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February 13, 2020 2020/ED-2(AB)

Mr. Keith Kawaoka, Director
State of Hawaii
Department of Health
Office of Environmental Quality Control
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Mr. Kawaoka:

SUBJECT:	Chapter 343, Hawaii Revised Statutes Draft Environmental Assessment (DEA)
Project:	Waimanalo Paradise Seawall Repair
Applicants:	Nesbitt HI Holdings, LLC, and Waimanalo Paradise LLC
Agent:	HHF Planners (Scott Ezer)
Location:	41-505 Kalanianaole Highway - Waimanalo
Tax Map Keys:	4-1-002: 021 and 022

With this letter, the Department of Planning and Permitting hereby transmits the DEA and anticipated finding of no significant impact for the Waimanalo Paradise seawall Repair Project at 41-505 Kalanianaole Highway (Tax Map Keys 4-1-021 and 022), in the Koolaupoko District on the island of Oahu, for publication in the February 23, 2020, edition of "The Environmental Notice."

We are transmitting a completed Office of Environmental Quality Control Publication Form, a KML map file, and an electronic copy of the DEA via the online submittal form. Should you have any questions, please contact Alex Beatty, of our staff, at 768-8032.

Very truly yours,

FOR: Kathy K. Sokugawa
Acting Director

From: webmaster@hawaii.gov
To: HI Office of Environmental Quality Control
Subject: New online submission for The Environmental Notice
Date: Thursday, February 13, 2020 3:11:35 PM

Action Name

Waimanalo Paradise Seawall Repair

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (3) Propose any use within a shoreline area

Judicial district

Koʻolaupoko, Oʻahu

Tax Map Key(s) (TMK(s))

(1) 4-1-002:021 ; (1) 4-1-002:022

Action type

Applicant

Other required permits and approvals

Numerous

Discretionary consent required

Shoreline Setback Variance

Approving agency

City and County of Honolulu, Department of Planning and Permitting

Agency contact name

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Applicant

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Applicant address

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Was this submittal prepared by a consultant?

Yes

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Consultant address

733 Bishop Street, #2590
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United States
Map It

Action summary

Waimanalo Paradise LLC and Nesbitt HI Holdings, LLC are proposing repairs and modifications to an existing seawall fronting two residential oceanfront parcels in Waimānalo, Oʻahu, Hawaiʻi. The existing seawall was originally constructed roughly 100 years to protect the property from erosion and ocean-related hazards, and is structurally deficient to meet current design soil and design wave loads. Proposed improvements consist of repairs to shore up damaged and deteriorated portions of the seawall; modifications to raise the wall height along portions of the seawall to a uniform 9-foot height; and the addition of structural elements located inland of the existing seawall.

Reasons supporting determination

See DEA Section 7

Attached documents (signed agency letter & EA/EIS)

- DOC001-12.pdf
- Waimanalo-Paradise-DRAFT-EA-Feb-7-2020.pdf

Action location map

- WaimanaloSeaWall_ProjectARea.zip

Authorized individual

Alex Beatty

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

Draft Environmental Assessment

WAIMĀNALO PARADISE SEAWALL REPAIR

FEBRUARY 2020

Prepared For

Waimānalo Paradise LLC

Prepared By

HHF PLANNERS
places for people

Draft Environmental Assessment
WAIMĀNALO PARADISE SEAWALL REPAIR

FEBRUARY 2020

Prepared For

Waimānalo Paradise LLC

Prepared By

HHF PLANNERS
places for people

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ACRONYMS AND ABBREVIATIONS

AAQS	ambient air quality standards
AIS	Archaeological Inventory Survey
AMAP	Applicable Monitoring and Assessment Plan
BFE	base flood elevation
BLNR	Board of Land and Natural Resources
BMPP	Best Management Practices Plan
CGG	University of Hawaiʻi Coastal Geology Group
Chl a	Chlorophyll a
CIA	cultural impact assessment
City	City and County of Honolulu
CMU	concrete masonry unit
CO	carbon monoxide
CRM	concrete rubble masonry
CSH	Cultural Surveys Hawaiʻi
CZM	Coastal Zone Management
DA	Department of the Army
dBA	A-weighted decibels
DLNR	State of Hawaiʻi Department of Land and Natural Resources
DOH	State of Hawaiʻi Department of Health
DP	Development Plan
DPP	City and County of Honolulu Department of Planning and Permitting
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
H_2S	hydrogen sulfide
HAR	Hawaiʻi Administrative Rules
HDOH-WQS	State of Hawaiʻi Department of Health Water Quality Standards
HDOT	State of Hawaiʻi Department of Transportation
HPD	Honolulu Police Department
HRS	Hawaiʻi Revised Statutes
KIbC	Kawaihapai very stony clay loam, 0 to 15%
LUO	City and County of Honolulu Land Use Ordinance
MCBH	Marine Corps Base Hawaii
MCTAB	Marine Corps Training Area Bellows
mgd	million gallons per day
mhhw	mean higher high water line
MRCI	Marine Research Consultants, Inc.
msl	mean sea level
NH4+	ammonium nitrogen
NHO	Native Hawaiian Organization
NO_2	nitrogen dioxide
NO3-	nitrate + nitrite nitrogen (NO3- + NO2-
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWP	Nationwide Permit
O_3	ozone
OCCL	Office of Conservation and Coastal Lands
OP	State of Hawaiʻi Office of Planning
Pb	lead
$PM_{2.5}$	fine particulate matter, 2.5 microns (size) or smaller
PM_{10}	particulate matter, 10 microns (size) or smaller
PO4-3	orthophosphate phosphorus
ROH	Revised Ordinances of Honolulu
SEI	Sea Engineering, Inc.
SCP	Sustainable Communities Plan
Si	silica
SFHA	Special Flood Hazard Area
SIHP	State Inventory of Historic Places
SLR	sea level rise
SMA	Special Management Area

