E. Bishop shows the Island of Moku`ula with its adjacent fishponds to be located at the southeast corner of the parcel containing Loko o Mokuhinia (Enclosure 3). The purpose of the Mokuhinia/Moku`ula Ecosystem Restoration Project is to restore significant aquatic ecosystem function, structure, and dynamic processes of the fishpond that has been lost.

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The dominance of sugarcane and sugarcane plantations above Lahaina in the late 19th century turned Loko o Mokuhinia into a marshy area covered with sedges by 1913. At that time, businessmen of Lahaina began a public project to fill in the stagnant remains of the old freshwater pond system with soils brought in from the Honokowai area to the north of Lahaina. Executive Order 52 allowed the establishment of Malu Ulu o Lele County Park over the filled-in

areas of the Loko o Mokuhinia, including areas of Moku`ula Island. The fill layer(s) now ranges in thickness of about 1-foot to 4-feet (30 to 120 cm).

The area of potential effect (APE) for the second study is the entire site listed on the NRHP. In the opinion of POH, collections of the composite sediment samples collected at the surface should have no impact on the historic properties as these will be confined to the upper 3 inches of the fill layer. The 2.5 inches diameter open barrel split spoon sampler is likely to penetrate through the Loko o Mokohinia basal sediment layer (or layers) which is (or are) likely to contain information important in Hawaiian history and prehistory. Such information would include organic and inorganic remains as well as cultural items that would provide evidence of environmental conditions in Hawaii covering periods potentially going back to pre-human occupation of the Hawaiian Island chain as well as back to the more recent pre- and post-contact eras. Thus, POH is of the opinion that the boring has the potential to have an adverse impact on potentially significant cultural layers that comprised the bottom of the pond. This adverse impact, however, may be countered by ensuring that an experienced archaeological monitor is present during the sampling to record and collect soil samples from the open barrel split spoon sampler to ensure that no historically important materials are extracted, and to extract important information from the soil samples with various laboratory analyses, e.g., pollen and radiocarbon, wood and artifact identification, etc.

POH understands the cultural significance of this site. Hokulani Holt Padila has offered to perform Native Hawaiian protocols both before the sampling is undertaken and after the sampling has been completed. POH has also been in consultation with her regarding the above described sampling process.

POH is thus proposing, based on information it has available, a "no adverse effect to historic property" determination for Oceanit's second study on the condition that an experienced archaeological monitor be present during the drilling of all bore holes to document presence/absence of pond sediment(s) and the performance of related analyses, as appropriate, to document past environmental conditions and human occupation of the region. POH is also very aware that it does not possess all the knowledge necessary to identify all cultural resources present in the project area and the APE. It is thus requesting guidance and assistance from you and members of the Maui Island Burial Council on other cultural resources located in the APE that may be impacted by this undertaking so that actions necessary to assure the protection and preservation of these cultural sites can be considered and implemented in compliance with the NHPA. POH does not anticipate presence of intact Native Hawaiian burial remains, or *iwi,* in the *loko*'s basal layers or in the more recent overlying fill layer(s) in the project area.

POH has also initiated consultation with the Office of Hawaiian Affairs, the Lahaina Hawaiian Civic Club, the Maui County Cultural Resources Commission, the Friends of Moku`ula, Kaanapali Beach Hotel Po`okela Program, Na Kupuna O Maui, and Hui O Wa`a Kaula in an attempt to identify all significant cultural resources in the APE that may be impacted by this undertaking. It is also consulting with the State Historic Preservation Office and, because the project area is listed in the NRHP, with the National Park Service, the U.S. government agency with jurisdiction over NRHP sites.

Any assistance from the members of your organization and the Maui Island Burial Council in facilitating this Section 106 consultation process is greatly appreciated. Should you require any additional information, please contact Ms. Athline Clark, Project Manager of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

for Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

June 14, 2010

Civil and Public Works Branch
Programs and Project Management Division

Ms. Lori Sablas
Director
Kaanapali Beach Hotel Po`okela Program
2525 Kaanapali Parkway
Lahaina, Hawaii 96761

Dear Ms. Sablas:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Moku`ula, is proposing an undertaking called an ecosystem restoration project adjacent to Maui's sacred island of Moku`ula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The island and its ponds are now entirely contained within the present boundaries of Malu Ulu o Lele Park (Tax Map Key (TMK): 2-4-6-07:002) (see Enclosure 2). The Park is bounded on its westerly (or *makai*) side by Front Street; by Shaw Street on it southerly edge; by an open ditch at its northerly boundary; and at its easterly (or *mauka*) end by privately owned properties along Wainee Street. An 1884 map by S.E. Bishop shows the Island of Moku`ula with its adjacent fishponds to be located at the southeast corner of the parcel containing Loko o Mokuhinia (Enclosure 3). The purpose of the Mokuhinia/Moku`ula Ecosystem Restoration Project is to restore significant aquatic ecosystem function, structure, and dynamic processes of the fishpond that has been lost.

POH is currently performing various studies for the restoration project to investigate its feasibility for construction. One such study includes a hazardous, toxic, and radioactive waste (HTRW) investigation to assess presence/absence of material hazardous to human health and safety in the project area. The hydrology study, undertaken by Oceanit in 2008 under contract to POH, detected presence of arsenic at a level higher than recommended by the State of Hawaii, Department of Health, for human exposure. POH is proposing a second detailed site investigation and testing, using Oceanit again, to characterize the nature and extent of the arsenic contamination. Oceanit has submitted a sampling analysis plan (SAP) for the second study, dated July 2009 (Enclosure 4). Please note that some adjustments to the SAP as described below have been made based on comments received by the Maui Island Burial Council on April 29, 2010. The purpose of this letter is to initiate coordination and consultation for the second investigation as required under Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 Code of Federal Regulations Part 800 (NHPA).

Oceanit's SAP for the second study calls for collecting soil samples from 18 core holes excavated down to a maximum depth of 6-feet below ground surface. A truck mounted direct-push rig will be used to advance a 2.5-inch open-bit split-spoon sampler for collecting the soil samples. To ensure representative sampling, the project area is divided into seven (7) sampling units (see Enclosure 4). Per comments received from the Maui Island Burial Council, the following adjustments are made to the SAP. Two (2) to three (3) core holes each will be randomly located in five (5) of the seven (7) sampling units outlined in Enclosure 4. None of the core holes will be positioned over the former location of Moku`ula Island or the associated fishpond, indicated as units 2 and 4 on Enclosure 4. The borings will be cored 1-foot at a time. Soil samples will stop once the samples reach the bottom extent of the modern fill (6-feet or less in depth). After each foot of soil is cored, the split-spoon is inserted and the soil sample removed, and analyzed to ensure that no historically significant materials are embedded. Soil samples are then taken for each of these cores. The core sampling is estimated to take three (3) to four (4) days.

The SAP also calls for the collection and analysis of composite samples from 30 to 50 surface soils samples within a semi-random grid from depth of 1 to 3 inches (3 to 7.5 cm) from each of the seven sampling units in Enclosure 4, for a total of approximately 250 samples. These 30 to 50 samples will be collected using a spoon or similar sampling device. Analysis of the composite samples will assist in determining the level of arsenic contamination throughout the project area. Other non-ground disturbing activities such as topographic surveys and water sampling will occur as part of the site investigation activities. All activities on site, including core sampling, will be completed within 50 calendar days.

Loko o Mokuhinia is cited in Hawaiian mythology as the home of the lizard goddess, Kihawahine, the tutelary deity to the old Maui royal family line that gave rise to King Kamehameha III. From 1837 to 1845, Moku`ula Island was also the royal residence of King Kamehameha III of the Hawaiian Islands when Lahaina became the capital of the Hawaiian kingdom. King Kamehameha III also built a mausoleum at the northern point of Moku`ula Island that, at one occasion, held the remains of Hawaiian royalty. Moku`ula Island began losing its prominence, eventually becoming abandoned, when the royal residence was moved to Honolulu and upon the succession of King Kamehameha IV. Thus, Moku`ula has historic significance on several levels and, in May 1997, the island along with Loko o Mohuhinia and Hale Piula (as contained within the TMKs, 2-4-6-07 and 2-4-6-02-23) were all placed on the National Register of Historic Places (NRHP) for their association with events that made a significant contribution to the broad patterns of our history, their association with the lives of persons significant in our past, and their yielding, or likely to yield, information important in prehistory or history.

The dominance of sugarcane and sugarcane plantations above Lahaina in the late 19th century turned Loko o Mokuhinia into a marshy area covered with sedges by 1913. At that time, businessmen of Lahaina began a public project to fill in the stagnant remains of the old freshwater pond system with soils brought in from the Honokowai area to the north of Lahaina. Executive Order 52 allowed the establishment of Malu Ulu o Lele County Park over the filled-in

areas of the Loko o Mokuhinia, including areas of Moku`ula Island. The fill layer(s) now ranges in thickness of about 1-foot to 4-feet (30 to 120 cm).

The area of potential effect (APE) for the second study is the entire site listed on the NRHP. In the opinion of POH, collections of the composite sediment samples collected at the surface should have no impact on the historic properties as these will be confined to the upper 3 inches of the fill layer. The 2.5 inches diameter open barrel split spoon sampler is likely to penetrate through the Loko o Mokohinia basal sediment layer (or layers) which is (or are) likely to contain information important in Hawaiian history and prehistory. Such information would include organic and inorganic remains as well as cultural items that would provide evidence of environmental conditions in Hawaii covering periods potentially going back to pre-human occupation of the Hawaiian Island chain as well as back to the more recent pre- and post-contact eras. Thus, POH is of the opinion that the boring has the potential to have an adverse impact on potentially significant cultural layers that comprised the bottom of the pond. This adverse impact, however, may be countered by ensuring that an experienced archaeological monitor is present during the sampling to record and collect soil samples from the open barrel split spoon sampler to ensure that no historically important materials are extracted, and to extract important information from the soil samples with various laboratory analyses, e.g., pollen and radiocarbon, wood and artifact identification, etc.

POH understands the cultural significance of this site. Hokulani Holt Padila has offered to perform Native Hawaiian protocols both before the sampling is undertaken and after the sampling has been completed. POH has also been in consultation with her regarding the above described sampling process.

POH is thus proposing, based on information it has available, a "no adverse effect to historic property" determination for Oceanit's second study on the condition that an experienced archaeological monitor be present during the drilling of all bore holes to document presence/absence of pond sediment(s) and the performance of related analyses, as appropriate, to document past environmental conditions and human occupation of the region. POH is also very aware that it does not possess all the knowledge necessary to identify all cultural resources present in the project area and the APE. It is thus requesting guidance and assistance from you and members of the Maui Island Burial Council on other cultural resources located in the APE that may be impacted by this undertaking so that actions necessary to assure the protection and preservation of these cultural sites can be considered and implemented in compliance with the NHPA. POH does not anticipate presence of intact Native Hawaiian burial remains, or *iwi,* in the *loko*'s basal layers or in the more recent overlying fill layer(s) in the project area.

POH has also initiated consultation with the Office of Hawaiian Affairs, the Lahaina Hawaiian Civic Club, the Maui County Cultural Resources Commission, the Friends of Moku`ula, Kuleana Kuikahi, Na Kupuna O Maui, and Hui O Wa`a Kaula in an attempt to identify all significant cultural resources in the APE that may be impacted by this undertaking. It is also consulting with the State Historic Preservation Office and, because the project area is listed in the

NRHP, with the National Park Service, the U.S. government agency with jurisdiction over NRHP sites.

Any assistance from the members of your organization and the Maui Island Burial Council in facilitating this Section 106 consultation process is greatly appreciated. Should you require any additional information, please contact Ms. Athline Clark, Project Manager of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

for Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

June 14, 2010

Civil and Public Works Branch
Programs and Project Management Division

Ms. Myrna Ah Hee
Director
Hui O Wa`a Kaulau
525 Front Street
Lahaina, Hawaii 96761

Dear Ms. Ah Hee:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Moku`ula, is proposing an undertaking called an ecosystem restoration project adjacent to Maui's sacred island of Moku`ula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The island and its ponds are now entirely contained within the present boundaries of Malu Ulu o Lele Park (Tax Map Key (TMK): 2-4-6-07:002) (see Enclosure 2). The Park is bounded on its westerly (or *makai*) side by Front Street; by Shaw Street on it southerly edge; by an open ditch at its northerly boundary; and at its easterly (or *mauka*) end by privately owned properties along Wainee Street. An 1884 map by S.E. Bishop shows the Island of Moku`ula with its adjacent fishponds to be located at the southeast corner of the parcel containing Loko o Mokuhinia (Enclosure 3). The purpose of the Mokuhinia/Moku`ula Ecosystem Restoration Project is to restore significant aquatic ecosystem function, structure, and dynamic processes of the fishpond that has been lost.

POH is currently performing various studies for the restoration project to investigate its feasibility for construction. One such study includes a hazardous, toxic, and radioactive waste (HTRW) investigation to assess presence/absence of material hazardous to human health and safety in the project area. The hydrology study, undertaken by Oceanit in 2008 under contract to POH, detected presence of arsenic at a level higher than recommended by the State of Hawaii, Department of Health, for human exposure. POH is proposing a second detailed site investigation and testing, using Oceanit again, to characterize the nature and extent of the arsenic contamination. Oceanit has submitted a sampling analysis plan (SAP) for the second study, dated July 2009 (Enclosure 4). Please note that some adjustments to the SAP as described below have been made based on comments received by the Maui Island Burial Council on April 29, 2010. The purpose of this letter is to initiate coordination and consultation for the second investigation as required under Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 Code of Federal Regulations Part 800 (NHPA).

Oceanit's SAP for the second study calls for collecting soil samples from 18 core holes excavated down to a maximum depth of 6-feet below ground surface. A truck mounted direct-push rig will be used to advance a 2.5-inch open-bit split-spoon sampler for collecting the soil samples. To ensure representative sampling, the project area is divided into seven (7) sampling units (see Enclosure 4). Per comments received from the Maui Island Burial Council, the following adjustments are made to the SAP. Two (2) to three (3) core holes each will be randomly located in five (5) of the seven (7) sampling units outlined in Enclosure 4. None of the core holes will be positioned over the former location of Moku`ula Island or the associated fishpond, indicated as units 2 and 4 on Enclosure 4. The borings will be cored 1-foot at a time. Soil samples will stop once the samples reach the bottom extent of the modern fill (6-feet or less in depth). After each foot of soil is cored, the split-spoon is inserted and the soil sample removed, and analyzed to ensure that no historically significant materials are embedded. Soil samples are then taken for each of these cores. The core sampling is estimated to take three (3) to four (4) days.

The SAP also calls for the collection and analysis of composite samples from 30 to 50 surface soils samples within a semi-random grid from depth of 1 to 3 inches (3 to 7.5 cm) from each of the seven sampling units in Enclosure 4, for a total of approximately 250 samples. These 30 to 50 samples will be collected using a spoon or similar sampling device. Analysis of the composite samples will assist in determining the level of arsenic contamination throughout the project area. Other non-ground disturbing activities such as topographic surveys and water sampling will occur as part of the site investigation activities. All activities on site, including core sampling, will be completed within 50 calendar days.

Loko o Mokuhinia is cited in Hawaiian mythology as the home of the lizard goddess, Kihawahine, the tutelary deity to the old Maui royal family line that gave rise to King Kamehameha III. From 1837 to 1845, Moku`ula Island was also the royal residence of King Kamehameha III of the Hawaiian Islands when Lahaina became the capital of the Hawaiian kingdom. King Kamehameha III also built a mausoleum at the northern point of Moku`ula Island that, at one occasion, held the remains of Hawaiian royalty. Moku`ula Island began losing its prominence, eventually becoming abandoned, when the royal residence was moved to Honolulu and upon the succession of King Kamehameha IV. Thus, Moku`ula has historic significance on several levels and, in May 1997, the island along with Loko o Mohuhinia and Hale Piula (as contained within the TMKs, 2-4-6-07 and 2-4-6-02-23) were all placed on the National Register of Historic Places (NRHP) for their association with events that made a significant contribution to the broad patterns of our history, their association with the lives of persons significant in our past, and their yielding, or likely to yield, information important in prehistory or history.

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areas of the Loko o Mokuhinia, including areas of Moku`ula Island. The fill layer(s) now ranges in thickness of about 1-foot to 4-feet (30 to 120 cm).

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POH understands the cultural significance of this site. Hokulani Holt Padila has offered to perform Native Hawaiian protocols both before the sampling is undertaken and after the sampling has been completed. POH has also been in consultation with her regarding the above described sampling process.

POH is thus proposing, based on information it has available, a "no adverse effect to historic property" determination for Oceanit's second study on the condition that an experienced archaeological monitor be present during the drilling of all bore holes to document presence/absence of pond sediment(s) and the performance of related analyses, as appropriate, to document past environmental conditions and human occupation of the region. POH is also very aware that it does not possess all the knowledge necessary to identify all cultural resources present in the project area and the APE. It is thus requesting guidance and assistance from you and members of the Maui Island Burial Council on other cultural resources located in the APE that may be impacted by this undertaking so that actions necessary to assure the protection and preservation of these cultural sites can be considered and implemented in compliance with the NHPA. POH does not anticipate presence of intact Native Hawaiian burial remains, or *iwi,* in the *loko's* basal layers or in the more recent overlying fill layer(s) in the project area.

POH has also initiated consultation with the Office of Hawaiian Affairs, the Lahaina Hawaiian Civic Club, the Maui County Cultural Resources Commission, the Friends of Moku`ula, Kaanapali Beach Hotel Po`okela Program, Na Kupuna O Maui, and Kuleana Kuikahi in an attempt to identify all significant cultural resources in the APE that may be impacted by this undertaking. It is also consulting with the State Historic Preservation Office and, because the

project area is listed in the NRHP, with the National Park Service, the U.S. government agency with jurisdiction over NRHP sites.

Any assistance from the members of your organization and the Maui Island Burial Council in facilitating this Section 106 consultation process is greatly appreciated. Should you require any additional information, please contact Ms. Athline Clark, Project Manager of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

for Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

July 29, 2010

A. Clark
CEPOH-PP-C

C. Barger
CEPOH-PP-C

D. Chow
CEPOH-PP-C

P. Billington
CEPOH-OC

S. Cayetano
CEPOH-PP-Z

T. Pareja
CEPOH-PP

Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Ms. Laura Thielen
Chairperson and State Historic Preservation Officer
State of Hawaii
Department of Land and Natural Resources
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

Dear Ms. Thielen:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on February 22, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the February 22, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800 and to seek your concurrence that this action would have 'no adverse effect to historic properties.' We are writing to provide information on the revised sampling methodology, proposed sampling schedule and to seek your concurrence on the project. In accordance with 36 CRF Section 800 3(c) (4), we will assume concurrence if no comments are received within 30 days of the date of this letter.

As stated in our previous letter, based on previous investigations there is a likelihood that hazard contaminants (primarily arsenic) may occur in the modern fill material at Malu Ulu O Lele Park (Tax Map Key: 2-4-6-07:002). Before proceeding in defining potential design options for the restoration of wetlands at Mokuhinia, it is critical for POH to define the degree and extent of potential arsenic contamination at the site. Depending on the levels of arsenic and locations, there could be risk to human health and safety associated with removing and/or disposing of the fill material or, at lower levels, the arsenic may be pose no threat to human health and safety but could pose a threat to the native species that would utilize the restored wetland. If arsenic or other contaminants are found at high risk levels, there are several design options that could be incorporated to ensure that the contaminants do not impact humans or the native species while still providing for restoration of some of the wetland areas.

After discussions with the Maui Lanai Island Burial Council (Council) on April 29, 2010 and again on June 24, 2010 on the initial sampling plan, the Council raised concerns over the potential for the small subsurface core samples to impact unidentified burial remains that may occur in the project area. While POH was able to adjust the subsurface sampling to avoid the

area of Mokuula and the associated fish pond (Enclosure 2), thereby reducing the number of core samples, and adjusting the sampling method to allow for more frequent monitoring (sampling at 1-foot intervals versus the originally proposed 2-feet intervals), concerns still remain on the potential to affect unidentified human remains. In response to this concern, POH will continue to investigate options to conduct the subsurface sampling to reduce the risk of affecting unidentified human remains while ensuring that the sampling method does not increase risk of potential exposure to unidentified soil contaminants to either the field investigation team or the community. POH will provide you with an update on the subsurface sampling process, once an optimum method of collections have been determined. Subsurface sampling will not be considered within the Mokuula area or the associated fishpond.

In the interim, the Council did not raise concerns with POH proceeding with a majority of the sampling to include sampling water in the adjacent ditch and existing wells, conducting the surface spoon sampling across the entire project site, and sampling the exposed soil in the open archaeological trenches dug by Friends of Mokuula that have been confirmed not to contain any potential human remains.

POH understands the cultural significance of this site. Ms. Hokulani Holt-Padila has offered to perform Native Hawaiian cultural protocols both before the sampling is undertaken and after the sampling has been completed. An archaeologist from Cultural Services Hawaii will monitor all these sampling activities and will stop activities immediately in the event that unknown historic properties are encountered. The surface sampling activities are tentatively scheduled in early September and will last for two (2) days.

In addition to the Council, POH has consulted with several other groups listed in Enclosure 3. To date, POH has received concurrence on the project from the Office of Hawaiian Affairs and the Friends of Mokuula.

A copy of this letter will be forwarded to Mr. Hinano Rodrigues, Maui Cultural Historian, State of Hawaii, Department of Land and Natural Resources, Maui Historic Preservation Office, 130 Mahalani Street, Wailuku, Hawaii 96793; Ms. Phyllis L. Cayan, Chief, State of Hawaii, Department of Land and Natural Resources, Hawaii State Historic Preservation Division, History and Cultural Branch, 601 Kamokila Boulevard, Suite 555, Kapolei, Hawaii 96707; and Ms. Morgan Davis, Archeologist, 601 Kamokila Boulevard, Suite 555, Kapolei, Hawaii 96707. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

July 29, 2010

A. Clark
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C. Barger
CEPOH-PP-C

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Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Members of Maui Lanai Islands Burial Council
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Office
130 Mahalani Street
Wailuku, Hawaii 96793

Dear Maui Lanai Islands Burial Council Members:

As you are aware, the U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, has come before the Maui Lanai Islands Burial Council (MLIBC) on two occasions requesting your input on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). We are writing to provide a status update on the project and to notify the Maui Lanai Islands Burial Council of modifications to the sampling plan that were discussed at the meeting on June 24, 2010.

Based on previous investigations there is a likelihood that hazard contaminants (primarily arsenic) may occur in the modern fill material at Malu Ulu O Lele Park (Tax Map Key: 2-4-6-07:002). Before proceeding in defining potential design options for the restoration of wetlands at Mokuhinia, it is critical for POH to define the degree and extent of potential arsenic contamination at the site. Depending on the levels of arsenic and locations, there could be risk to human health and safety associated with removing the fill material or disposing of the fill material or at lower levels, the arsenic may be pose no threat to human health and safety but could pose a threat to the native species that would utilize the restored wetland. If arsenic or other contaminants are found at high risk levels, there are several design options that could be incorporated to ensure that the contaminants do not impact humans or the native species while still providing for restoration of some of the wetland areas.

After the discussions with the MLIBC on April 29, 2010 and again on June 24, 2010, the MLIBC raised concerns over the potential for the small subsurface core samples to impact unidentified burial remains that may occur in the project area. While POH presented information on an adjusted sampling plan to avoid the area of Mokuula and the associated fish pond (Enclosure 2), thereby reducing the number of core samples, and adjusting the sampling method to allow for more frequent monitoring (sampling at 1-foot intervals versus the originally

proposed 2-foot intervals), concerns still remain on the potential to affect unidentified human remains. In response to this concern, POH will continue to investigate methods to conduct the subsurface sampling to reduce the risk of affecting unidentified human remains while ensuring that the sampling method does not increase risk of potential exposure to unidentified soil contaminants to either the field investigation team or the community. Subsurface sampling will not be considered within the Mokuula area or the associated fishpond. POH will also continue to provide updates on the subsurface soil sampling process, once an optimum method for collecting this data has been determined.

In the interim, as the MLIBC did not raise concerns with POH proceeding with the majority of the sampling, the sampling activities are now tentatively scheduled in early September 2010 for two (2) days. The sampling will in include the water in the adjacent ditch and existing wells, conducting the surface spoon sampling across the entire project site, and sampling the exposed soil in the open archaeological trenches dug by Friends of Mokuula that have been confirmed not to contain any potential human remains.

POH understands the cultural significance of this site. Ms. Hokulani Holt-Padila has offered to perform Native Hawaiian cultural protocols both before the sampling is undertaken and after the sampling has been completed. An archaeologist from Cultural Services Hawaii will monitor all these sampling activities and will stop activities immediately in the event that unknown historic properties are encountered.

In addition to the Council, POH has consulted with several other groups listed in Enclosure 3. To date, POH has received concurrence on the project from the Office of Hawaiian Affairs and the Friends of Mokuula.

A copy of this letter will be forwarded to Mr. Hinano Rodrigues, Maui Cultural Historian, State of Hawaii, Department of Land and Natural Resources, Maui Historic Preservation Office, 130 Mahalani Street, Wailuku, Hawaii 96793 and Ms. Phyllis L. Cayan, Chief, State of Hawaii, Department of Land and Natural Resources, Hawaii State Historic Preservation Division, History and Cultural Branch, 601 Kamokila Boulevard, Suite 555, Kapolei, Hawaii 96707. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

July 29, 2010

A. Clark
CEPOH-PP-C

C. Barger
CEPOH-PP-C

D. Chow
CEPOH-PP-C

P. Billington
CEPOH-OC

S. Cayetano
CEPOH-PP-Z

T. Paresa
CEPOH-PP

Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Ms. Shirley Kahai
Friends of Mokuula
505 Front Street, Suite 221
Lahaina, Hawaii 96761

Dear Ms. Kahai:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on February 22, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the February 22, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

As stated in our previous letter, based on previous investigations there is a likelihood that hazard contaminants (primarily arsenic) may occur in the modern fill material at Malu Ulu O Lele Park (Tax Map Key: 2-4-6-07:002). Before proceeding in defining potential design options for the restoration of wetlands at Mokuhinia, it is critical for POH to define the degree and extent of potential arsenic contamination at the site. Depending on the levels of arsenic and locations, there could be risk to human health and safety associated with removing the fill material or disposing of the fill material or at lower levels, the arsenic may be pose no threat to human health and safety but could pose a threat to the native species that would utilize the restored wetland. If arsenic or other contaminants are found at high risk levels, there are several design options that could be incorporated to ensure that the contaminants do not impact humans or the native species while still providing for restoration of some of the wetland areas.

After discussions with the Maui Lanai Island Burial Council (Council) on April 29, 2010 and again on June 24, 2010 on the initial sampling plan, the Council raised concerns over the potential for the small subsurface core samples to impact unidentified burial remains that may occur in the project area. While POH was able to adjust the sampling to avoid the area of Mokuula and the associated fish pond (Enclosure 2), thereby reducing the number of core samples, and adjusting the sampling method to allow for more frequent monitoring (sampling at

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In the interim, the Council did not raise concerns with POH proceeding with the majority of the sampling to include sampling water in the adjacent ditch and existing wells, conducting the surface spoon sampling across the entire project site, and sampling the exposed soil in the open archaeological trenches dug by Friends of Mokuula that have been confirmed not to contain any potential human remains.

POH understands the cultural significance of this site. Ms. Hokulani Holt-Padila has offered to perform Native Hawaiian cultural protocols both before the sampling is undertaken and after the sampling has been completed. An archaeologist from Cultural Services Hawaii will monitor all these sampling activities and will stop activities immediately in the event that unknown historic properties are encountered. The surface sampling activities are tentatively scheduled in early September for two (2) days.

In addition to the Council, POH has consulted with several other groups listed in Enclosure 3. To date, POH has received concurrence on the project from the Office of Hawaiian Affairs and the Friends of Mokuula. POH will continue to provide updates on the subsurface soil sampling process, once an optimum method for collecting this data has been determined.

Should you require any additional information, please contact Ms. Athline Clark, Project Manager, of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

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T. Paresa
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Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Ms. Lori Sablas
Director
Kaanapali Beach Hotel Pookela Program
2525 Kaanapali Parkway
Lahaina, Hawaii 96761

Dear Ms. Sablas:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on June 14, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the June 14, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

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Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

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T. Paresa
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Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Ms. Myrna Ah Hee
Director
Hui O Waa Kaulau
525 Front Street
Lahaina, Hawaii 96761

Dear Ms. Ah Hee:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on June 14, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the June 14, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

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Anthony J. Paresa, P.E.
Deputy District Engineer for
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T. Paresa
CEPOH-PP

Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Ms. Uilani Kapu
President
Kuleana Kuikahi
P.O.Box 11524
Lahaina, Hawaii 96761

Dear Ms. Kapu:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on June 14, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the June 14, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

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Anthony J. Paresa, P.E.
Deputy District Engineer for
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Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Mr. Stanley Solamino
County of Maui
Cultural Resources Commission
Department of Planning
250 South High Street, Suite 200
Wailuku, Hawaii 96793

Dear Mr. Solamino:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on February 22, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the February 22, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

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Deputy District Engineer for
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T. Paresa
CEPOH-PP

Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Mr. Matthew Erickson
Pelekikena
Lahaina Hawaiian Civic Club
P.O. Box 10965
Lahaina, Hawaii 96761

Dear Mr. Erickson:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on June 14, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the June 14, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

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T. Pareja
CEPOH-PP

Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Ms. Patty Nishiyama
Na Kupuna O Maui
320 Kaeo Street
Lahaina, Hawaii 96761

Dear Ms. Nishiyama:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on June 14, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the June 14, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

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Anthony J. Paresa, P.E.
Deputy District Engineer for
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U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

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A. Clark
CEPOH-PP-C

C. Barger
CEPOH-PP-C

D. Chow
CEPOH-PP-C

P. Billington
CEPOH-OC

S. Cavetano
CEPOH-PP-Z

T. Pareja
CEPOH-PP

Rtn to K. Chin
CEPOH-PP-C
File/Distr

Civil and Public Works Branch
Programs and Project Management Division

Mr. Clyde Namuo
Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namuo:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, previously sent you a letter on February 22, 2010 requesting your comments on the proposed soil sampling investigations to be conducted as part of the planning process for the ecosystem restoration project adjacent to Maui's sacred island of Mokuula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii (Enclosure 1). The purpose of the February 22, 2010 letter was to initiate coordination and consultation as required under Section 106 of the National Historic Preservation Act of 1996, as amended, and implementing regulations 36 CFR Part 800. We are writing to provide a status update on the project and to notify you of modifications to the sampling plan that were outlined in the previous letter.

As stated in our previous letter, based on previous investigations there is a likelihood that hazard contaminants (primarily arsenic) may occur in the modern fill material at Malu Ulu O Lele Park (Tax Map Key: 2-4-6-07:002). Before proceeding in defining potential design options for the restoration of wetlands at Mokuhinia, it is critical for POH to define the degree and extent of potential arsenic contamination at the site. Depending on the levels of arsenic and locations, there could be risk to human health and safety associated with removing the fill material or disposing of the fill material or at lower levels, the arsenic may be pose no threat to human health and safety but could pose a threat to the native species that would utilize the restored wetland. If arsenic or other contaminants are found at high risk levels, there are several design options that could be incorporated to ensure that the contaminants do not impact humans or the native species while still providing for restoration of some of the wetland areas.

After discussions with the Maui Lanai Island Burial Council (Council) on April 29, 2010 and again on June 24, 2010 on the initial sampling plan, the Council raised concerns over the potential for the small subsurface core samples to impact unidentified burial remains that may occur in the project area. While POH was able to adjust the sampling to avoid the area of Mokuula and the associated fish pond (Enclosure 2), thereby reducing the number of core

samples, and adjusting the sampling method to allow for more frequent monitoring (sampling at 1-foot intervals versus the originally proposed 2-feet intervals), concerns still remain on the potential to affect unidentified human remains. In response to this concern, POH will continue to investigate options to conduct the subsurface sampling to reduce the risk of affecting unidentified human remains while ensuring that the sampling method does not increase risk of potential exposure to unidentified soil contaminants to either the field investigation team or the community. Subsurface sampling will not be considered within the Mokuula area or the associated fishpond.

In the interim, the Council did not raise concerns with POH proceeding with the majority of the sampling to include sampling water in the adjacent ditch and existing wells, conducting the surface spoon sampling across the entire project site, and sampling the exposed soil in the open archaeological trenches dug by Friends of Mokuula that have been confirmed not to contain any potential human remains.

POH understands the cultural significance of this site. Ms. Hokulani Holt-Padila has offered to perform Native Hawaiian cultural protocols both before the sampling is undertaken and after the sampling has been completed. An archaeologist from Cultural Services Hawaii will monitor all these sampling activities and will stop activities immediately in the event that unknown historic properties are encountered. The surface sampling activities are tentatively scheduled in early September for two (2) days.

In addition to the Council, POH has consulted with several other groups listed in Enclosure 3. To date, POH has received concurrence on the project from the Office of Hawaiian Affairs and the Friends of Mokuula. POH will continue to provide updates on the subsurface soil sampling process, once an optimum method for collecting this data has been determined.

Should you require any additional information, please contact Ms. Athline Clark, Project Manager, of the Civil and Public Works Branch, at (808) 438-2264.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

January 3, 2011

REPLY TO ATTENTION OF:

Civil and Public Works Branch
Programs and Project Management Division

Mr. William Aila
Interim Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhikewa Building
601 Kamokila Boulevard, Suite 555
Kapolei, Hawaii 96707

Dear Mr. Aila:

The U.S. Army Corps of Engineers, Honolulu District (POH), in partnership with the County of Maui and the Friends of Mokuula, is developing the *feasibility plan for the proposed aquatic ecosystem restoration project adjacent to Maui's sacred island of Moku`ula with its complex of freshwater ponds, the Loko o Mokuhinia, in Lahaina, Maui, Hawaii* (Enclosure 1). As part of this planning process, soil sampling investigations are required to understand the potential extent and intensity of potential contaminants in the soil at the site. Previous letters to you on 22 Feb 10 and 19 Aug 10, initiated the complete coordination and consultation as required under Section 106 of the National Historic Preservation Act (NHPA) of 1996, as amended, and implementing regulations 36 Constitutional Rights Foundation (CRF) Part 800, and sought your concurrence on the Phase I sampling (surface and water sampling) at the site. The purpose of this letter is to seek your concurrence with our determination of "no adverse effect to historic properties" on the Phase II sampling (subsurface sampling) and additional subsurface sampling, associated with the wetlands delineation required to meet Section 404, Clean Water Act regulations. Within this letter, we are providing the final sampling methodology and proposed archaeological monitoring of the results from the surface sampling that occurred in mid-October 2010. In accordance with 36 CRF Section 800 3(c) (4), we request concurrence within 30 days of the date of this letter.

As stated in our previous letters, based on previous investigations, there is a likelihood that hazard contaminants (primarily arsenic) may occur in the modern fill material at Malu Ulu O Lele Park (TMK: 2-4-6-07:002). Before proceeding in defining potential design options for the restoration of wetlands at Mokuhinia, it is critical for POH to define the degree and extent of potential arsenic contamination at the site. In addition, POH needs to undertake a wetland delineation of the site, which also involves additional soil sampling.

As discussed in our letter of 19 Aug 10, the surface and water sampling were conducted first, while POH investigated all viable options to reduce impacts to the subsurface sampling, based on

comments raised by the Maui Lanai Island Burial Council (Council) at the 29 Apr 10 and 24 Jun 10, Council meetings. Surface and water sampling was conducted in October 2010. Because of the cultural significance of the site, Ms. Hokulani Holt-Padila was asked to perform Native Hawaiian cultural protocols both, before the sampling was undertaken, and after the sampling was completed. An archaeologist from the Cultural Services Hawaii, monitored all these sampling activities. No archaeological materials were identified during the sampling activities. Groundwater, surface water, and surface soil were collected and tested for arsenic. The groundwater samples were collected from the five existing monitoring wells on the site. Surface soil samples were taken over the entire field area. Grab samples were also obtained from the fenced-in area dedicated to the Maui Community College and Friends of Moku'ula open archaeological trenches. Lastly, the 'auwai (ditch) running along the northwest side of the site were sampled. The water and the bottom sediment in this 'auwai, were sampled in three discrete locations. None of the soil samples taken were at concentrations exceeding the Environmental Action Levels set by the State of Hawaii, Department of Health. From the wells and 'auwai, one sample had high arsenic levels, but expert opinion is that finding arsenic only in this one sample with no detection in the rest of the samples, shows that the sample is not reflective of the site groundwater, and no additional action is needed. A copy of the draft report and the draft archaeological monitoring reports are attached, which summarize the findings from this sampling (Enclosures 2 and 3).

Based on the concerns raised for the proposed subsurface sampling methodology by the Council, POH sought advice from subject matter experts on other options for sampling other than the use of a core sample. POH also inquired about the use of ground penetrating radar (GPR) as a means of detecting subsurface objects prior to coring. Due to the fact that the soil contains high concentrations of salt, and is very moist, the subject matter experts determined that GPR was not a viable option, and would not detect the presence of historic resources in the soil. In addition, since the fill at Mokuhinia consists of soil brought from a number of locations, and was applied over a number of years and is not uniform in nature, it is not possible to model or to analyze content and this makes the detection of arsenic using any method other than coring, problematic. Depending on the levels and locations of the arsenic, there could be risks to human health and safety associated with sampling the fill material with any method other than coring. Due to these risks, POH feels that the coring method previously proposed is the best option for subsurface sampling. POH has adjusted the subsurface sampling protocol to avoid the area of Mokuula and the associated fish pond (Enclosure 4), thereby reducing the number of core samples, and adjusting the sampling method to allow for more frequent monitoring (sampling at 1 foot intervals versus the originally proposed 2 foot intervals).

POH understands the cultural significance of this site. Ms. Hokulani Holt-Padila has committed to performing additional Native Hawaiian cultural protocols before and after any additional sampling activities. An archaeologist from Cultural Services Hawaii will monitor all additional sampling activities.

In addition to the Council, POH plans to consult with several other groups listed in Enclosure 5. To date, POH has received concurrence on the project from the Office of Hawaiian Affairs and the Friends of Mokuula.

A copy of this letter will be forwarded to Hinano Rodrigues, Maui Cultural Historian, and Ms. Morgan Davis, Maui Archeologist, of the State of Hawaii, Department of Land and Natural Resources, Maui Historic; Ms. Phyllis L. Cayan, Chief, State of Hawaii, Department of Land and Natural Resources and the Hawaii State Historic Preservation Division, History and Cultural Branch. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, at (808) 438-2264.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Ms. Patty Nishiyama
Na Kupuna O Maui
320 Kaeo Street
Lahaina, Hawaii 96761

Dear Ms. Nishiyama:

The U.S. Army Corps of Engineers, Honolulu District (Corps), in partnership with the County of Maui and the Friends of Mokuula, would like to provide you with an update on the soil sampling investigations occurring at Malu Ulu O Lele Park in Lahaina, Maui, Hawaii (Tax Map Key: 2-4-6-07:002). This informational update is being provided in compliance with the Corps Civil Works planning process (ER 1105-2-100). The soil sampling is necessary as part of the planning process for the proposed ecosystem restoration project at that location that would reestablish the complex of freshwater ponds (known as Loko o Mokuhinia) adjacent to Maui's sacred island of Mokuula (Enclosure 1). This letter reports the results from the surface sampling that occurred in mid-October 2010 and provides an update on the proposed subsurface soil sampling methodology necessary to complete the soils investigation. In addition, we wanted to inform you that the Corps will be taking subsurface soil samples to determine the boundaries of any wetlands that may exist on the proposed project site.