SSBN Small-scale beach nourishment

SSV Shoreline Setback Variance

$S0_2$ sulfur dioxide

TCP traditional cultural properties

TMK Tax Map Key

TN total nitrogen

TP total phosphorus

UH University of Hawai‘i

USFWS United States Fish and Wildlife Service

WQC Water Quality Certification

1. INTRODUCTION

Waimānalo Paradise LLC and Nesbitt HI Holdings, LLC (the Applicant) is proposing repair and modification of an existing seawall fronting two residential oceanfront parcels in Waimānalo, Oʻahu, Hawaiʻi. The proposed repairs and modifications ("Proposed Action") are needed to shore up damaged and deteriorated portions of the seawall and to increase the height of portions of the seawall to achieve a minimum 9-foot height along its length. The Proposed Action is intended to protect the residential property from wave damage, erosion, and the effects of sea level rise.

1.1 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) is prepared in accordance with Chapter 343 Hawaiʻi Revised Statutes (HRS), as amended, and Title 11, Chapter 200.1, Hawaiʻi Administrative Rules (HAR), Environmental Impact Statement Rules. An EA is required due to the location of the Proposed Action within the shoreline area as defined in Section 206A-41 HRS. No public funds are being used for this project.

This EA analyzes the potential environmental and socioeconomic consequences of the Proposed Action and reasonable alternatives. The intent of the EA is to provide sufficient analysis for determining whether the Proposed Action requires preparation of an environmental impact statement or a Finding of No Significant Impact (FONSI) pursuant to Chapter 343 HRS.

1.2 PROJECT SUMMARY

PROJECT NAME	Waimānalo Paradise Seawall Repair
PROPOSED ACTION	Repair and modification of an existing seawall fronting two residential parcels in Waimānalo. The subject seawall is constructed of stone and concrete grout and was built between 1911 and 1928. The seawall is 585 feet long with a crest elevation ranging from +11.0 feet mean sea level (msl) to +5.0 feet msl. Seawall height will be increased in several sections to achieve a minimum height of +9 feet msl.
LOCATION	41-505 Kalanianaʻole Highway, Waimānalo, Oʻahu, Hawaiʻi
TAX MAP KEY (TMK) PARCELS	(1) 4-1-002:021 and 022
PROJECT AREA	Approximately 3.005 acres (130,900 square feet)
LANDOWNERS/APPLICANTS	Waimānalo Paradise LLC (Owner of TMK Parcel (1) 4-1-002:022) Nesbitt HI Holdings, LLC (Owner of TMK Parcel (1) 4-1-002:021)
STATE LAND USE DISTRICT	Urban District
DEVELOPMENT PLAN (DP) DESIGNATION	Koʻolau Poko Sustainable Communities Plan Land Use Designation: Low Density Residential
ZONING	R-10 Residential
SPECIAL MANAGEMENT AREA (SMA)	Within SMA

FLOOD ZONE DESIGNATION	Zone VE—100-year flood, Coastal, Wave Action, base flood elevation (BFE) determined Zone AE—100-year flood, BFE determined Zone D—Outside 500-year flood boundary
PERMITS AND APPROVALS REQUIRED	HRS Chapter 343, Hawaiʻi Environmental Policy Act compliance Board of Land & Natural Resources approval Shoreline Setback Variance (SSV) Building, grading, grubbing, stockpiling permits
CHAPTER 343 HRS ANTICIPATED DETERMINATION	Finding of No Significant Impact (FONSI)
APPROVING AGENCY CONTACT	City and County of Honolulu Department of Planning and Permitting 650 South King Street, 7th Floor Honolulu, Hawaiʻi 96813
CONSULTANT CONTACT	Scott Ezer, Principal HHF Planners 733 Bishop Street, Suite 2590 Honolulu, Hawaiʻi 96813, sezer@hhf.com; (808) 457-3158