As stated in our previous letters, earlier investigations indicated that there may be hazardous contaminants (primarily arsenic) in the modern fill material at the proposed project site. Before identifying potential design options for the proposed restoration of wetlands at Mokuhinia, it is critical for the Corps to define the degree and extent of potential arsenic contamination at the site. However, the Maui/Lanai Burial Council raised concerns over the potential for the proposed subsurface sampling to impact unidentified burial remains that may exist in the proposed project area. Accordingly, to avoid and minimize potential impacts to any human burial remains, the Corps modified its initial sampling plan and agreed to consider all reasonable and viable subsurface soil sampling methods. We ultimately determined that the coring method with 1-foot increments as proposed in our July 29, 2010 letter is the option that best meets the needs and objectives of the soil investigation while minimizing impacts to cultural resources and/or historic properties that may be present.

On January 3, 2011, we notified the State Historic Preservation Officer (SHPO) of the adjustments we made to the sampling plan. These adjustments are consistent with our original determination made pursuant to Section 106 of the National Historic Preservation Act of "no

adverse effect to historic properties." The original determination was communicated to the SHPO by letter dated February 25, 2010.

The Corps conducted the initial surface sampling for contaminants in mid-October 2010, after notification to the SHPO. The Corps collected and tested groundwater, surface water, and surface soil for arsenic. The groundwater samples were collected from the five (5) existing monitoring wells on the site. Surface soil samples were taken over the entire field area, and we also obtained samples from the open archaeological trenches in the fenced-in area used by the Maui Community College and Friends of Mokuula. Lastly, the Corps sampled the water and bottom sediment in the 'auwai (ditch) running along the northwest side of the site. The surface sampling did not find any contaminant levels of concern. A copy of the draft report, which summarizes the findings from the surface sampling, is attached (Enclosure 2).

Because the Corps understands the cultural significance of this site, Ms. Hokulani Holt-Padila performed Native Hawaiian cultural protocols both before the sampling was undertaken and after the sampling was completed, and sampling activities over Mokuula and its immediate vicinity were monitored by an archaeologist from Cultural Surveys Hawaii. No archaeological or historical materials of concern were found during the surface sampling. Copies of the draft archaeological monitoring report are also attached (Enclosure 3).

With respect to the proposed subsurface sampling methodology, based on the concerns raised by the Council, the Corps sought advice from subject matter experts on options for sampling other than the use of a core sample. The Corps also inquired about the use of ground penetrating radar (GPR) as a mean of detecting subsurface objects prior to coring. The GPR will only penetrate to 80 centimeters below surface depth and would not be able to detect in situ cultural resources that may occur below the fill material. Because of the mix of fill material and sources of the fill material, the GPR will unlikely be able to distinguish disturbed cultural resources from fill debris. The GPR is also unlikely to identify bone fragments in the fill because fragments will not be able to be distinguished from the high clay content soil. Since the fill at Mokuhinia was brought in from a number of locations, was applied over a number of years, and is not uniform in nature, it is not possible to model the location, extent and level of the contaminants within the study area to analyze content. This makes the detection of arsenic using any method other than coring problematic. In addition, depending on the levels and locations of the arsenic, there could be risks to human health and safety associated with sampling the fill material with any method other than coring. Due to these potential risks, the Corps determined that the coring method previously proposed best meets our needs for subsurface sampling.

However, in order to be responsive to the concerns of the Council, the Corps has adjusted the subsurface sampling protocol to avoid the area of Mokuula and its associated fish pond (Enclosure 4) and to allow for more frequent monitoring (sampling at 1-foot intervals versus the originally proposed 2-foot intervals). The sampling for the wetland delineation occurs within the top two feet of the soils and will avoid the sensitive areas of Mokuula and the associated fish

pond. We anticipate conducting the subsurface sampling and wetland delineation in Spring 2011.

As we previously informed SHPO, the Corps will have an archaeological monitor present for the subsurface sampling. The archaeological monitor will identify and record potential cultural deposits exposed in the cores taking appropriate samples for laboratory analyses to determine significance of the deposit(s). Furthermore, Ms. Holt-Padila has agreed to perform the Native Hawaiian cultural protocols before and after the subsurface sampling and wetland delineation activities as she did for the surface sampling.

The Corps has provided this update to the other groups listed in Enclosure 5. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, at (808) 438-2264 or Mr. Kanalei Shun, Archaeologist, at (808) 438-7000.

Sincerely,

for Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Mr. Clyde Namuo
Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namuo:

The U.S. Army Corps of Engineers, Honolulu District (Corps), in partnership with the County of Maui and the Friends of Mokuula, would like to provide you with an update on the soil sampling investigations occurring at Malu Ulu O Lele Park in Lahaina, Maui, Hawaii (Tax Map Key: 2-4-6-07:002). This informational update is being provided in compliance with the Corps Civil Works planning process (ER 1105-2-100). The soil sampling is necessary as part of the planning process for the proposed ecosystem restoration project at that location that would reestablish the complex of freshwater ponds (known as Loko o Mokuhinia) adjacent to Maui's sacred island of Mokuula (Enclosure 1). This letter reports the results from the surface sampling that occurred in mid-October 2010 and provides an update on the proposed subsurface soil sampling methodology necessary to complete the soils investigation. In addition, we wanted to inform you that the Corps will be taking subsurface soil samples to determine the boundaries of any wetlands that may exist on the proposed project site.

As stated in our previous letters, earlier investigations indicated that there may be hazardous contaminants (primarily arsenic) in the modern fill material at the proposed project site. Before identifying potential design options for the proposed restoration of wetlands at Mokuhinia, it is critical for the Corps to define the degree and extent of potential arsenic contamination at the site. However, the Maui/Lanai Burial Council raised concerns over the potential for the proposed subsurface sampling to impact unidentified burial remains that may exist in the proposed project area. Accordingly, to avoid and minimize potential impacts to any human burial remains, the Corps modified its initial sampling plan and agreed to consider all reasonable and viable subsurface soil sampling methods. We ultimately determined that the coring method with 1-foot increments as proposed in our July 29, 2010 letter is the option that best meets the needs and objectives of the soil investigation while minimizing impacts to cultural resources and/or historic properties that may be present.

On January 3, 2011, we notified the State Historic Preservation Officer (SHPO) of the adjustments we made to the sampling plan. These adjustments are consistent with our original determination made pursuant to Section 106 of the National Historic Preservation Act of "no

adverse effect to historic properties." The original determination was communicated to the SHPO by letter dated February 25, 2010.

The Corps conducted the initial surface sampling for contaminants in mid-October 2010, after notification to the SHPO. The Corps collected and tested groundwater, surface water, and surface soil for arsenic. The groundwater samples were collected from the five (5) existing monitoring wells on the site. Surface soil samples were taken over the entire field area, and we also obtained samples from the open archaeological trenches in the fenced-in area used by the Maui Community College and Friends of Mokuula. Lastly, the Corps sampled the water and bottom sediment in the 'auwai (ditch) running along the northwest side of the site. The surface sampling did not find any contaminant levels of concern. A copy of the draft report, which summarizes the findings from the surface sampling, is attached (Enclosure 2).

Because the Corps understands the cultural significance of this site, Ms. Hokulani Holt-Padila performed Native Hawaiian cultural protocols both before the sampling was undertaken and after the sampling was completed, and sampling activities over Mokuula and its immediate vicinity were monitored by an archaeologist from Cultural Surveys Hawaii. No archaeological or historical materials of concern were found during the surface sampling. Copies of the draft archaeological monitoring report are also attached (Enclosure 3).

With respect to the proposed subsurface sampling methodology, based on the concerns raised by the Council, the Corps sought advice from subject matter experts on options for sampling other than the use of a core sample. The Corps also inquired about the use of ground penetrating radar (GPR) as a mean of detecting subsurface objects prior to coring. The GPR will only penetrate to 80 centimeters below surface depth and would not be able to detect in situ cultural resources that may occur below the fill material. Because of the mix of fill material and sources of the fill material, the GPR will unlikely be able to distinguish disturbed cultural resources from fill debris. The GPR is also unlikely to identify bone fragments in the fill because fragments will not be able to be distinguished from the high clay content soil. Since the fill at Mokuhinia was brought in from a number of locations, was applied over a number of years, and is not uniform in nature, it is not possible to model the location, extent and level of the contaminants within the study area to analyze content. This makes the detection of arsenic using any method other than coring problematic. In addition, depending on the levels and locations of the arsenic, there could be risks to human health and safety associated with sampling the fill material with any method other than coring. Due to these potential risks, the Corps determined that the coring method previously proposed best meets our needs for subsurface sampling.

However, in order to be responsive to the concerns of the Council, the Corps has adjusted the subsurface sampling protocol to avoid the area of Mokuula and its associated fish pond (Enclosure 4) and to allow for more frequent monitoring (sampling at 1-foot intervals versus the originally proposed 2-foot intervals). The sampling for the wetland delineation occurs within the top two feet of the soils and will avoid the sensitive areas of Mokuula and the associated fish

pond. We anticipate conducting the subsurface sampling and wetland delineation in Spring 2011.

As we previously informed SHPO, the Corps will have an archaeological monitor present for the subsurface sampling. The archaeological monitor will identify and record potential cultural deposits exposed in the cores taking appropriate samples for laboratory analyses to determine significance of the deposit(s). Furthermore, Ms. Holt-Padila has agreed to perform the Native Hawaiian cultural protocols before and after the subsurface sampling and wetland delineation activities as she did for the surface sampling.

The Corps has provided this update to the other groups listed in Enclosure 5. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, at (808) 438-2264 or Mr. Kanalei Shun, Archaeologist, at (808) 438-7000.

Sincerely,

Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Mr. Stanley Solamino
County of Maui
Cultural Resources Commission
Department of Planning
250 South High Street, Suite 200
Wailuku, Hawaii 96793

Dear Mr. Solamino:

The U.S. Army Corps of Engineers, Honolulu District (Corps), in partnership with the County of Maui and the Friends of Mokuula, would like to provide you with an update on the soil sampling investigations occurring at Malu Ulu O Lele Park in Lahaina, Maui, Hawaii (Tax Map Key: 2-4-6-07:002). This informational update is being provided in compliance with the Corps Civil Works planning process (ER 1105-2-100). The soil sampling is necessary as part of the planning process for the proposed ecosystem restoration project at that location that would reestablish the complex of freshwater ponds (known as Loko o Mokuhinia) adjacent to Maui's sacred island of Mokuula (Enclosure 1). This letter reports the results from the surface sampling that occurred in mid-October 2010 and provides an update on the proposed subsurface soil sampling methodology necessary to complete the soils investigation. In addition, we wanted to inform you that the Corps will be taking subsurface soil samples to determine the boundaries of any wetlands that may exist on the proposed project site.

As stated in our previous letters, earlier investigations indicated that there may be hazardous contaminants (primarily arsenic) in the modern fill material at the proposed project site. Before identifying potential design options for the proposed restoration of wetlands at Mokuhinia, it is critical for the Corps to define the degree and extent of potential arsenic contamination at the site. However, the Maui/Lanai Burial Council raised concerns over the potential for the proposed subsurface sampling to impact unidentified burial remains that may exist in the proposed project area. Accordingly, to avoid and minimize potential impacts to any human burial remains, the Corps modified its initial sampling plan and agreed to consider all reasonable and viable subsurface soil sampling methods. We ultimately determined that the coring method with 1-foot increments as proposed in our July 29, 2010 letter is the option that best meets the needs and objectives of the soil investigation while minimizing impacts to cultural resources and/or historic properties that may be present.

On January 3, 2011, we notified the State Historic Preservation Officer (SHPO) of the

adjustments we made to the sampling plan. These adjustments are consistent with our original determination made pursuant to Section 106 of the National Historic Preservation Act of "no adverse effect to historic properties." The original determination was communicated to the SHPO by letter dated February 25, 2010.

The Corps conducted the initial surface sampling for contaminants in mid-October 2010, after notification to the SHPO. The Corps collected and tested groundwater, surface water, and surface soil for arsenic. The groundwater samples were collected from the five (5) existing monitoring wells on the site. Surface soil samples were taken over the entire field area, and we also obtained samples from the open archaeological trenches in the fenced-in area used by the Maui Community College and Friends of Mokuula. Lastly, the Corps sampled the water and bottom sediment in the 'auwai (ditch) running along the northwest side of the site. The surface sampling did not find any contaminant levels of concern. A copy of the draft report, which summarizes the findings from the surface sampling, is attached (Enclosure 2).

Because the Corps understands the cultural significance of this site, Ms. Hokulani Holt-Padila performed Native Hawaiian cultural protocols both before the sampling was undertaken and after the sampling was completed, and sampling activities over Mokuula and its immediate vicinity were monitored by an archaeologist from Cultural Surveys Hawaii. No archaeological or historical materials of concern were found during the surface sampling. Copies of the draft archaeological monitoring report are also attached (Enclosure 3).

With respect to the proposed subsurface sampling methodology, based on the concerns raised by the Council, the Corps sought advice from subject matter experts on options for sampling other than the use of a core sample. The Corps also inquired about the use of ground penetrating radar (GPR) as a mean of detecting subsurface objects prior to coring. The GPR will only penetrate to 80 centimeters below surface depth and would not be able to detect in situ cultural resources that may occur below the fill material. Because of the mix of fill material and sources of the fill material, the GPR will unlikely be able to distinguish disturbed cultural resources from fill debris. The GPR is also unlikely to identify bone fragments in the fill because fragments will not be able to be distinguished from the high clay content soil. Since the fill at Mokuhinia was brought in from a number of locations, was applied over a number of years, and is not uniform in nature, it is not possible to model the location, extent and level of the contaminants within the study area to analyze content. This makes the detection of arsenic using any method other than coring problematic. In addition, depending on the levels and locations of the arsenic, there could be risks to human health and safety associated with sampling the fill material with any method other than coring. Due to these potential risks, the Corps determined that the coring method previously proposed best meets our needs for subsurface sampling.

However, in order to be responsive to the concerns of the Council, the Corps has adjusted the subsurface sampling protocol to avoid the area of Mokuula and its associated fish pond (Enclosure 4) and to allow for more frequent monitoring (sampling at 1-foot intervals versus the

originally proposed 2-foot intervals). The sampling for the wetland delineation occurs within the top two feet of the soils and will avoid the sensitive areas of Mokuula and the associated fish pond. We anticipate conducting the subsurface sampling and wetland delineation in Spring 2011.

As we previously informed SHPO, the Corps will have an archaeological monitor present for the subsurface sampling. The archaeological monitor will identify and record potential cultural deposits exposed in the cores taking appropriate samples for laboratory analyses to determine significance of the deposit(s). Furthermore, Ms. Holt-Padila has agreed to perform the Native Hawaiian cultural protocols before and after the subsurface sampling and wetland delineation activities as she did for the surface sampling.

The Corps has provided this update to the other groups listed in Enclosure 5. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, at (808) 438-2264 or Mr. Kanalei Shun, Archaeologist, at (808) 438-7000.

Sincerely,

For Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Ms. Lori Sablas
Director
Kaanapali Beach Hotel Pookela Program
2525 Kaanapali Parkway
Lahaina, Hawaii 96761

Dear Ms. Sablas:

The U.S. Army Corps of Engineers, Honolulu District (Corps), in partnership with the County of Maui and the Friends of Mokuula, would like to provide you with an update on the soil sampling investigations occurring at Malu Ulu O Lele Park in Lahaina, Maui, Hawaii (Tax Map Key: 2-4-6-07:002). This informational update is being provided in compliance with the Corps Civil Works planning process (ER 1105-2-100). The soil sampling is necessary as part of the planning process for the proposed ecosystem restoration project at that location that would reestablish the complex of freshwater ponds (known as Loko o Mokuhinia) adjacent to Maui's sacred island of Mokuula (Enclosure 1). This letter reports the results from the surface sampling that occurred in mid-October 2010 and provides an update on the proposed subsurface soil sampling methodology necessary to complete the soils investigation. In addition, we wanted to inform you that the Corps will be taking subsurface soil samples to determine the boundaries of any wetlands that may exist on the proposed project site.

As stated in our previous letters, earlier investigations indicated that there may be hazardous contaminants (primarily arsenic) in the modern fill material at the proposed project site. Before identifying potential design options for the proposed restoration of wetlands at Mokuhinia, it is critical for the Corps to define the degree and extent of potential arsenic contamination at the site. However, the Maui/Lanai Burial Council raised concerns over the potential for the proposed subsurface sampling to impact unidentified burial remains that may exist in the proposed project area. Accordingly, to avoid and minimize potential impacts to any human burial remains, the Corps modified its initial sampling plan and agreed to consider all reasonable and viable subsurface soil sampling methods. We ultimately determined that the coring method with 1-foot increments as proposed in our July 29, 2010 letter is the option that best meets the needs and objectives of the soil investigation while minimizing impacts to cultural resources and/or historic properties that may be present.

On January 3, 2011, we notified the State Historic Preservation Officer (SHPO) of the adjustments we made to the sampling plan. These adjustments are consistent with our original determination made pursuant to Section 106 of the National Historic Preservation Act of "no

adverse effect to historic properties." The original determination was communicated to the SHPO by letter dated February 25, 2010.

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The Corps has provided this update to the other groups listed in Enclosure 5. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, at (808) 438-2264 or Mr. Kanalei Shun, Archaeologist, at (808) 438-7000.

Sincerely,

for Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Ms. Uilani Kapu
President
Kuleana Kuikahi
P.O.Box 11524
Lahaina, Hawaii 96761

Dear Ms. Kapu:

The U.S. Army Corps of Engineers, Honolulu District (Corps), in partnership with the County of Maui and the Friends of Mokuula, would like to provide you with an update on the soil sampling investigations occurring at Malu Ulu O Lele Park in Lahaina, Maui, Hawaii (Tax Map Key: 2-4-6-07:002). This informational update is being provided in compliance with the Corps Civil Works planning process (ER 1105-2-100). The soil sampling is necessary as part of the planning process for the proposed ecosystem restoration project at that location that would reestablish the complex of freshwater ponds (known as Loko o Mokuhinia) adjacent to Maui's sacred island of Mokuula (Enclosure 1). This letter reports the results from the surface sampling that occurred in mid-October 2010 and provides an update on the proposed subsurface soil sampling methodology necessary to complete the soils investigation. In addition, we wanted to inform you that the Corps will be taking subsurface soil samples to determine the boundaries of any wetlands that may exist on the proposed project site.

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Sincerely,

for Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Mr. Matthew Erickson
Pelekikena
Lahaina Hawaiian Civic Club
Lahaina, Hawaii 96761

Dear Mr. Erickson:

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Sincerely,

for Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Ms. Shirley Kahai
Friends of Mokuula
505 Front Street, Suite 221
Lahaina, Hawaii 96761

Dear Ms. Kahai:

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Sincerely,

for Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Ms. Phyllis L. Cayan
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
Maui Lanai Islands Burial Council
601 Kamokila Boulevard, Suite 555
Kapolei, Hawaii 96707

Dear Ms. Cayan:

The U.S. Army Corps of Engineers, Honolulu District (Corps), in partnership with the County of Maui and the Friends of Mokuula, would like to provide you with an update on the soil sampling investigations occurring at Malu Ulu O Lele Park in Lahaina, Maui, Hawaii (Tax Map Key: 2-4-6-07:002). This informational update is being provided in compliance with the Corps Civil Works planning process (ER 1105-2-100). The soil sampling is necessary as part of the planning process for the proposed ecosystem restoration project at that location that would reestablish the complex of freshwater ponds (known as Loko o Mokuhinia) adjacent to Maui's sacred island of Mokuula (Enclosure 1). This letter reports the results from the surface sampling that occurred in mid-October 2010 and provides an update on the proposed subsurface soil sampling methodology necessary to complete the soils investigation. In addition, we wanted to inform you that the Corps will be taking subsurface soil samples to determine the boundaries of any wetlands that may exist on the proposed project site.

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Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 31, 2011

Civil and Public Works Branch
Programs and Project Management Division

Ms. Myrna Ah Hee
Director
Hui O Waa Kaulau
525 Front Street
Lahaina, Hawaii 96761

Dear Ms. Ah Hee:

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pond. We anticipate conducting the subsurface sampling and wetland delineation in Spring 2011.

As we previously informed SHPO, the Corps will have an archaeological monitor present for the subsurface sampling. The archaeological monitor will identify and record potential cultural deposits exposed in the cores taking appropriate samples for laboratory analyses to determine significance of the deposit(s). Furthermore, Ms. Holt-Padila has agreed to perform the Native Hawaiian cultural protocols before and after the subsurface sampling and wetland delineation activities as she did for the surface sampling.

The Corps has provided this update to the other groups listed in Enclosure 5. Should you require any additional information, please contact Ms. Athline Clark, Project Manager, at (808) 438-2264 or Mr. Kanalei Shun, Archaeologist, at (808) 438-7000.

Sincerely,

For Derek J. Chow
Chief, Civil and Public Works Branch

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

May 25, 2011

Civil and Public Works Branch
Programs and Project Management Division

Mr. William Aila
Chairperson and State Historic Preservation Officer
State of Hawai'i
Department of Land and Natural Resources
601 Kamokila Boulevard, Room 555
Kapolei, Hawai'i 96707

Dear Mr. Aila:

The U.S. Army Corps of Engineers, Honolulu District (Corps), in partnership with the County of Maui and the Friends of Moku'ula, is continuing to move forward with the planning process for the proposed project to restore the Loko o Mokuhinia, the complex of wetlands adjacent to the sacred island of Moku'ula in Lahaina, Maui, Hawai'i. Pursuant to Section 106 of the National Historic Preservation Act of 1996, as amended and implementing regulation 36 Code of Federal Regulations (CFR) Part 800, we completed consultation for the surface soil sampling. However, a review of our records indicates that we have not yet consulted with you on the matter of subsurface soil sampling.

As you know from our previous letters, past investigations have indicated that hazardous contaminants (primarily arsenic) may exist in the modern fill material at the proposed project site of Malu 'Ulu O Lele Park (Tax Map Key: 2-4-6-07:002). Because the level of contamination will affect our design alternatives, we must take subsurface soil samples to determine the degree and extent of the potential contamination at the proposed project site. Subsurface soil samples are also needed to determine the boundaries of any wetlands that may exist on the proposed project site and the area of potential effect.

In order to be responsive to concerns raised by the Maui/Lāna'i Burial Council, we sought advice from the subject matter experts on options for subsurface soil sampling other than the use of a core sample. We adjusted the hazardous contaminants subsurface sampling protocol to avoid the area of Moku'ula and its associated fish pond (Enclosure 1) and allow for more frequent monitoring by sampling at 1-foot intervals instead of the originally proposed 2-foot intervals. The sampling for the wetland delineation will also avoid the sensitive areas of Moku'ula and the associated fish pond and will occur only within the top two feet of soil. An archaeologist from Cultural Services Hawai'i will monitor all these sampling activities and will stop activities immediately in the event that unknown historic properties are encountered. Based on this action, we make the determination that the proposed subsurface soil sampling and

wetland delineation sampling will have "no adverse effect on historic sites."

Because we understand the cultural significance of this site, we have asked Ms. Hokulani Holt-Padila to perform Native Hawaiian cultural protocol both before the subsurface soil sampling is undertaken and after it has been completed. The subsurface soil sampling activities are tentatively scheduled for late June 2011 and will last for approximately two (2) days. We anticipate conducting the wetland delineation in the late summer of 2011.

Pursuant to Section 106, the Corps has also consulted with the groups listed in Enclosure 2. To date, the Corps has received concurrence on the subsurface soil sampling activities from the Office of Hawaiian Affairs and the Friends of Moku'ula.

A copy of this letter will be forwarded to Dr. Pua Aiu, your Administrator of the Hawai'i State Historic Preservation Division, 601 Kamokila Boulevard, Suite 555, Kapolei, Hawai'i 96707; Mr. Hinano Rodrigues, Maui Cultural Historian, State of Hawai'i, Department of Land and Natural Resources, Maui Historic Preservation Office, 130 Mahalani Street, Wailuku, Hawai'i 96793; and Ms. Morgan Davis, Maui Archeologist, State of Hawai'i, Department of Land and Natural Resources, Maui Historic Preservation Office, 130 Mahalani Street, Wailuku, Hawai'i 96793.

In accordance with 36 CFR 800.3(c)(4), we will assume concurrence if no comments are received within 30 days of receipt of this letter. Should you require any additional information, please contact Ms. Athline Clark, Project Manager of the Civil and Public Works Branch, at (808) 438-2264.

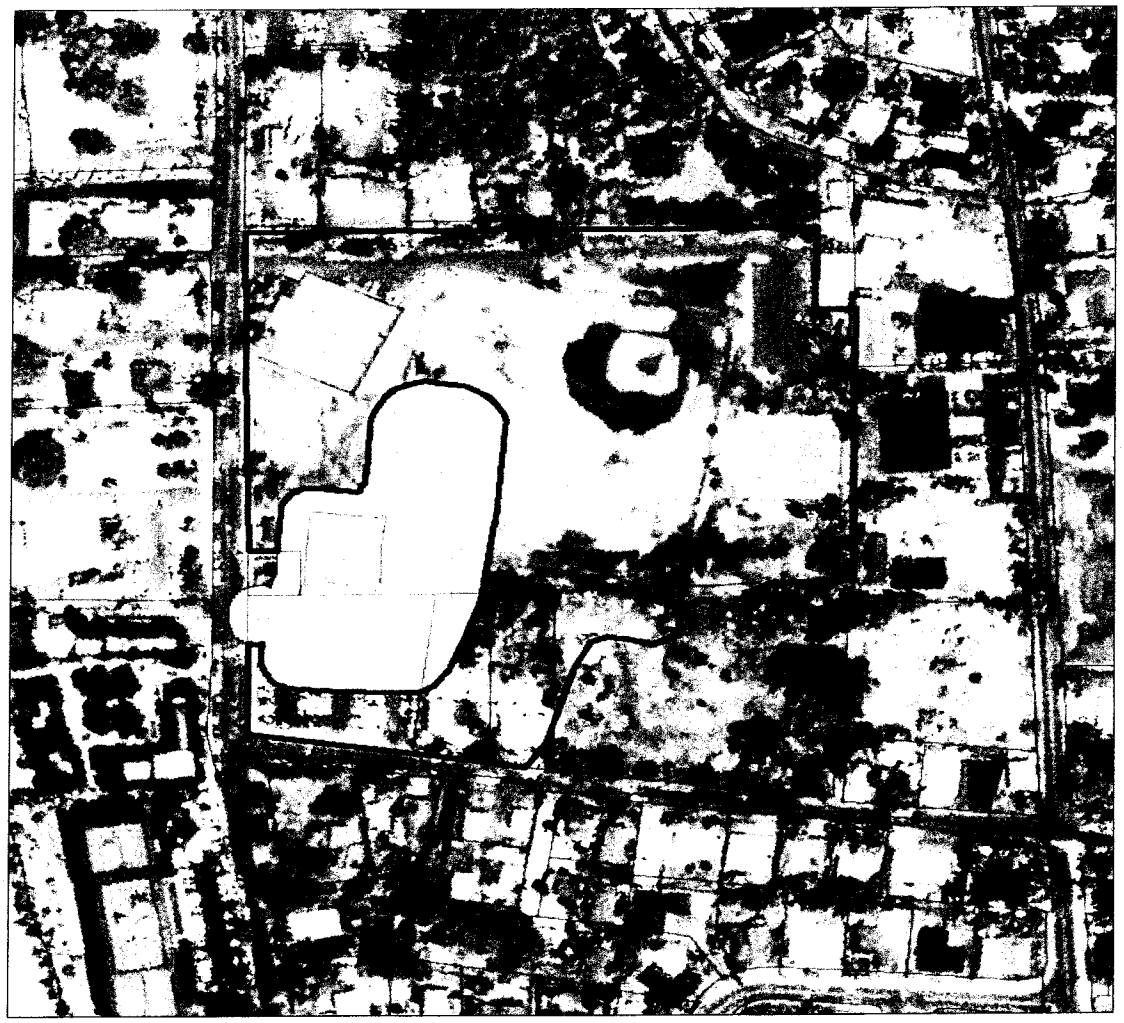
Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

Enclosure 1

Mokuhinia/Moku'ula Ecosystem Restoration Project



Legend

- Project Area
- TMK Parcel
- Fishpond
- Island
- 10m Buffer

0 100 200 400 Feet

N

U.S. Army Corps of Engineers
Honolulu District
Technical Integration Branch

28 January 2010

Enclosure 2

Mokuhinia/Moku`ula Ecosystem Restoration Project
National Historic Preservation Act Consultation – Interested Parties

Mr. Clyde Namuo
Administrator
Office of Hawaiian Affairs
711 Kapi`olani Boulevard, Suite 500
Honolulu, HI 96813

Maui Lanai Island Burial Council
C/O Maui Historic Preservation Office
130 Mahalani St
Wailuku, Hawaii 96793

Hui O Waa Kaulau
Myrna Ah Hee, Director
525 Front Street
Lahaina, Hawaii 96761

Ms. Shirley Kahai
Friends of Mokuula
505 Front Street, Suite 221
Lahaina, HI 96761

Maui County Cultural Resources Commission
Attn: Maui County Department of Planning
250 S. High Street
Kalana Pakui Building, Suite 200
Wailuku, HI 96793

Kaanapali Beach Hotel Pookela Program
Lori Sablas, Director
2525 Kaanapali Parkway
Lahaina, Hawaii 96761

Ms. Uilani Kapu
President
Kuleana Kuikahi
PO Box 11524
Lahaina, HI 96761

Na Kupuna O Maui
Patty Nishiyama
320 Kaeo Street
Lahaina, Hawaii 96761

Mr. Matthew Erickson
Pelekikena
Lahaina Hawaiian Civic Club
P.O. Box 10965
Lahaina, HI 96761

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 27

June 8, 2011

Anthony J. Paresa, P.E.
Deputy District Engineer for Programs and Project Management
Civil and Public Works Branch, Programs & Project Management Division
Department of the Army
U.S. Army Corps of Engineers, Honolulu District
Fort Shafter, Hawaii 96858-5440

LOG NO: 2011.1601
DOC NO: 1106MD15
Archaeology
History & Culture

Dear Mr. Paresa:

SUBJECT: National Historic Preservation Act (NHPA) Section 106 Review – Subsurface Testing at Malu 'Ulu O Lele Park Waine'e Ahupua'a, Lāhainā District, Island of Maui TMK: (2) 4-6-007:002 (por.)

Thank you for the opportunity to comment on the aforementioned undertaking, which we received on June 1, 2011. This particular issue was previously brought before the public at the Maui/Lāna'i Islands Burial Council (M/LIBC), providing adequate time for consultation pursuant to CFR 36 § 800.

The proposed scope of work for this undertaking involves subsurface testing in a complex of wetlands adjacent to Moku'ula Island on Maui. The U.S. Army Corps of Engineers, Honolulu District, has identified this area as one where hazardous contaminants (primarily arsenic) may exist in the modern fill material in the proposed site location in the Malu 'Ulu O Lele Park. Because the level of contamination will affect design alternatives, subsurface soil samples are necessary. These soil samples will also be utilized to define the area of potential effect (APE) for the wetland restoration project.

Core sampling will occur in one-foot intervals but will avoid the sensitive areas of Moku'ula (the original island) and the associated fishpond. Sampling will further only occur within the upper two feet of soil. An archaeological monitor will be on-site and a cultural expert will conduct Native Hawaiian cultural protocol both before and after the subsurface core sampling activities. This strategy has been approved by both the Office of Hawaiian Affairs and the Friends of Moku'ula. We are aware that some past council members of the M/LIBC requested consideration of "flat-blading" excavations to test for arsenic in order to avoid possible impacts to subsurface historic properties, we understand that this method could inadvertently release significant amounts of arsenic into the air of a public park.

We concur with the U.S. Army Corps' determination that there will be no historic properties effected by this undertaking pursuant to CFR 36 § 800, so long as mitigation in the form of preventative archaeological monitoring occurs. We look forward to reviewing an archaeological monitoring plan for this project pursuant to HAR § 13-279.

If you have questions about this letter please contact Morgan Davis at (808) 243-5169 or via email to: morgan.e.davis@hawaii.gov.

Aloha,

Pūa Aiu, Ph.D.
Administrator
State Historic Preservation Division

Cc: Hinano R. Rodrigues, Cultural Historian, SHPD Maui Island Section

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

May 25, 2012

REPLY TO ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Mr. William J. Aila, Jr.
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
State of Hawaii
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

Dear Mr. Aila:

The U.S. Army Corps of Engineers, Honolulu District (POH) is conducting a feasibility planning study for the proposed restoration of Loko o Mokuhinia, the wetland complex adjacent to the sacred islet of Mokuula and an associated feature of State Inventory Historic Properties number 50-05-03-2967, Mokuula Complex, in Lahaina, Maui, Hawaii. The islet and its ponds are generally contained within the present boundaries of Malu Ulu o Lele Park (tax map key [TMK] 2-4-6-07:002), bounded on the western side by Front Street; by Shaw Street on the southern edge; by Mokuhinia Way and an *`auwai* on the northern boundary; and on the eastern edge by privately owned properties along Wainee Street. An 1884 map by S.E. Bishop depicts the islet of Moku'ula and its associated ponds in the southwestern corner of the parcel containing Loko o Mokuhinia (Enclosure 1). The purpose of this letter is to continue Section 106 consultation (in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 Code of Federal Regulations Part 800 (NHPA)) on the wetland restoration efforts and to provide you with the results from previous Section 106 consultations on subsurface soil sampling.

Previous Section 106 Consultations

We previously consulted with your office on surface and subsurface soil sampling conducted in support of the planning study (State Historic Preservation Division Log No. 2011.1601; Doc No. 1106MD15). Past investigations had indicated the potential presence of hazardous contaminants (primarily arsenic) in the modem fill material at the project site. Because contamination could affect the restoration design alternatives, POH undertook subsurface soil samples to determine the degree and extent of potential contamination. Consultation on this undertaking was initiated in a letter dated February 22, 2010. Your department responded with concurrence with the determination of "no adverse effect on historic sites," with archaeological monitoring during the subsurface soil sampling.

The sampling approach for the subsurface soil sampling was subsequently modified based on

input from the Maui/Lanai Islands Burial Council (dated April 29, 2010); this information was conveyed to your department via a letter dated July 29, 2010. A subsequent letter was provided on May 25, 2011 to update your department on the proposed dates for the subsurface soil sampling effort. In addition, the letter notified your department that wetland delineation would be conducted within the project site.

The analytical results of the soil sampling indicated that none of the samples contained concentrations of arsenic that exceed the Hawaii State Department of Health Tier 1 environmental action limit for arsenic in soil. The highest concentration of soil arsenic at the site was found to be 14.8 mg/kg for surface soil, and 16.0 mg/kg for subsurface soil. The highest concentration of arsenic in the sediment samples taken from the *`auwai* was 3.63 mg/kg. These reported concentrations are within the published range of background concentrations for soil arsenic in Hawaii. The Natural Resource Conservation Service (NRCS) and POH conducted a wetland delineation of the study area on July 29, 2011. The delineation determined that no jurisdictional wetlands are present on site. However, the delineation re-affirmed there is adequate ground water to support wetland restoration. An archaeological monitor from Cultural Surveys Hawaii was present at all times during subsurface sampling. The archaeological monitoring report concluded that although isolated faunal material and manuports were found in the fill soil, no culturally significant resources were disturbed. No culturally significant intact soil depositories were encountered during soil sampling.

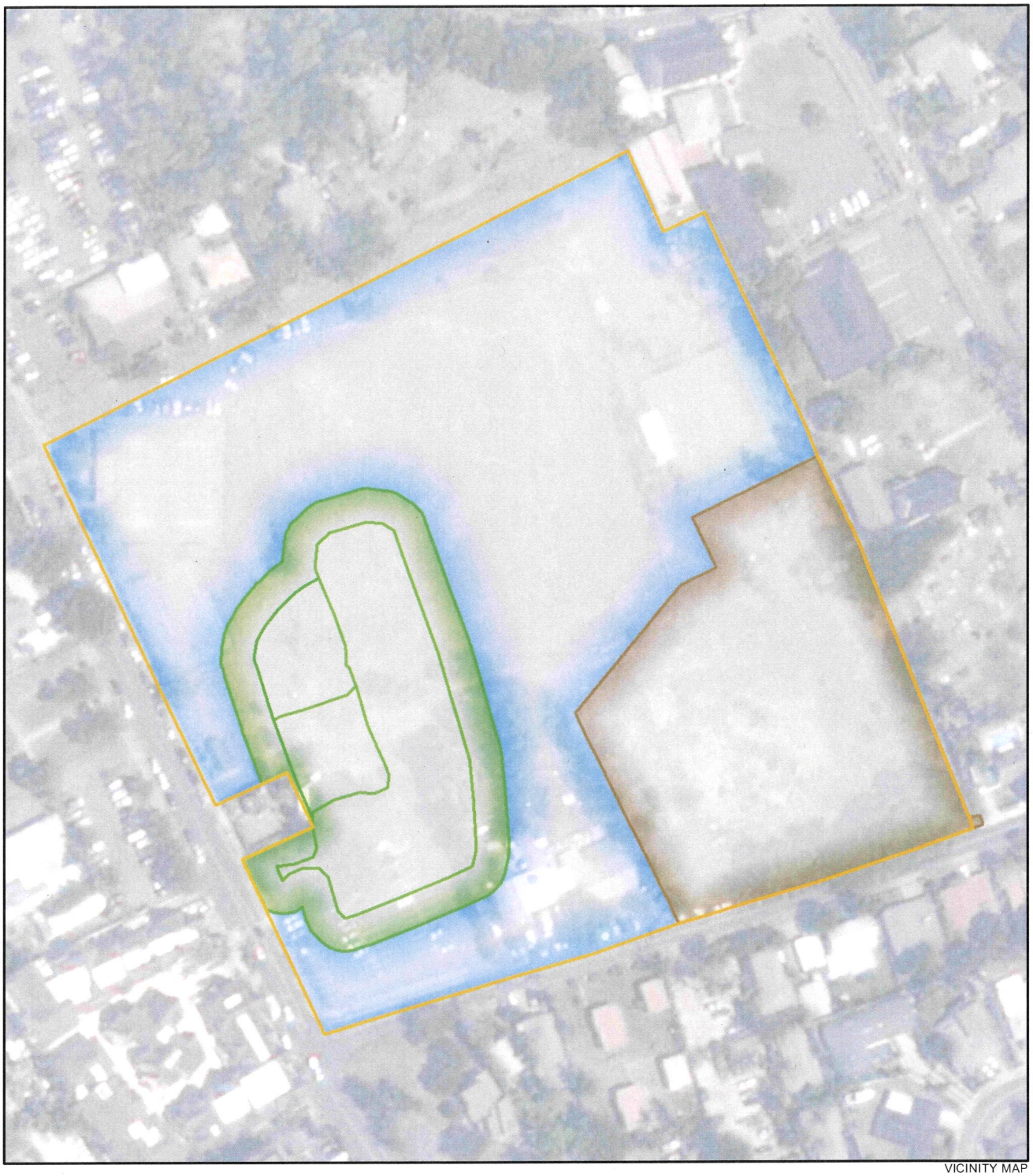
A copy of the *Final Arsenic Site Investigation Report for Mokuhinia Pond, Lahaina, Maui, Hawaii* and the associated archaeological monitoring reports is enclosed in the attached CD (Enclosures 2 and 3). Because POH is still in the planning stages of the proposed undertaking and will be evaluating several alternatives, the specific details of the restoration design are not known at this time. When these details become known, POH will continue to consult with your office on the details and their effect on cultural resources in compliance with NHPA. POH has also consulted with several other groups listed in Enclosure 4.

Should you require any additional information, please contact Mr. Kanalei Shun, Archeologist of my Environmental Programs Branch, at (808) 835-4097 or Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

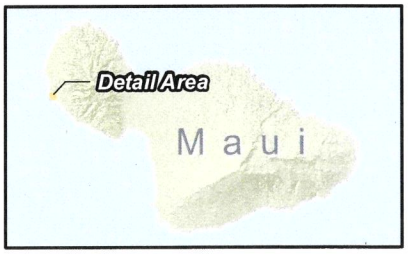
Enclosures



VICINITY MAP

Legend

- Moku'ula/Mokuhinia Site
- Mokuhinia Ecosystem Restoration Project Site
- Moku'ula
- Friends of Moku'ula Support Facilities



Notes:
The boundaries of Moku`ula and the adjacent southern pond are based on the boundaries shown in the Hawaiian Government Survey of the Town of Lahaina (S.E. Bishop, 1884); the northern pond was added at the request of Friends of Moku`ula based on historical documents. A 10 meter buffer has been included around the perimeter of the island and adjacent ponds.

0 75 150 Feet

1 inch = 150 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

Project Site

Mokuhinia Ecosystem Restoration Project

Lahaina, Maui, Hawaii

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Enclosure 4

Mokuhinia/Moku`ula Ecosystem Restoration Project
National Historic Preservation Act Consultation – Interested Parties

Mr. William Aila, Jr.
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
501 Kamokila Boulevard
Kapolei, Hawaii 96707

History and Culture Branch
Hawaii State Historic Preservation Division
Department of Land and Natural Resources
601 Kamokila Boulevard, Suite 555
Kapolei, Hawaii 96707

Ms. Shirley Kahai
Friends of Mokuula
505 Front Street, Suite 221
Lahaina, Hawaii 96761

Mr. William Kahaialii
President
Hui O Waa Kaulau
525 Front Street
Lahaina, Hawaii 96761

Ms. Lori Sablas
Director
Kaanapali Beach Hotel Pookela Program
2525 Kaanapali Parkway
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Pelekikena
Lahaina Hawaiian Civic Club
P.O. Box 10965
Lahaina, Hawaii 96761

Dr. Kamanaopono Crabbe
Chief Executive Officer
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Maui Lanai Island Burial Council
130 Mahalani Street
Wailuku, Hawaii 96793

Maui County Cultural Resources Commission
Attn: Maui County Department of Planning
250 S. High Street
Kalana Pakui Building, Suite 200
Wailuku, Hawaii 96793

Ms. Patty Nishiyama
Na Kupuna O Maui
320 Kaeo Street
Lahaina, Hawaii 96761

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

May 25, 2012

REPLY TO ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Mr. Keeaumoku Kapu
Chairperson, Maui/Lanai Islands Burial Council
Department of Land and Natural Resources
State Historic Preservation Division
DLNR Maui Office Annex
130 Mahalani Street
Wailuku, Hawaii 96793

Dear Mr. Kapu:

The U.S. Army Corps of Engineers, Honolulu District (POH) is conducting a feasibility planning study for the proposed restoration of Loko o Mokuhinia, the wetland complex adjacent to the sacred islet of Mokuula and an associated feature of State Inventory of Historic Properties number 50-05-03-2967, Mokuula Complex, in Lahaina, Maui, Hawaii. The islet and its ponds are generally contained within the present boundaries of Malu Ulu o Lele Park (tax map key [TMK] 2-4-6-07:002), bounded on the western side by Front Street; by Shaw Street on the southern edge; by Mokuhinia Way and an *auwai* on the northern boundary; and on the eastern edge by privately owned properties along Wainee Street. An 1884 map by S.E. Bishop depicts the islet of Mokuula and its associated ponds in the southwestern corner of the parcel containing Loko o Mokuhinia (Enclosure 1). The purpose of this letter is to continue Section 106 consultation (in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 Code of Federal Regulations Part 800 (NHPA)) on the wetland restoration efforts and to provide you with the results from previous Section 106 consultations on subsurface soil sampling.

Previous Section 106 Consultations

We previously consulted with your office on surface and subsurface soil sampling conducted in support of the planning study (State Historic Preservation Division Log No. 2011.1601; Doc No. 1106MD15). Past investigations had indicated the potential presence of hazardous contaminants (primarily arsenic) in the modem fill material at the project site. Because contamination could affect the restoration design alternatives, POH undertook subsurface soil samples to determine the degree and extent of potential contamination. Consultation on this undertaking was initiated in a letter dated February 22, 2010.

The sampling approach for the subsurface soil sampling was subsequently modified based on

input from the Maui/Lanai Islands Burial Council (MLIBC) (dated April 29, 2010 and June 24, 2010); this information was conveyed to the MLIBC via a letter dated July 29, 2010. A subsequent letter was provided on January 11, 2011, to update the MLIBC on the results of the surface soil sampling. In addition, the letter notified the MLIBC that wetland delineation would be conducted within the project site.

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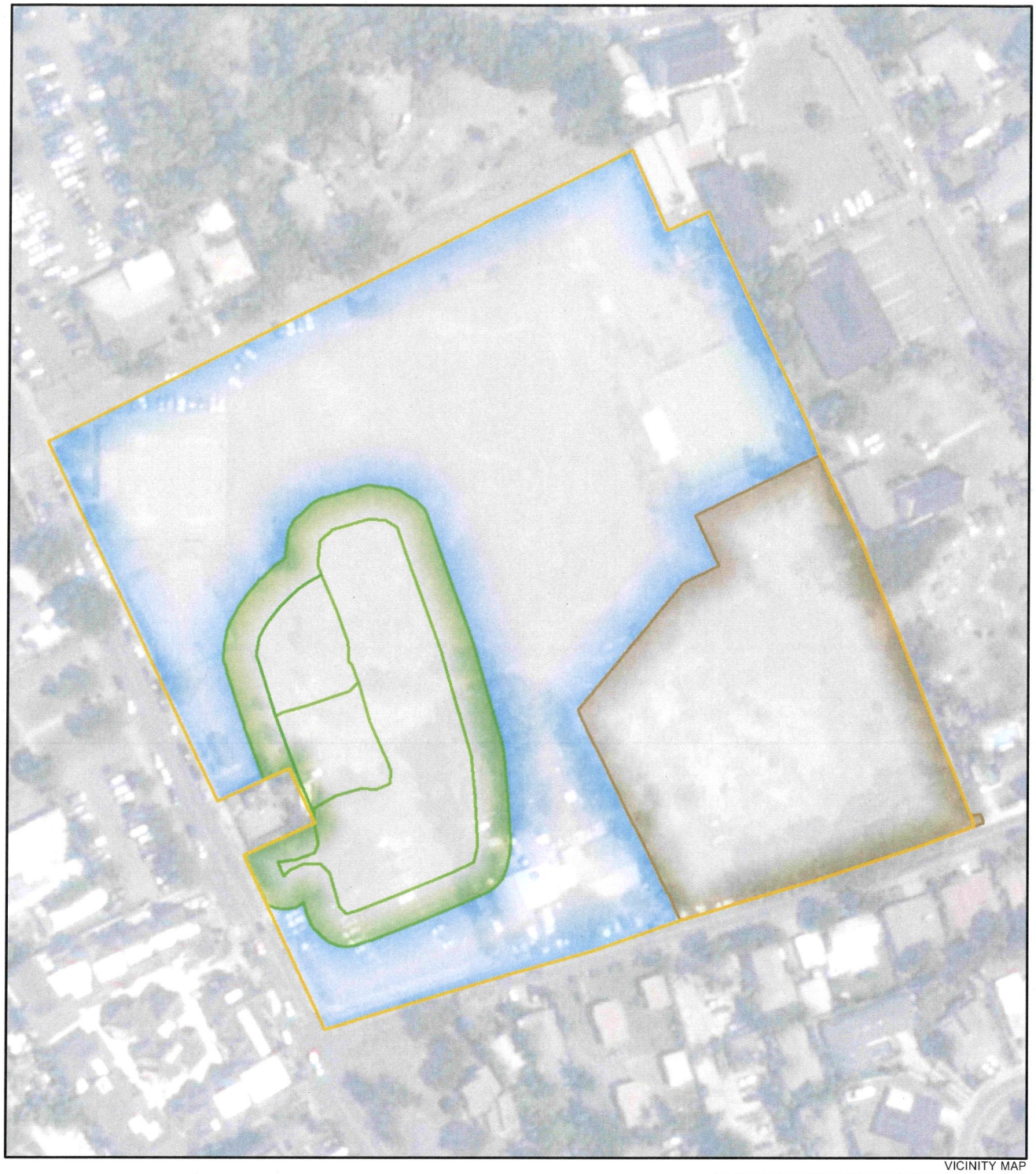
A copy of the *Final Arsenic Site Investigation Report for Mokuhinia Pond, Lahaina, Maui, Hawaii* and the associated archaeological monitoring reports is enclosed in the attached CD (Enclosures 2 and 3). Because POH is still in the planning stages of the proposed undertaking and will be evaluating several alternatives, the specific details of the restoration design are not known at this time. When these details become known, POH will continue to consult with the MLIBC on the project details and their effect on cultural resources in compliance with NHPA. A list of those previously consulted is attached as Enclosure 4.

Should you require any additional information, please contact Mr. Kanalei Shun, Archeologist of my Environmental Programs Branch, at (808) 835-4097 or Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures



VICINITY MAP

Legend

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- Mokuhinia Ecosystem Restoration Project Site
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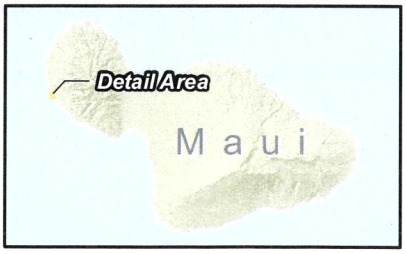

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1 inch = 150 feet
NAD83 HARN HAWAII SPCS 5102, US Feet

Project Site

Mokuhinia Ecosystem Restoration Project
Lahaina, Maui, Hawaii

CH2MHILL

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Enclosure 4

Mokuhinia/Moku`ula Ecosystem Restoration Project
National Historic Preservation Act Consultation – Interested Parties

Mr. William Aila, Jr.
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
501 Kamokila Boulevard
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Wailuku, Hawaii 96793

Ms. Patty Nishiyama
Na Kupuna O Maui
320 Kaeo Street
Lahaina, Hawaii 96761

Polanui Hiu, CMMA
Front Street, Lahaina, HI
96761

May 25, 2012

Aloha,

My name is Dr. Scott Fisher and I am writing to you as the Hawaiian Island Land Trust's Director of Conservation as well as a board member of the Maui Nui Marine Resources Council, specifically in the capacity as a participant in the Polanui Ahupua'a Community Managed Marine Area (CMMA). Our goal at Polanui is to utilize traditional Hawaiian terrestrial and marine management strategies to improve the quality of these ecosystems, increase the abundance of keystone species and to improve the quality of life for the local community who depends on these marine resources.

Over the past two years we have held numerous meetings with local kupuna, resource managers and other stakeholders to understand the current condition of the nearshore marine environment; evaluate what was known historically about the relative abundance of this area; and to devise strategies to restore the ecological integrity and health of Polanui's marine ecosystem. Our evaluation of the relative abundance of the marine ecosystem has indicated a dramatic reduction in the identified keystone species, particularly manini, kole, moi, weke, uhu and hinalea. We selected these particular fish species based on their contribution to the sand and reef composition, structure and function as well as the overall health, productivity and biodiversity of the nearshore ecosystem, as well as their contribution to the ecological resilience of this area.

Through this participatory process we have concluded that, while there are many stresses on this fragile ecosystem, traditional Hawaiian management practices can serve to mitigate the disturbance patterns brought about by development (including infrastructure improvements), over harvesting and the array of stresses to the reef and nearshore marine ecosystem. Some of the most severe disturbance patterns derive from the excessive accumulation of sediments which result from the failure to control the velocity of hydrological flow from the uplands into the coastal zone. Sediment accumulation causes a broad spectrum of problems, but is most evident when it results in the death of the coral reef ecosystem which can have catastrophic and cascading impacts on the entire nearshore environment. Excessive sedimentation derives from a combination of poor management practices, including failing to construct barriers which slow the velocity of storm runoff and implementing inadequate measures to prevent erosion at construction sites. Considering the size and scope of a number of proposed projects we are particularly concerned with the potential for further degradation of the marine environment and the direct impact this will have on the quality of life for the people who depend on this area for their livelihood.

The Polanui Hiu CMMA is requesting to be consulted as a Native Hawaiian organization during the Cultural Impact Assessment phase of any proposed development in the Lahaina District, particularly as part of an environmental impact study.

The Polanui Community Marine Managed Area group is concerned about the potential for significant ecological degradation of the local marine resources deriving from proposed projects in the Lahaina district, and consequently our ability to manage this area according to traditional Hawaiian principles and practices. However, we also recognize that through a process of collaborative dialogue, meaningful consultation and the implementation of adequate preventative measures, steps can be taken to mitigate further degradation.

Me ka ha'aha'a

Scott Fisher

Scott Fisher, Ph.D.
Director of Conservation

Edwin Lindsey

Michael Buden

Daniel S. Reading

Mark Hecht

Lisa Agdeppa

Luida Castro

Nalei K. Sampson

Rhiannon Chandler

June 14, 2012

William J. Aila - Chairperson
OFFICE OF THE CHAIRPERSON
1151 Punchbowl Street, Room 130 Honolulu, Hawai`i 96813
Phone: 808-587-0400
FAX: 808-587-0390

Alan Arakawa - Mayor
County of Maui
200 S. High Street
Kalani O Maui Bldg, 9th Floor
Wailuku, HI 96793

Athline Clark - Army Corps of Engineers Project Manager
USACE Honolulu District
CEPOH-PP-C Building 230
Ft. Shafter, Hawaii 96858-5440
Email: Athline.M.Clark@usace.army.mil.

Re: May 30, 2012, Lahaina Civic Center, Maui County/U.S.A.C.E. Scoping Public Meeting—King Kamehameha III Royal Residential Complex.

Aloha: Chairperson, William J. Aila, Mayor, Alan Arakawa, Project Manager, Athline Clark,

Thank you for allowing me to be in partnership with the County of Maui/State of Hawaii/U.S. Army Corps of Engineers Scoping Process of the King Kamehameha III Royal Residential Complex, and other State/National Register components of *historic peoples, places,* and *things* concerning **Moku'ula**, **Mokuhinia**, and Hale Pi'ula, etc.

On behalf of our Kuloloi'a Ohana we look forward to working instrumentally with you (the County of Maui, the State of Hawaii) and your associates, the U.S. Army Corps of Engineers, and the opportunity to satisfy the Spirit of the **Section 106 Consultation** process. We look forward to working intimately with the owners in the implementation of Step One, Step Two, and Step Three Processes of Scoping, Feasibility, Planning and Environmental Review Assessment of

the **Mokuhinia Ecosystem Restoration Project** of our State/National Recognition, Register, and Repository of Ancestral and Generational Heritage.

The Kuloloi'a Lineage and Ohana would Aloha your Meaningful Acknowledgement, Attendant Respect, Reverential Preservation of our Relationship to our special **Sacred Places** and **Traditional Place Names** of Old Hawaii.

I look forward to sharing other collective archival documentation as **potential** significant updates to complement the "**fragments** of Hawaiian history" of ancient mindfulness. These **Sacred** components of Maui's history *before* the conquest of Kamehameha the First and *before* the LCA Process following the 1848 Mahele and *before* the conquest of Christianity in Hawaii at both Ports of Lahaina and I Ke Kai O Kuloloi'a, now called Honolulu Harbor.

Eo! E ala! Eia ka leo! O Ke Akua ...

With love and aloha,

Uncle Leslie Kuloloio
469 Ma'alo Street
Kahului, Maui, 96732
Cell phone: 808-281-7652
Email: pokaiuli@yahoo.com

cc: Manny Kuloloia
Leina'ala Kuloloia-Vedder
Aha Moku Council O Maui

June 14, 2012

William J. Aila - Chairperson
OFFICE OF THE CHAIRPERSON
1151 Punchbowl Street, Room 130
Honolulu, Hawai`i 96813
Phone: 808-587-0400
FAX: 808-587-0390

Alan Arakawa - Mayor
County of Maui
200 S. High Street
Kalani O Maui Bldg, 9th Floor
Wailuku, HI 96793

Athline Clark - Army Corps of Engineers Project Manager
USACE Honolulu District
CEPOH-PP-C Building 230
Ft. Shafter, Hawaii 96858-5440
Email: Athline.M.Clark@usace.army.mil.

Subject: Waiokama-Waine'e *Lineal Descendants* Working Group

Re: May 30, 2012, Lahaina Civic Center, Maui County/U.S.A.C.E. Scoping Public Meeting—King Kamehameha III Royal Residential Complex.

Aloha: Chairperson, William J. Aila, Mayor, Alan Arakawa, Project Manager, Athline Clark,

On behalf (see attachment) of Waiokama-Waine'e *Lineal Descendants* Working Group we express our sincere appreciation and aloha for the opportunity to partner with the State of Hawaii, County of Maui and U.S. Army Corp of Engineers Scoping Process of the King Kamehameha III Royal Residential Complex, and other State/National Registered components of Hawaii's historic people, places and *pre/post-contact history* concerning **Moku'ula**, **Mokuhinia**, Hale Pi'ula, etc…

On behalf of Waiokama-Waine'e *Lineal Descendants* Working Group we look forward to working instrumentally with the County of Maui and State of Hawaii), respectively, along with

We look forward to working intimately with all concerned parties in the implementation of Step One, Step Two, and Step Three Processes of Scoping, Feasibility, Planning and Environmental Review Assessment of the **Mokuhinia Ecosystem Restoration Project** of our State/National Recognition, Register, and Repository of Ancestral and Generational Heritage.

With sincere aloha and Mahalo…

Foster Ampong - Lineal Descendant
Waiokama Ahupua'a, Moku O Lahaina

Contact Information:
Foster Ampong
P.O. Box 3196
Wailuku, HI 96793
Phone: (808)281-3894
Email: ahamokuowailuku@yahoo.com

cc: Aha Moku Council O Maui
Keeaumoku Kapu
Leslie Kuloloia
Friends of Moku'ula
Na Ohana O Keaweiwi O Kahoma

Waiokama-Waine'e *Lineal Descendants* Working Group

Members: Keeaumoku Kapu, U'I Kapu, Leslie Kuloloia, Foster Ampong –*Lineal Descendants and Aha Moku Council O Maui Representatives and Advisers*.

Purpose: For Lineal Descendants, e.g. *stakeholders* of Waiokama-Waine'e Ahupua'a of Moku O Lahaina to *exercise and malama collectively their respective kuleana* of their wahi pana e.g. ancestral lands, religion, history and future.

Mission: To *nurture and assist restoration efforts* in the Lahaina Moku at Waiokama-Waine'e, Ahupua'a *including* efforts currently underway at Mokuhinia and Moku'ula, respectively.

Vision: Restoration of our wahi pana carried out through the ancient Hawaiian method of Lokahi e hana ka lima - a holistically sustainable means of *all parties joining hands to complete work beneficial to all.*

Parties: Waiokama-Waine'e *Lineal Descendants* Working Group
Friends of Moku'ula
State of Hawaii
County of Maui
Army Corp of Engineers

Contacts:

Keeaumoku & U'I Kapu
Aha Moku O Maui
P.O. Box 11524
Lahaina, HI 96761
Phone: (808) 250-1479
Email: keeaumokukapu@yahoo.com
Website: www.ahamoku.com

Leslie Kuloloia
469 Ma'alo Street
Kahului, HI 96732
Phone: (808) 281-7652
Email: pokaiuli@yahoo.com

Foster Ampong
P.O. Box 3196
Wailuku, HI 96793
Phone: (808)281-3894
Email: ahamokuowailuku@yahoo.com

Summary: Often, in today's changing/challenging environment we experience the *inherent and unsustainable adversities* from competing and conflicting efforts within and throughout our Island community. The goal, in essence-and-effect remedy, of *Waiokama-Waine'e Lineal Descendants Working Group* is to holistically within sustainable means assist with restoring Moku'ula and parts of the surrounding lands, e.g. Mokuhunia affording all stakeholders the greatest success and benefits.

End

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

September 11, 2012

REPLY TO ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Ms. Louise Dunford Brodnitz, AIA AICP
Program Analyst
Advisory Council on Historic Preservation
Office of Federal Agency Programs
Federal Property Management Section
The Old Post Office Building
1100 Pennsylvania Ave, NW, Suite 803
Washington, DC 20004

Dear Ms. Brodnitz:

The purpose of this letter is to notify the Advisory Council on Historic Preservation (Council) that the U.S. Army Corps of Engineers, Honolulu District (USACE) is conducting a feasibility planning study for the proposed Mokuhinia Ecosystem Restoration Project. The project would involve the restoration of Loko o Mokuhinia, the complex of ponds adjacent to the sacred island of Moku ʻula and an associated feature of King Kamehameha III's Royal Residential Complex (National Register No. 97000408 and State Inventory Historic Property [SIHP] No. 50-50-03-2967), located in Lahaina, island of Maui, Hawai ʻi. The proposed project site is generally located within the boundaries of the County of Maui's Malu Ulu o Lele Park, its associated parking lot (tax map key [TMK] 2-4-6-07:002 and 2-4-6-07:036), and the adjacent parcels that are currently occupied by the Salvation Army (TMK 2-4-6-07:037 and 2-4-6-07:038).

The proposed project boundaries are shown in Enclosure 1. If implemented, the proposed project would constitute a federal undertaking requiring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), and its implementing regulations at 36 CFR Part 800. In accordance with 36 CFR § 800.8(c), USACE intends to use the process and documentation required by the National Environmental Policy Act of 1969 (NEPA) to comply with Section 106, in lieu of the procedures set forth in 36 CFR § 800.3 through 800.6.

History of Project Site

Loko o Mokuhinia is cited in Hawaiian mythology as the home of the lizard goddess, Kihawahine, Mokuhinia Kalamaʻula, the once mortal daughter of a *piʻo* (high ranking marriage) between Piʻilani and Lāʻieloheikawai, who transformed into the *moʻo* goddess upon her death. The area of Loko o Mokuhinia was a favored residence of the Maui *aliʻi* and sacred to the

worship of Kihawahine, the *mo'o* goddess, since the time of Kiha-a-Pi'ilani. From 1837 to 1845, Moku'ula Island was also the royal residence of King Kamehameha III, when Lahaina became the capital of the Hawaiian Kingdom. King Kamehameha III built a mausoleum at the northern portion of Moku'ula Island to hold the remains of Hawaiian royalty. As King Kamehameha IV grew into succession, the royal residence was relocated to Honolulu, and Moku'ula Island and Loko o Mokuhinia diminished in prominence; the site was eventually filled by Lahaina businessmen in 1914, and under Executive Order 52, was assigned to the County of Maui for use as a park.

Loko o Mokuhinia and Moku'ula currently lie under fill layer(s) that range in thickness from about one to four feet, and no surface remains of the complex are presently visible. The site has historic significance on several levels. King Kamehameha III's Royal Residential Complex (which includes Moku'ula, Loko o Mokuhinia and Hale Piula) is listed on the Hawai'i State Register of Historic Places (SIHP No. 50-50-03-2967) and on the National Register of Historic Places (National Register No. 97000408). Additionally, the project site is located within the larger Lahaina Historic District, which is designated as a National Historic Landmark and is listed on the National and State Registers (National Register No. 66000302 and SIHP No. 50-50-03-3001). The County of Maui has also established Historic Districts Nos. 1 and 2 in the town of Lahaina. Historic District No. 1 is intended to preserve, as well as to enable the State and County to restore historic structures and sites. Historic District No. 2 is intended to preserve the charm of Lahaina by preserving the architectural styles that are unique to Lahaina (Maui County Code Section 19.50). Loko o Mokuhinia and Moku'ula are within the County Historic District No. 1.

Description of Proposed Undertaking

At the request of the County of Maui, USACE is investigating the restoration of Loko o Mokuhinia. The purpose of the proposed project is to restore significant ecosystem function, structure, and dynamic processes that were lost when the pond system was filled in the early 1900s. The restoration may require excavation below the depth of the modern fill; near the original banks of the pond system, where iwi (native Hawaiian ancestral remains) may be located; and near the island of Moku'ula, where remains of Hawaiian royalty possibly still exist.

Area of Potential Effect

Given the inclusion of the proposed project site in these various historic districts described above, USACE has identified the Area of Potential Effects (APE) for the proposed project as the entire National Historic Landmark District, which is the most expansive of those districts. The boundaries of the National Historic Landmark District, which will be used for the purposes of describing the APE, are shown in Enclosure 2.

NEPA Compliance and Public Participation

The project is currently in the feasibility phase of the USACE planning process. As part of the efforts to evaluate the potential environmental impacts of the proposed project, USACE is preparing an Environmental Assessment in compliance with NEPA. If USACE ultimately determines that an environmental impact statement is required, it will be submitted to the Council in accordance with 36 CFR § 800.8(c). USACE identified consulting parties through the NEPA scoping process. A detailed stakeholder engagement effort is being undertaken, and

USACE is consulting with a variety of stakeholders, including Native Hawaiian Organizations, lineal descendants, and ‘ohana (families) from Lahaina. Due to the potential for the proposed project to adversely affect historic properties, it is anticipated that a memorandum of agreement will be prepared in accordance with 36 CFR § 800.6(c).

If you have any questions, please contact Mr. Kanalei Shun, Archaeologist of my Environmental Programs Branch, at (808) 835-4097 or Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032.

Sincerely,

for

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

Enclosure 1: Project Location Map

LEGEND

- Moku'ula/Mokuhina Site
- Mokuhinia Ecosystem Restoration Project Site
- Special Management Area
- TMK

0 125 250 Feet

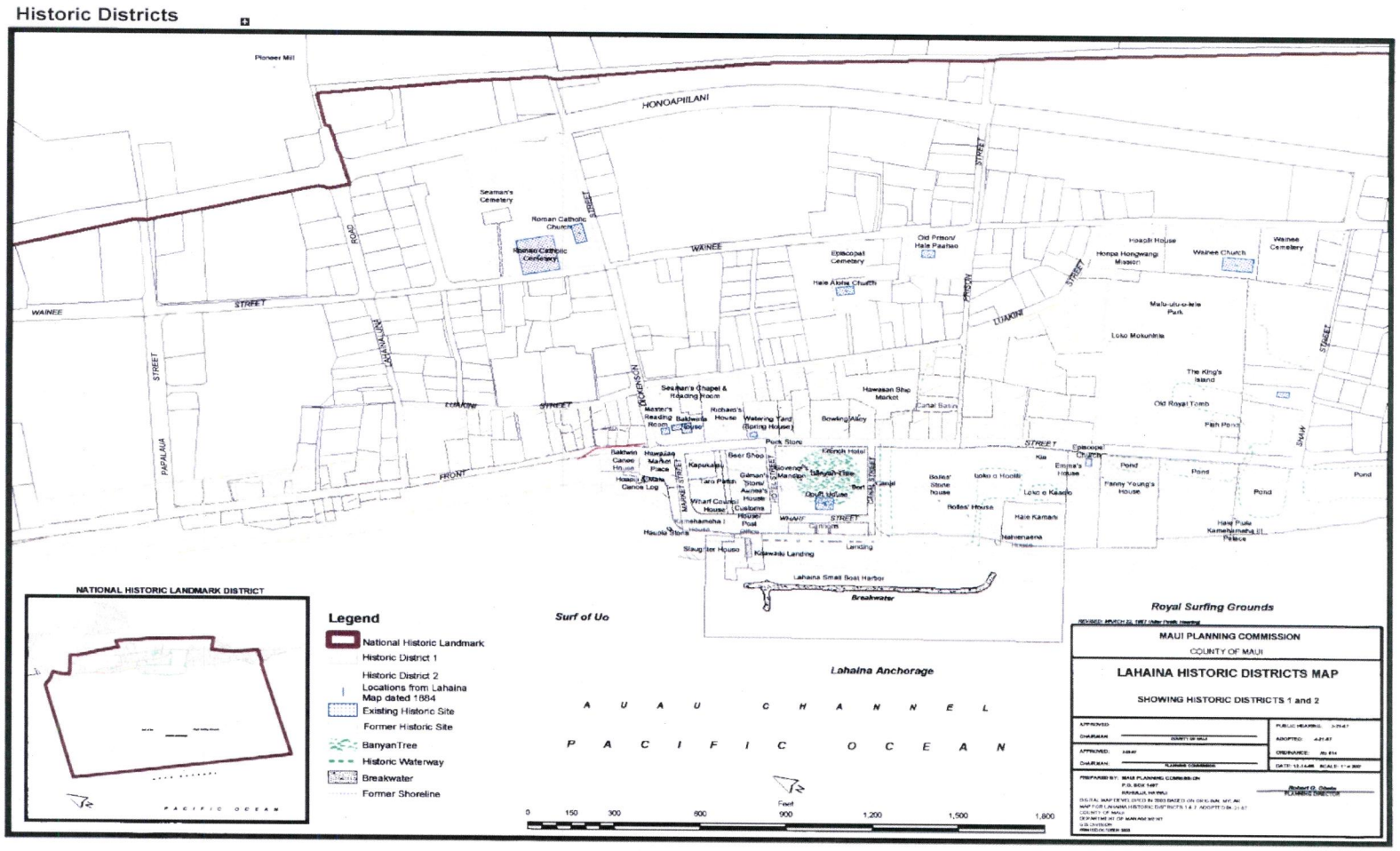
1 inch = 250 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 1
Land Use
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

CH2MHILL

Enclosure 2: Lahaina Historic District



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

September 11, 2012

REPLY TO
ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Mr. Leslie Kuloloi'a
469 Ma'alo Street
Kahului, Hawai'i 96732

Dear Mr. Kuloloi'a:

We have received your letter dated June 14, 2012, and appreciate your desire to participate in the feasibility planning process for the proposed Mokuhinia Ecosystem Restoration Project. In response to your letter, we will include you in future correspondence as a consulting party under Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations at 36 Code of Federal Regulations (CFR) Part 800.

A copy of this letter has been furnished to Mr. Zeke Kalua, 200 South High Street, 9th Floor, Wailuku, Hawai'i 96793; Mr. William J. Aila, Jr., Department of Land and Natural Resources, State of Hawai'i, 1151 Punchbowl Street, Honolulu, Hawai'i 96813; and Mr. Keeaumoku Kapu, Department of Land and Natural Resources, State Historic Preservation Division, DLNR Maui Office Annex, 130 Mahalani Street, Wailuku, Hawai'i 96793. If you have any questions, please contact Mr. Kanalei Shun, Archaeologist of my Environmental Programs Branch, at (808) 835-4097 or Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032.

Sincerely,

for Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

September 11, 2012

REPLY TO ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Mr. Foster Ampong
Waiokama-Waine'e Lineal Descendants Working Group
P.O. Box 3196
Wailuku, Hawai'i 96793

Dear Mr. Ampong:

We have received your letter on behalf of the Waiokama-Waine'e Lineal Descendants Working Group dated June 14, 2012, and appreciate your desire to participate in the feasibility planning process for the proposed Mokuhinia Ecosystem Restoration Project. In response to your letter, we will include the Waiokama-Waine'e Lineal Descendants Working Group in future correspondence as a consulting party under Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations at 36 Code of Federal Regulations Part 800.

A copy of this letter has been furnished to Mr. Zeke Kalua, 200 South High Street, 9th Floor, Wailuku, Hawai'i 96793; Mr. William J. Aila, Jr., Department of Land and Natural Resources, State of Hawai'i, 1151 Punchbowl Street, Honolulu, Hawai'i 96813; Mr. Keeaumoku Kapu, Department of Land and Natural Resources, State Historic Preservation Division, DLNR Maui Office Annex, 130 Mahalani Street, Wailuku, Hawai'i 96793; and Mr. Leslie Kuloloia, Kuloloia Ohana, 469 Ma'alo Street, Kahului, Hawai'i 96732; Friends of Moku'ula, 505 Front Street, Suite 221, Lahaina, Hawai'i 96761. If you have any questions, please contact Mr. Kanalei Shun, Archaeologist of my Environmental Programs Branch, at (808) 835-4097 or Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032.

Sincerely,

for Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAI'I 96858-5440

January 3, 2013

REPLY TO
ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Mr. William J. Aila, Jr.
Chairperson and State Historic Preservation Officer
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

Dear Mr. Aila:

As described in previous correspondences (dated February 22, 2010; July 29, 2010; May 25, 2011; and May 5, 2012), the U.S. Army Corps of Engineers (USACE) is conducting a feasibility study to evaluate the proposed restoration of Loko o Mokuhinia, the complex of ponds adjacent to the sacred island of Mokuula and an associated feature of State Inventory Historic Property (SIHP) No. 50-50-03-2967 (King Kamehameha III's Royal Residential Complex), located in Lahaina, Island of Maui, Hawaii. The proposed project site is generally contained within the boundaries of Malu Ulu o Lele Park and the associated parking lot (TMK 2-4-6-07:002 and 2-4-6-07:036), as well as the adjacent parcels that are currently occupied by the Salvation Army (TMK 2-4-6-07:037 and 2-4-6-07:038). The proposed project would not include any work within or immediately adjacent to Mokuula, as delineated based on an 1884 map by S.E. Bishop. The proposed project boundaries delineated in yellow (Enclosure 1).

The feasibility study is being conducted by USACE, in concert with the County of Maui, and the proposed project would constitute a federal undertaking that would require compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations at 36 Code of Federal Regulations, Part 800 National Historic Preservation Act (NHPA) prior to implementation. The proposed project is also subject to the National Environmental Policy Act (NEPA), and to the extent possible, the NEPA process is being used in support of the Section 106 consultation requirements. The purpose of this letter is to continue consultation under Section 106, specifically as related to providing information about the Area of Potential Effect (APE) of the proposed project.

Loko o Mokuhinia is cited in Hawaiian mythology as the home of the lizard goddess, Kihawahine Mokuhinia Kalamaula, the once mortal daughter of a *pi'o* (high ranking marriage) between Piilani and Queen Laieloheloheikawai, who transformed into the *mo'o* goddess upon her

death. The area of Loko o Mokuhinia was a favored residence of the Maui *ali'i* and sacred to the worship of Kihawahine, the *mo'o* goddess, since the time of Kihaapiilani who was Kihawahine's brother and a king of Maui. From 1837 to 1845, Mokuula Island was also the royal residence of King Kamehameha III, when Lahaina became the capital of the Hawaiian Kingdom. King Kamehameha III built a mausoleum at the northern portion of Mokuula Island to hold the remains of Hawaiian royalty. As King Kamehameha IV grew into succession, the royal residence was relocated to Honolulu, and Mokuula Island and Loko o Mokuhinia diminished in prominence; the site was eventually filled by Lahaina businessmen in 1914 and, under Executive Order 52, was assigned to the County of Maui for use as a park. Loko o Mokuhinia and Mokuula currently lie under fill layer(s) that range in thickness from about one to four feet.

The site has historic significance on several levels. King Kamehameha III's Royal Residential Complex (which includes Mokuula, Loko o Mokuhinia and Hale Piula) is listed on the Hawaii State Register of Historic Places (SIHP No. 50-50-03-2967) and on the National Register of Historic Places (National Register No. 97000408). Additionally, the project site is located within the larger Lahaina Historic District, which is designated as a National Historic Landmark and is listed on the National and State Registers (National Register No. 66000302 and SIHP No. 50-50-03-3001) (Enclosure 2). The County of Maui has also established Historic Districts Numbers 1 and 2 in the town of Lahaina. Historic District No. 1 is intended to preserve, as well as to enable the State and County to restore historic structures and sites. Historic District No. 2 is intended to preserve the charm of Lahaina by preserving the architectural styles that are unique to Lahaina (Maui County Code Section 19.50). Loko o Mokuhinia and Mokuula are within the County Historic District No. 1.

Given the inclusion of the proposed project site in these historic districts, the USACE has identified the APE for the proposed project as the entire National Historic Landmark District, which is the most expansive of the various districts. The boundaries of the National Historic Landmark District, which will be used for the purposes of describing the APE, are shown in Enclosure 2. As part of the continuing coordination and consultation process mandated under Section 106 of the NHPA, USACE requests comments from all three branches of your Historic Preservation Division on the proposed APE. We are also separately requesting comments from the Office of Hawaiian Affairs, lineal descendants from that area of Maui, Maui County Cultural Resources Committee, Hawaii Historic Foundation, the Lahaina Civic Club, and several others listed in Enclosure 3.

A copy of this letter with enclosures will also be provided to Dr. Pua Aiu, Administrator of the Hawaii State Historic Preservation Division, 601 Kamokila Boulevard, Suite 555, Kapolei, Hawaii 96707; and Mr. Hinano Rodrigues, Maui Cultural Historian, State of Hawaii, Department of Land and Natural Resources, Maui Historic Preservation Office, 130 Mahalani Street, Wailuku, Hawaii 96793.

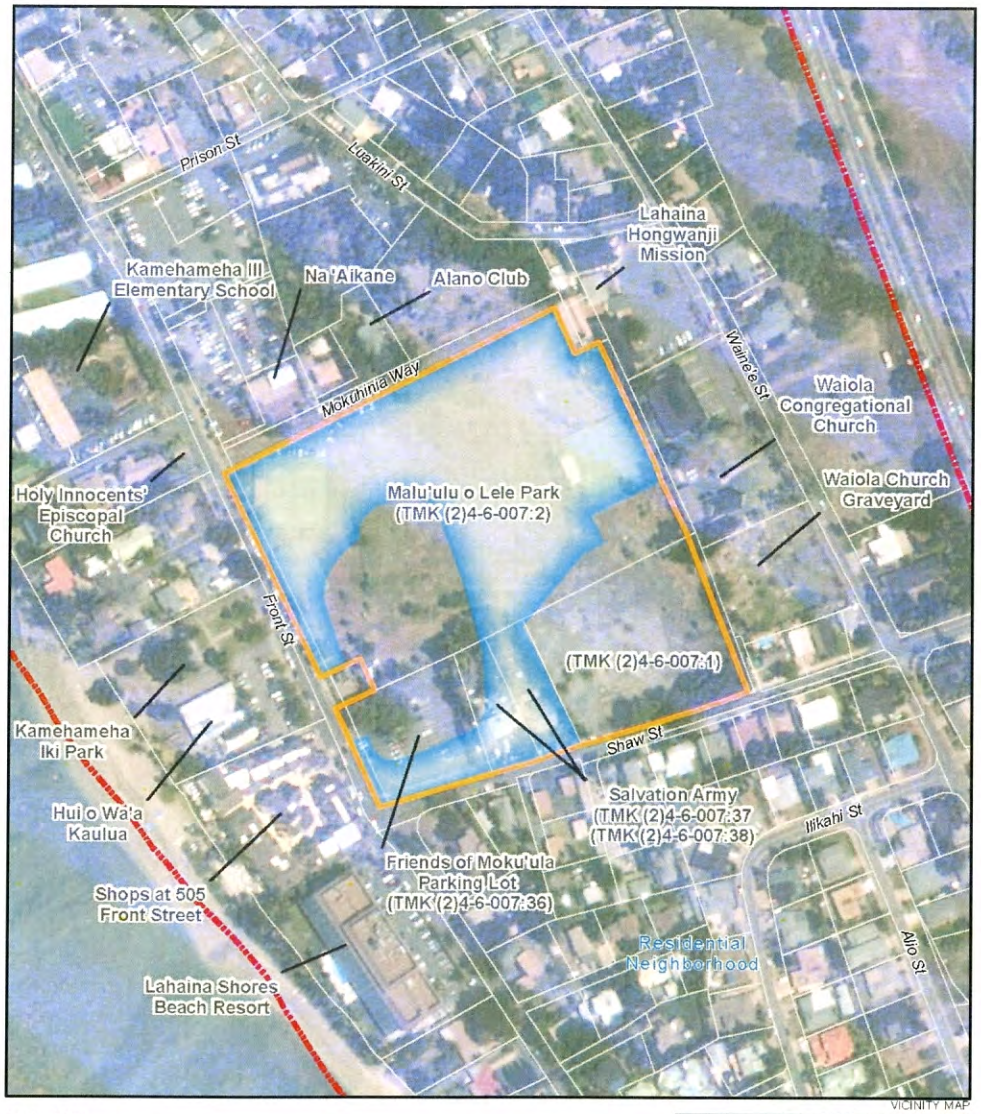
If you have any questions, please contact Mr. Kanalei Shun, Archaeologist of my Environmental Programs Branch, at (808) 835-4097 or Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032.

Sincerely,

Andrew Kohashi

for Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures



LEGEND

- Moku'ula/Mokuhina Site
- Mokuhinia Ecosystem Restoration Project Site
- Special Management Area
- TMK

0 125 250 Feet

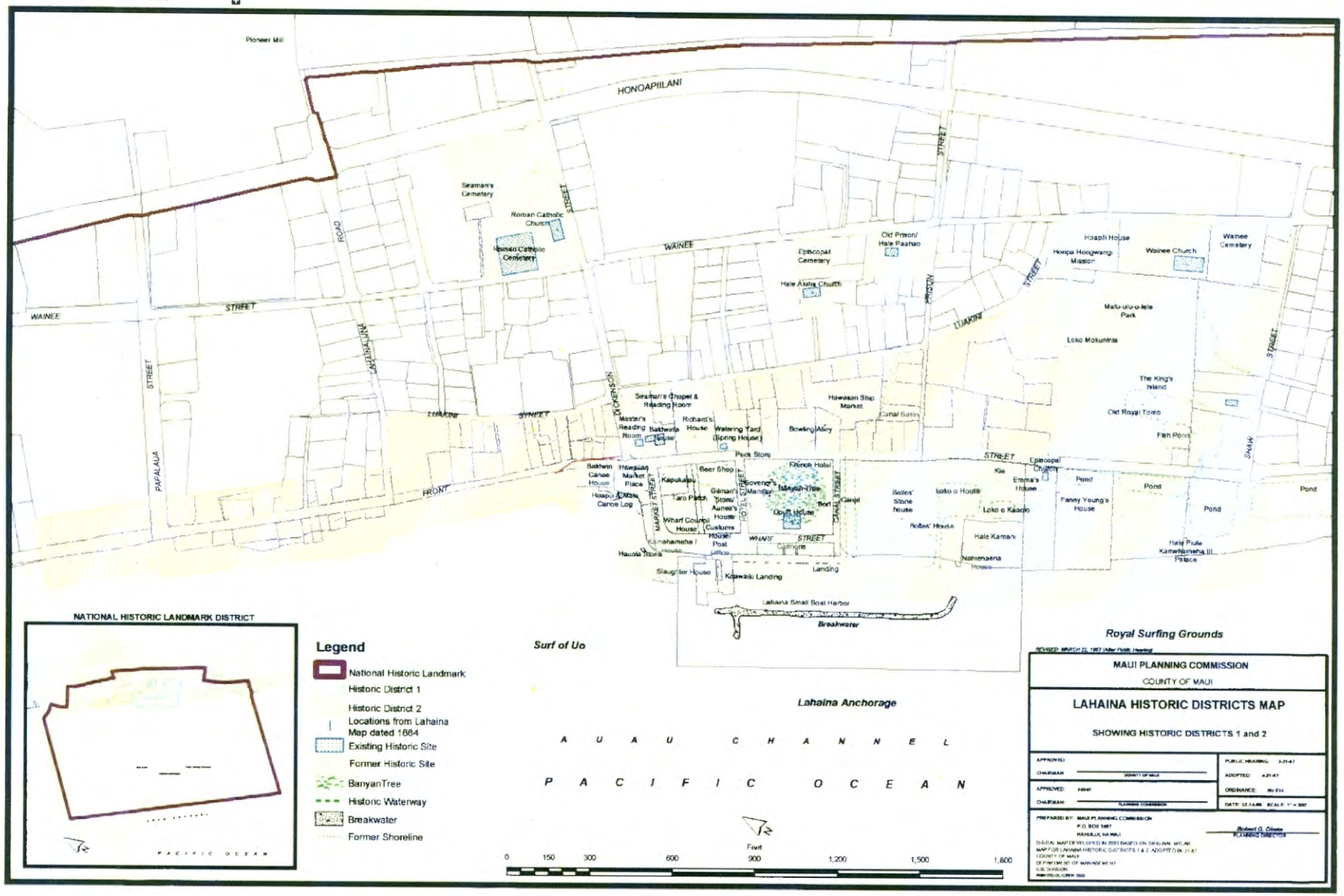
1 inch = 250 feet

NAD83 HARN HAWAII SPCS 5102, US Feet

FIGURE 1
Land Use
Mokuhinia Ecosystem Restoration Project
Lāhainā, Maui, Hawai'i

CH2MHILL

Historic Districts



Mokuhinia/Moku`ula Ecosystem Restoration Project
National Historic Preservation Act Consultation – Interested Parties

Mr. William Aila
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
501 Kamokila Boulevard
Kapolei, Hawaii 96707

Mr. Keeaumoku Kapu, Chairman
Maui Lanai Island Burial Council
130 Mahalani Street
Wailuku, Hawaii 96793

Ms. Shirley Kahai
Friends of Mokuula
505 Front Street, Suite 221
Lahaina, HI 96761

Hui O Waa Kaulau
Mr. William Kahaialii, President
525 Front Street
Lahaina, Hawaii 96761

Kaanapali Beach Hotel Pookela Program
Lori Sablas, Director
2525 Kaanapali Parkway
Lahaina, Hawaii 96761

Ms. Uilani Kapu
President
Kuleana Kuikahi
PO Box 11524
Lahaina, HI 96761

Dr. Scott Fisher
Polanui Ahupua'a Community Managed Marine Area
2371 Vineyard Street
Wailuku, Hawai'i 96793

Dr. Kamanaopono Crabbe
Chief Executive Officer
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, HI 96813

Mr. Foster Ampong
Waiakama-Wainee Lineal Descendents
Working Group
58 Hoola Hou Street
Wailuku, Hawaii 96793

Maui County Cultural Resources
Commission
Attn: Maui County Department of
Planning
250 S. High Street
Kalana Pakui Building, Suite 200
Wailuku, Hawaii 96793

Leslie Kuloloia
469 Maalo Street
Kahului, Hawaii 96732

Na Kupuna O Maui
Patty Nishiyama
320 Kaeo Street
Lahaina, Hawaii 96761

Mr. Matthew Erickson, Pelekikena
Lahaina Hawaiian Civic Club
P.O. Box 10965
Lahaina, HI 96761

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

July 1, 2013

REPLY TO ATTENTION OF:

Environmental Programs Branch
Programs and Project Management Division

Mr. William J. Aila, Jr.
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
State of Hawaii
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

Dear Mr. Aila:

The U.S. Army Corps of Engineers, Honolulu District (Corps) is conducting a feasibility planning study in partnership with the County of Maui for the proposed Mokuhinia Ecosystem Restoration Project in the town of Lahaina on the island of Maui, Hawaii. The ecosystem restoration project is being undertaken under Section 206 of the Corps' Continuing Authorities Program. As described in previous correspondence (dated February 22, 2010; July 29, 2010; May 25, 2011; May 5, 2012; and January 3, 2013), the purpose of the feasibility study is to evaluate the proposed restoration of Loko o Mokuhinia, a contributing feature to King Kamehameha III's Royal Residential Complex (National Register No. 97000408 and SIHP 50-50-03-2967). Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) and its implementing regulations 36 CFR Part 800, we request your concurrence with our determination that the proposed Mokuhinia Ecosystem Restoration Project will have "no adverse effect on historic properties," given the proposed project avoidance and mitigation actions described in the attached project description.

Historically, Loko o Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the shoreline of West Maui. The wetland served as habitat for a variety of wetland species, including Hawaiian waterbirds, migratory water fowl, and shorebird species. Traditionally, Loko o Mokuhinia had great religious and cultural significance being the residence of Kihawahine, a *moo akua* and spiritual guardian of the high ranking *alii* that ruled Maui during prehistoric times. Within the pond was the island of Moku ula, which was the preferred residence of high ranking *alii* through the mid-1800s. Over time, alterations to the hydrologic regime resulted in stagnation of the pond and, in 1914, the pond was filled for hygienic and development purposes. A 1918 Executive Order turned the area over to the County of Maui for the establishment of Malu Ulu Olele Park. Based on previous archaeological studies and monitoring of geotechnical investigations, the old surfaces of Mokuhinia and Moku ula currently lie approximately 2- to 3-feet beneath the park.

The proposed project site is generally contained within the boundaries of Malu Ulu Olele Park and the associated parking lot (tax map key (TMK) 2-4-6-07:001, 2-4-6-07:002, and 2-4-6-07:036), as well as the adjacent parcels that are currently occupied by the Salvation Army (TMK 2-4-6-07:037 and 2-4-6-07:038), Wainee Ahupuaa, Lahaina District, Maui (Enclosure 1). The proposed project would not include any work within or immediately adjacent to Moku ula island, as delineated based on an 1884 map by S.E. Bishop.

If you have any questions, please contact Mr. Kanalei Shun, Archaeologist of my Environmental Programs Branch, at (808) 835-4097, or Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

Summary of Proposed Undertaking
The goal of the project is to restore a portion of the Loko o Mokuhinia to provide aquatic ecosystem functions as well as other wetland functions. The specific objectives of the project are to: (1) partially restore the Loko o Mokuhinia in order to maximize foraging habitat for the endangered Hawaiian stilt (*aeo*, *Himantopus mexicanus knudseni*) and Hawaiian coot (*alae ke okeo*, *Fulica alai*) throughout the year; and (2) provide habitat for migratory waterfowl and shorebird species. Based on the project goal and objectives, a restoration design has been developed. The design proposed for this site is developed to meet the foraging requirements of the target avian species. The designs will be further developed in the next phase of the project.

The proposed project site is generally contained within the boundaries of Malu Ulu Olele Park and the associated parking lot (tax map key (TMK) 2-4-6-07:001, 2-4-6-07:002, and 2-4-6-07:036), as well as the adjacent parcels that are currently occupied by the Salvation Army (TMK 2-4-6-07:037 and 2-4-6-07:038), Wainee Ahupuaa, Lahaina District, Maui (Attachment 1). The proposed project would not include any work within or immediately adjacent to Moku ula island, as delineated based on an 1884 map by S.E. Bishop.

As shown in Attachment 2, specific components of the proposed restoration design are outlined as follows:

- Excavation to intercept the existing groundwater, as needed to achieve a maximum water depth of approximately 2 feet, based on average groundwater levels in winter.

- Grading to provide shallow wetland slopes (with target slopes of 18:1 and maximum slopes of 3:1) and microtopographic variation throughout the wetland.

- Installation of a well and pump to supplement water levels, as needed to maintain desired water levels (particularly during drier months of the year).

- Installation of an outlet into an adjacent ditch (which runs along the northern edge of the project site) to promote internal water circulation and accommodate surface water overflow.

- Planting of wetland vegetation species including *kaluha* (*Bolboschoenus maritimus*), *makaloa* (*Cyperus laevigatus*), *ahuawa* (*Cyperus javanicus*), *akulikuli* (*Sesuvium portulacastrum*), *ae'ae* (*Bacopa monnieri*), *akiaki* (*Sporobolus virginicus*) and *ohelo kai* (*Lycium sandwicense*).

- Installation of a perimeter fence to provide predator control.

Area of Potential Effects (APE)
Historically, Loko o Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the shoreline of West Maui. The wetland served as habitat for a variety of wetland species, including Hawaiian waterbirds, migratory water fowl, and shorebird species. Traditionally, Loko o Mokuhinia had great religious and cultural significance being the residence of Kihawahine, a *moo akua* and spiritual guardian of the high ranking *alii* that ruled Maui during

prehistoric times. Within the pond was the island of Moku ula, which was the preferred residence of high ranking *alii* through the mid-1800s. Over time, alterations to the hydrologic regime resulted in stagnation of the pond and, in 1914, the pond was filled for hygienic and development purposes. A 1918 Executive Order turned the area over to the County of Maui for the establishment of Malu Ulu Olele Park. Based on previous archaeological studies and monitoring of geotechnical investigations, the old surfaces of Mokuhinia and Moku ula currently lie approximately 2- to 3-feet beneath the park.

As described in our letter dated January 3, 2013, the project site is a component of King Kamehameha III's Royal Residential Complex (National Register No. 97000408 and SIHP 50-50-03-2967), and is part of the Lahaina Historic District (National Register No. 66000302 and SIHP No. 50-50-03-3001). In addition, the site falls within Historic District No. 1, as designated by the County of Maui. Given the inclusion of the project site in these historic districts, the Corps has identified the APE as the entire National Historic Landmark District, which is the most expansive of the designated districts; the boundaries are shown in Attachment 3.

Previous Archaeological Studies

Archival and library research on the background history and prehistory of the project area and environs suggests that the survey parcel was likely used as open space and/or lake shore when Lahaina served as the capital of the Hawaiian Kingdom, and thereafter was used as open space. Pond sediments identified over a portion of the parcel also indicated the soils had been submerged for some time and it was likely that this portion was a part of Loko o Mokuhinia before the land filling activities during the turn of the century (Frederickson et al. 1989). Previous archaeological excavations in the project area, shown in Attachment 4, also confirmed the existence of Moku ula beneath the coral and soil fill of the park as well as several architectural features in a good state of preservation. Much of the island was considered to be still preserved under the overlying fill deposits. Excavations also found evidence that the Loko o Mokuhinia that surrounded the island of Moku ula was most likely a natural pond and that the island itself was likely a mud bar resulting from alluvial deposition that was modified significantly for habitation. Stratigraphic sequence for the filling of Moku ula and Loko o Mokuhinia recorded a total of eight modern or recent fill components identified overlying sediments associated with the occupation of Moku ula (Klieger 1995). Specific to Moku ula, two discrete cultural layers were identified beneath these fill layers, consisting of multiple sub-strata, lenses, and sub-surface features. Archaeological features identified included concentrations of midden and charcoal remains, as well as an *in situ* basalt boulder alignment; a possible intact human burial was also found (Klieger and Clark 1995). Specific to Loko o Mokuhinia, two sediment layers were identified, with multiple sub-layers, consisting of mixed deposit of late historic era artifacts and faunal remains.

Traditional Cultural Properties Study

A traditional cultural properties (TCP) study has also been undertaken, and a draft report is currently being prepared. Preliminary information from the TCP study referred to various cultural features, particularly those that relate to the adjacent Waiola Church and its cemetery (Wainee Cemetery), which serves as the final resting place for prominent *alii* and missionaries. These features include a path along the western edge of Wainee Cemetery (adjacent to the eastern edge of the project site), which was used for horse-drawn carriages delivering coffins to

the cemetery for burial. The western edge of the Waiola Church property also included stone steps that were used as an access point by *alii* traveling across Mokuhinia to attend church. Individuals interviewed for the project also referenced a culturally significant grove of coconut trees located near the southeastern corner of Malu Ulu Olele Park (outside of the project boundaries), as well as the potential for burials in the walls surrounding Mokuhinia.

Relative to the cultural and spiritual beliefs associated with the project site, individuals interviewed for the TCP study suggested that Moku ula may be the most sacred site in Hawaii and its history is of national significance. Informants explained that individuals and groups from around the world continue to visit the site to worship Kihawahine. Although Mokuhinia is filled, there are individuals who believe that Kihawahine still lives at the site while some believe that the *moo akua* no longer exists at the site.

Assessment of Potential Effects

Relative to the APE, it is expected that the project may directly affect resources within the boundaries of the project site, with potential indirect effects occurring in other portions of the APE, that is, within the larger historic district. Based on the archival and library studies, the archaeological resources that have been identified within the project site consist of the historic pond sediments of Loko o Mokuhinia, which included a mixed deposit of late historic era artifacts and faunal remains (Klieger 1995). No human burials have been identified within the boundaries of the project site. The majority of the archaeological features identified were directly associated with Moku ula and/or its adjacent holding ponds. These features would be avoided, as the project area does not include any portion of Moku ula. As survey-grade data are not available for the boundaries of Moku ula, the project boundary will incorporate a 10-meter buffer around a liberally estimated boundary of the island and its associate holding ponds, to further minimize the potential for inadvertent impacts to the features associated with Moku ula. Although the exact depth to the historic pond sediments is not known across the entire site, it is expected that excavation for the proposed project will occur in the general depth range of these sediments, such that they may be encountered across portions of the project site during construction. The pond sediments have the potential to contain significant archaeological data on the historic and prehistoric environment surrounding the Loko o Mohuhinia and Moku ula and on subsistence and settlement pattern within the coastal areas of this segment of Lahaina Historic District and Maui Island. Thus, excavation of the pond sediments has the potential to have an adverse impact to significant archaeological resources.

To minimize the potential for adverse impacts, it proposed that excavation of soil greater than 2 feet below ground surface (bgs) will be conducted in 6-inch increments, using GPS-mounted machinery, to allow for careful removal and inspection of the material. A qualified archaeological monitor shall be present during all ground-disturbing activities. An archeological monitoring plan (AMP) shall be required to be developed and approved by State Historic Preservation Division (SHPD) prior to the start of any ground disturbing activities. The AMP shall provide details on how the monitoring shall be performed; cultural layers and materials identified and collected; other cultural material such as charcoal samples for radiocarbon dating, bulk midden samples, and artifacts collected and analyzed; and standard documentation to be performed, including scaled maps, profiles, photographs, detailed soil and provenience descriptions, and interpretation.

In the event that the archaeological monitor identifies archaeological materials, work in that area would be stopped immediately to allow the monitor to investigate the nature of the discovery. In the event that human remains are identified, SHPD shall be immediately notified and no further work would occur in the area unless specifically requested by SHPD. Additional details regarding the handling of any archaeological features would be outlined as part of the AMP.

The southwest corner of the site (including the areas occupied by the Salvation Army and a portion of the existing parking lot) has not undergone any subsurface investigations. It is anticipated that, if present, archaeological resources in these areas would be similar in nature to those that occur in previously investigated portions of the project site. In consultation with SHPD, an archaeological investigation of these areas may be conducted before construction and treatment of resources of these areas would be consistent with the approach described above.

In addition to the archaeological resources within the project site, a variety of other resources occur within the APE, as part of both King Kamehameha III's Royal Residential Complex and as part of the larger Lahaina Historic District. Implementation of the project design is not expected to directly affect any of the resources that occur outside of the project site, although construction activities associated with the project could indirectly affect these resources; indirect impacts could include noise or disruption of views from other portions of the historic district toward or across the site during construction. However, these impacts would be temporary. Over the long-term, implementation of the project is expected to benefit the overall historic district, through restoration of features that are consistent with the defining characteristics that contribute to its overall significance.

Relative to traditional cultural practices, preliminary results of the TCP indicate that the project site is considered to be a sacred cultural site and continues to be part of the living culture of the native Hawaiian community. A variety of cultural practices historically used areas within and surrounding the site, and although Mokuhinia is currently filled, the site is still actively used by some individuals for cultural practices, including the worship of Kihawahine. It is expected that cultural practices that occur within the project site may be temporarily affected during construction, as access to the site will likely be limited during ground-disturbing activities. However, these impacts are again temporary in nature. In recognition of the cultural importance of the site, the Corps will require consultants and contractors to be briefed on the nature of the site prior to the commencement of work and to allow for Native Hawaiian cultural protocol to be preformed prior to the start and at the end of any ground disturbing activity.

Determination of Effects

Based on the foregoing, the Corps has determined that the project will not adversely affect historic properties. An archaeological monitor will accompany all earth moving construction activities and the other provisos mentioned above such as implementation of cultural protocols, briefing of contractors, and incorporation of additional input, as appropriate, will be implemented. As part of the Corps feasibility planning process and pursuant to NEPA, an Environmental Assessment (EA) is being prepared to address potential impacts of the proposed project. SHPD shall be provided a copy of the draft EA as well as the draft TCP study. In the meantime, we are seeking your concurrence to the Corps' determination above of 'no adverse

effects to historic properties,' consistent with the requirements of Section 106 of the NHPA. Should any changes occur in any elements of the proposed design or construction described above, SHPD shall be notified of those changes and the 'no adverse effect' determination re-evaluated with your office in accordance with Section 106 of the NHPA.

References Cited:

Frederickson et al. 1989. *An Archaeological Inventory Survey or Parcel of Land Adjacent to Malu-ulu-o-lele Park, Lahaina, Maui, Hawaii*. Prepared for the County of Maui Department of Parks and Recreation. Xamanek Researchers, Pukalani, HI.

Klieger. Paul Christiaan (editor). 1995. *Moku'ula: History and Archaeology Excavations at the Private Palace of King Kamehameha III in Lahaina, Maui*. Prepared for Lahaina Restoration Foundation. Anthropology Department, Bishop Museum, Honolulu HI.

Klieger, Paul Christiaan and Stephen Clark. 1995. *Report on Human Burials at the Site 50-50-03-2967, Moku'ula, Lahaina, Maui*. Prepared for the State of Hawaii, Department of Land and Natural Resources, State Historic Preservation Division and Maui County Burial Council. Anthropology Department, Bishop Museum, Honolulu HI.

APPENDIX K

Consistency Determination for the Hawai`i CZM Program

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

August 7, 2013

Civil and Public Works Branch
Programs and Project Management Division

Mr. John Nakagawa
Federal Consistency Program
Hawaii State Office of Planning
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Mr. Nakagawa:

At the request of the County of Maui (henceforth referred to as the County), the Honolulu District, U.S. Army Corps of Engineers (USACE) is conducting a feasibility planning study for the proposed Mokuhinia Ecosystem Restoration Project in the town of Lahaina, on the island of Maui, Hawaii (Enclosure 1). The study is authorized under Section 206 of the 1996 Water Resources Development Act (WRDA), as amended.

Historically, Mokuhinia was an approximately 17-acre pond, one in a series of coastal wetlands along the western shoreline of Maui. The site served as habitat for a variety of waterbird and migratory shorebirds, as well as other wetland species. Within this pond, was the island of Mokuula, which was the preferred residence of high ranking alii (chiefs) of Maui through the mid-1800s. However, in 1913, Lahaina businessmen filled the pond for hygienic and development purposes, and a 1918 State Executive Order turned the area over to the County for the establishment of Malu Ulu o Lele Park. Mokuhinia and Mokuula currently lie approximately 2 to 3 feet under the ground surface of the park. The proposed project specifically addresses restoration of the aquatic ecosystem functions and processes associated with Mokuhinia.

Other activities are being concurrently planned within Malu Ulu o Lele Park as part of the restoration of the overall site as shown in Enclosure 1. Specifically, restoration of Mokuula is being pursued by the County in coordination with the native Hawaiian community. In addition, an area within the southeast corner of the park has been reserved for use by the by the Friends of Mokuula, a local non-profit organization. It is important to note that USACE is coordinating the restoration of Mokuhinia with these other activities, but does not have the authority to be involved with their planning or implementation.

PROJECT DESCRIPTION

As defined, the goal of the project is to restore a portion of the pond and associated wetlands of Mokuhinia to provide aquatic ecosystem functions and values, with consideration given to the subsequent cultural revitalization of Moku Ula by the native Hawaiian community. The specific objectives of the project are to: (1) re-establish wetland functions and values associated with Mokuhinia; (2) maximize foraging habitat throughout the year for the endangered Hawaiian stilt (aeo, Himantopus mexicanus knudseni) and Hawaiian coot (alae ke okeo, Fulica alai); and (3) provide habitat for migratory waterfowl and shorebird species.

Based on the project goal and objectives, a conceptual restoration design has been developed for the proposed project as shown in Enclosure 2. Specific components of the conceptual restoration design are as follows:

- Excavation to intercept the existing groundwater, as needed to achieve a maximum water depth of approximately 2 feet, based on average groundwater levels in the winter.

- Grading to provide shallow wetland slopes (with target slopes of 18:1 and maximum slopes of 3:1) and microtopographic variation throughout the wetland.

- Installation of a groundwater well and pump to supplement groundwater levels, as needed to maintain the desired hydrologic regime (particularly during drier months of the year).

- Installation of an outlet into an adjacent ditch (which runs along the northern edge of the project site) to promote internal water circulation and accommodate surface water overflow.

- Planting of wetland vegetation species including kaluha (*Bolboschoenus maritimus*), makaloa (*Cyperus laevigatus*), ahuawa (*Cyperusjavanicus*), akulikuli (*Sesuvium portulacastrum*), aeae (*Bacopa monnieri*), akiaki (*Sporobolus virginicus*), and ohelo kai (*Lycium sandwicense*).

- Installation of a perimeter fence to provide predator control.

If approved, it is currently anticipated that construction of the project would be completed in 2016. The USACE would be responsible for post-construction performance monitoring at the site for up to 10 years, and long-term operations and maintenance (O&M) activities would be performed by the County. Specific O&M

activities would be specified in an O&M plan prepared by USACE, and are expected to include basic site maintenance (e.g., trash removal, inspection, and repair of the perimeter fence), water level monitoring, pump operations, maintenance, vegetation management, and predator control efforts (e.g., trapping).

COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY

Section 307(c)(1)(A) of the CZMA requires federal actions that affect any land or water use or natural resources of the coastal zone be conducted in a manner that is consistent to the maximum extent practicable with the enforceable policies of an approved state management program. As the proposed project is being undertaken by USACE, it represents a federal action that is understood to require compliance under the "federal consistency" provision of the CZMA. Based on a review relative to the policies and objectives of Hawaii's CZM Program, we have determined that the proposed project is consistent to the maximum extent practicable. We are submitting the attached application and assessment forms, with a request for your concurrence with this determination. In addition, we will provide a copy of the Draft Integrated Feasibility Report and Environmental Assessment within the next few weeks, after it is published for public review. This document contains supporting information, including a detailed project description and associated maps, for your consideration.

If you have any questions, please contact Ms. Athline Clark, Project Manager of my Civil and Public Works Branch, at (808) 835-4032 or e-mail athline.m.clark@usace.army.mil.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosures

Hawaii CZM Program
Coastal Zone Management

HAWAII CZM PROGRAM
APPLICATION FOR CZM FEDERAL CONSISTENCY REVIEW

Project/Activity Title or Description: Mokuhinia Ecosystem Restoration Project

Location: Malu`ulu o Lele Park, Lahaina

Island: Maui

Tax Map Key: (2)4-6-007:002

Applicant and Agent Information

1. U.S. Army Corps of Engineers
Name of Applicant
Building 230
Address
Fort Shafter,HI 96858
City & State Zip Code
835-4032
Daytime Phone Fax Number
athline.m.clark@usace.army.mil
E-mail Address

2.
Name of Agent
Address
City & State Zip Code
Daytime Phone Fax Number
E-mail Address

CZM Consistency Determination or Certification

x Check the type of application below and sign.

☒ I. Federal Agency Activity

CZM Consistency Determination: "The proposed activity will be undertaken in a manner consistent to the maximum extent practicable with the enforceable policies of the Hawaii Coastal Zone Management Program."

Signature _____ Date AUG 07 2013
(Applicant or responsible party)

☐ II. Federal Permit or License (Please sign below)

CZM Consistency Certification: "The proposed activity complies with the enforceable policies of Hawaii's approved management program and will be conducted in a manner consistent with such program."

Signature _____ Date _____
(Applicant or responsible party)

☐ III. Federal Grants and Assistance (Please sign below)

CZM Consistency Certification: "The proposed activity complies with the enforceable policies of Hawaii's approved management program and will be conducted in a manner consistent with such program."

Signature _____ Date _____
(Applicant or responsible party)

Send To: Office of Planning, P.O. Box 2359, Honolulu, Hawaii 96804

Print Form

HAWAII CZM PROGRAM
FEDERAL CONSISTENCY ASSESSMENT FORM

RECREATIONAL RESOURCES

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

1) Improve coordination and funding of coastal recreation planning and management.

2) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

   a) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

   b) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

   c) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

   d) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

   e) Encouraging expanded public recreational use of county, State, and Federally owned or controlled shoreline lands and waters having recreational value;

   f) Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;

   g) Developing new shoreline recreational opportunities, where appropriate, such as artificial reefs for surfing and fishing; and

   h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, County planning commissions; and crediting such dedication against the requirements of section 46-6.

RECREATIONAL RESOURCES (continued)

Check either "Yes" or "No" for each of the following questions:		Yes	No
1.	Will the proposed action involve or be near a dedicated public right-of-way?	☐	☒
2.	Does the project site abut the shoreline?	☐	☒
3.	Is the project site near a State or County park?	☒	☐
4.	Is the project site near a perennial stream?	☐	☒
5.	Will the proposed action occur in or affect a surf site?	☐	☒
6.	Will the proposed action occur in or affect a popular fishing area?	☐	☒
7.	Will the proposed action occur in or affect a recreational or boating area?	☐	☒
8.	Is the project site near a sandy beach?	☐	☒
9.	Are there swimming or other recreational uses in the area?	☐	☒

Discussion:

The proposed project is located within Malu`ulu o Lele Park, which was assigned by State Executive Order to the County of Maui. The primary recreational uses and facilities that occur within the park include basketball, baseball/softball, tennis and gateball. In anticipation of the proposed project, the County has been working to address the future displacement of these activities with similar or improved recreational facilities within a short distance of the project site, such that displacement of Malu`ulu o Lele Park is not expected to result in a significant adverse impact; a detailed discussion of these actions is provided in the Draft Integrated Feasibility Report and Environmental Assessment (EA).

In addition to these recreational uses, the project site is identified as a destination along Ala Hele Moʻolelo O Lāhainā (Lāhainā Historic Trail), a self-guided tour focused on important historical sites throughout Lāhainā. Relative to recreational opportunities associated with the guided tours, the restored wetland is expected to serve as an added attraction, thus providing a long-term benefit.

Coastal-based recreational opportunities in the project vicinity include those associated with the nearby shoreline and ocean. However, these resources are located more than 400 feet to the west (beyond Front Street), and are not expected to be affected by project implementation.

HISTORIC RESOURCES

Objective: Protect, preserve, and where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

1) Identify and analyze significant archaeological resources;

2) Maximize information retention through preservation of remains and artifacts or salvage operations; and

3) Support State goals for protection, restoration, interpretation, and display of historic resources.

Check either "Yes" or "No" for each of the following questions:	Yes	No
1. Is the project site within a historic/cultural district?	☒	☐
2. Is the project site listed on or nominated to the Hawaii or National register of historic places?	☒	☐
3. Does the project site include undeveloped land which has not been surveyed by an archaeologist?	☒	☐
4. Has a site survey revealed any information on historic or archaeological resources?	☒	☐
5. Is the project site within or near a Hawaiian fishpond or historic settlement area?	☒	☐

Discussion:

The project site is a component of King Kamehameha III's Royal Residential Complex (National Register No. 97000408 and SIHP 50-50-03-2967), and is also part of the Lāhainā Historic District (National Register No. 66000302 and SIHP No. 50-50-03-3001). In addition, the site falls within Historic District No. 1, as designated by the County of Maui. Archaeological resources that have been identified within the project site consist of those associated with the historic pond sediments of Loko o Mokuhinia, which include a mixed deposit of late historic era artifacts and faunal remains. A detailed discussion of the measures that would be implemented to avoid and minimize construction-related impacts to archaeological resources is provided in the Draft Integrated Feasibility Report and EA. Over the long-term, implementation of the project is expected to benefit archaeological and cultural resources through restoration of features that contribute to the overall significance of the site.

SCENIC AND OPEN SPACE RESOURCES

Objective: Protect, preserve and where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

1) Identify valued scenic resources in the coastal zone management area;

2) Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

3) Preserve, maintain and where desirable, improve and restore shoreline open space and scenic resources; and

4) Encourage those developments that are not coastal dependent to locate in inland areas.

Check either "Yes" or "No" for each of the following questions:	Yes	No
1. Does the project site abut a scenic landmark?	☐	☒
2. Does the proposed action involve the construction of a multi-story structure or structures?	☐	☒
3. Is the project site adjacent to undeveloped parcels?	☒	☐
4. Does the proposed action involve the construction of structures visible between the nearest coastal roadway and the shoreline?	☐	☒
5. Will the proposed action involve construction in or on waters seaward of the shoreline? On or near a beach?	☐	☒

Discussion:

Implementation of the proposed project is expected to positively affect aesthetics in the project vicinity. Although the site currently provides views of open space associated with Malu`ulu o Lele Park, the project would restore the site to a state that is expected to be similar to historical conditions, which is generally expected to be more aesthetically pleasing. In particular, restoration of aquatic habitat (including native vegetation) will enhance views of the project site. As further discussed in the Draft Integrated Feasibility Report and EA, the project is not expected to restrict any existing view planes, including those east toward the West Maui Mountains (for example, from Kamehameha Iki Park), west toward the Pacific Ocean (particularly those views from Waiola Church), and/or along Front and Shaw Streets.

COASTAL ECOSYSTEMS

Objective: Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

1) Improve the technical basis for natural resources management;
2) Preserve valuable coastal ecosystems of significant biological or economic importance;
3) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land water uses, recognizing competing water needs; and
4) Promote water quantity and quality planning and management practices, which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses, which violate State, water quality standards.

Check either "Yes" or "No" for each of the following questions:	Yes	No
1. Does the proposed action involve dredge or fill activities?	☐	☒
2. Is the project site within the Shoreline Setback Area (20 to 40 feet inland of the shoreline)?	☐	☒
3. Will the proposed action require some form of effluent discharge into a body of water?	☐	☒
4. Will the proposed action require earthwork beyond clearing and grubbing?	☒	☐
5. Will the proposed action include the construction of special waste treatment facilities, such as injection wells, discharge pipes, or cesspools?	☐	☒
6. Is an intermittent or perennial stream located on or near the project site?	☐	☒
7. Does the project site provide habitat for endangered species of plants, birds, or mammals?	☐	☒
8. Is any such habitat located nearby?	☐	☒
9. Is there a wetland on the project site?	☐	☒
10. Is the project site situated in or abutting a Natural Area Reserve?	☐	☒
11. Is the project site situated in or abutting a Marine Life Conservation District?	☐	☒
12. Is the project site situated in or abutting an estuary?	☐	☒

Discussion:

The project site is currently comprised of an open field dominated with non-native species; no surface water features currently exist within the site. The proposed project involves excavation to intercept the existing groundwater, as needed to restore a coastal wetland ecosystem. Ground disturbance during construction could increase the amount of sediment and other pollutants in stormwater runoff, which could affect water quality in receiving waters. As further described in the Draft Integrated Feasibility Report and EA, sediment, erosion, and pollution prevention measures would be implemented, such that impacts to receiving waters are expected to be minimal.

ECONOMIC USES

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

1) Concentrate in appropriate areas the location of coastal dependent development necessary to the State's economy;

2) Insure that coastal dependent development such as harbors and ports, visitor industry facilities, and energy generating facilities are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

3) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

   a) Utilization of presently designated locations is not feasible;

   b) Adverse environmental effects are minimized; and

   c) Important to the State's economy.

Check either "Yes" or "No" for each of the following questions:		**Yes**	**No**
1.	Does the project involve a harbor or port?	☐	☒
2.	Is the project site within a designated tourist destination area?	☒	☐
3.	Does the project site include agricultural lands or lands designated for such use?	☐	☒
4.	Does the proposed activity relate to commercial fishing or seafood production?	☐	☒
5.	Does the proposed activity related to energy production?	☐	☒
6.	Does the proposed activity relate to seabed mining?	☐	☒

Discussion:

The proposed project would involve restoration of coastal wetland habitat in the Lahaina Historic Landmark, which is a primary tourist destination of Lahaina town. The proposed project would not result in the expansion or otherwise affect development in the coastal area.

COASTAL HAZARDS

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence.

Policies:

1) Develop and communicate adequate information on storm wave, tsunami, flood erosion, and subsidence hazard;

2) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;

3) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

4) Prevent coastal flooding from inland projects.

Check either "Yes" or "No" for each of the following questions:	Yes	No
1. Is the project site on or abutting a sandy beach?	☐	☒
2. Is the project site within a potential tsunami inundation area as depicted on the National Flood Insurance Program flood hazard map?	☒	☐
3. Is the project site within a potential flood inundation area according to a flood hazard map?	☒	☐
4. Is the project site within a potential subsidence hazard areas according to a subsidence hazard map?	☐	☒
5. Has the project site or nearby shoreline areas experienced shoreline erosion?	☐	☒

Discussion:

As described in the Draft Integrated Feasibility Report and EA, the project site is located within an area designated by FEMA as being subject to inundation during the 1-percent-annual-chance flood event (Zone AE). It is also located within the potential tsunami inundation area. Although there is a potential for these hazards to occur within the site, these conditions would not be expected to adversely affect the long-term functionality of the restored wetland. The restored wetland would include an outlet, which would function to maintain positive flow and regulate water levels within the wetland, such that the proposed project is not expected to increase flooding hazards within the project site or adjacent properties. As wetlands naturally attenuate flood waters, the restored habitat is expected to contribute to floodplain function, thus providing floodplain-related benefits

MANAGING DEVELOPMENT

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

1) Effectively utilize and implement existing law to the maximum extent possible in managing present and future coastal zone development;

2) Facilitate timely processing of application for development permits and resolve overlapping or conflicting permit requirements; and

3) Communicate the potential short- and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the general public to facilitate public participation in the planning and review process.

Check either "Yes" or "No" for each of the following questions:	Yes	No
1. Will the proposed activity require more than two (2) permits or approval? (Provide the status of each.)	☒	☐
2. Does the proposed activity conform with the State and County land use designations for the site?	☒	☐
3. Has or will the public be notified of the proposed activity?	☒	☐
4. Has a draft or final environmental impact statement or an environmental assessment been prepared?	☒	☐

Discussion:

The Draft Integrated Feasibility Report and EA describes the potential impacts of the proposed project, and is being provided for public review. A detailed list of the permits and approvals that will be required for the proposed project is contained in the Draft Integrated Feasibility Report and EA. In addition, the report includes a discussion of the extensive stakeholder involvement efforts that have been conducted to date.

PUBLIC PARTICIPATION

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

1) Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;

2) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and

3) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion. Please provide information about the proposal relevant to the Objective and Policies No. 2 and No. 3 above:

The planning process for the proposed project has included an extensive stakeholder involvement effort, as needed to disseminate information and obtain stakeholder input relative to the potential impacts and other aspects of the proposed project. A discussion of the extensive stakeholder involvement efforts that have been conducted to date is contained in the Draft Integrated Feasibility Report and EA.

BEACH PROTECTION

Objective: Protect beaches for public use and recreation.

Policies:

1) Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;

2) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

3) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion. Please provide information about the proposal relevant to the Objective and Policies above:

The proposed project would not affect any shoreline or beach areas.

MARINE RESOURCES

Objective: Implement the State's ocean resources management plan.

Policies:

1) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

2) Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

3) Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;

4) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

5) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

6) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion. Please provide information about the proposal relevant to the Objective and Policies above:

The proposed project would not affect any marine areas.

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