2. PROJECT DESCRIPTION AND ALTERNATIVES

2.1 PROJECT LOCATION

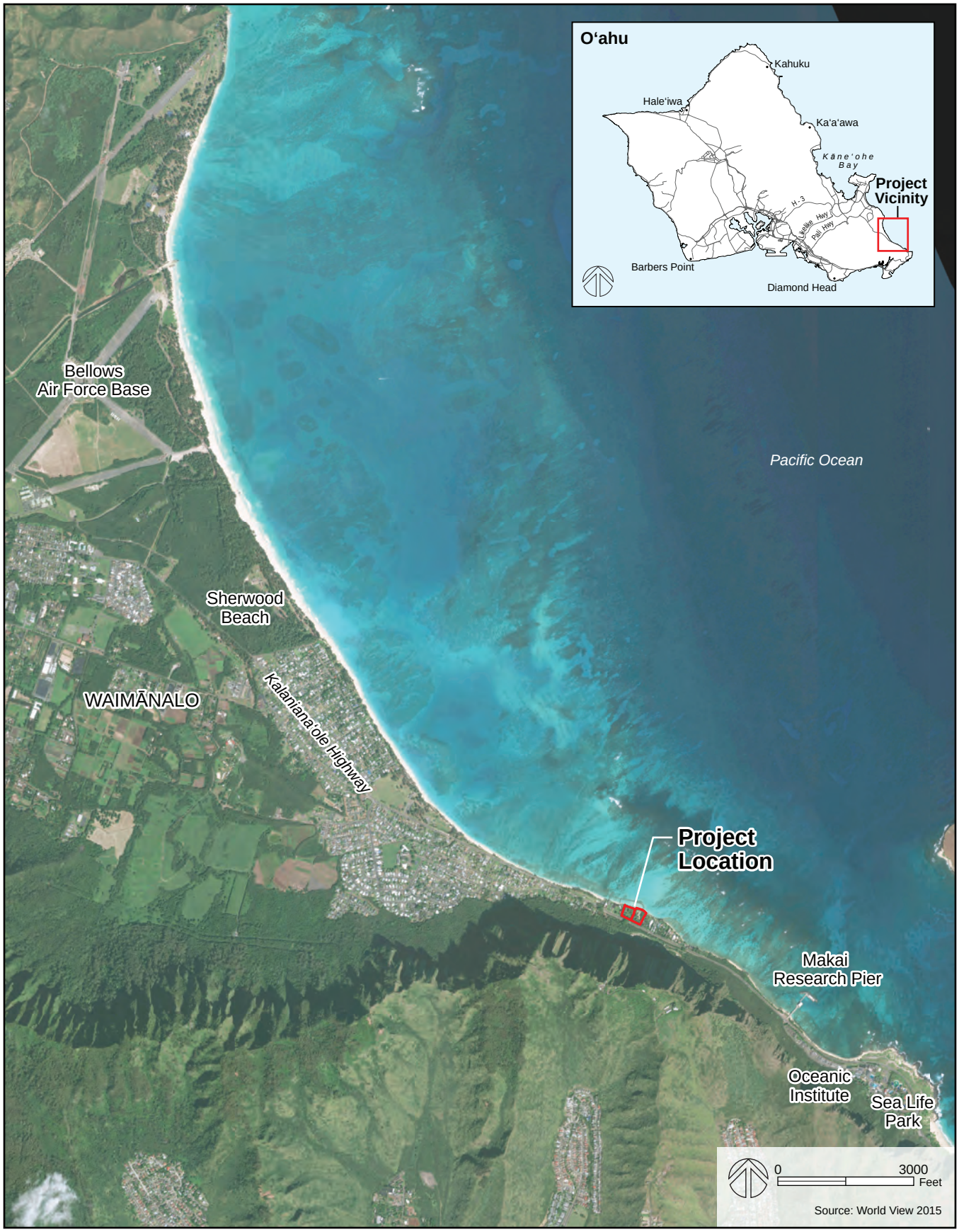
The Waimānalo Paradise residential property is located at 41-505 Kalaniana‘ole Highway in the *ahupua‘a* of Waimānalo, located on the windward side of the Island of O‘ahu (Figure 2-1). The community of Waimānalo is located roughly 17 miles from Downtown Honolulu. The project site is limited to the seawall area of the three-acre Waimānalo Paradise property.

The Waimānalo Paradise property was recently subdivided into two parcels, identified as Tax Map Key (TMK) (1) 4-1-002:021 (Parcel 21) and 022 (Parcel 22). The two contiguous lots are bordered by Kalaniana‘ole Highway to the south (mauka), residential parcels to the east, the Shriner’s Beach Club to the west, and the Pacific Ocean to the north (makai). The property is adjacent to a historic fishpond or pāhonu (turtle enclosure). The vertical seawall on the ocean side of the property is the subject of the proposed repairs. The photo below shows the Waimānalo Paradise property and the seawall.

Waimānalo Paradise property and subject seawall Source: SEI, 2019

2.2 PURPOSE AND NEED FOR ACTION

The purpose of the Proposed Action is twofold: 1) to increase the resilience of the Waimānalo Paradise property to coastal hazards and sea level rise through 2070, which is the 50-year planning horizon for this project; and 2) to repair the existing seawall to increase its useful life. According to federal and State of Hawai‘i planning estimates, by year 2070, sea level is expected to rise by 3.2 feet. The community of Waimānalo is located on the southeast corner of O‘ahu, and its northeast facing shoreline is exposed to a range of hazards including, but not limited to, tsunami, hurricanes, erosion, and sea level rise. The property’s oceanfront location makes it particularly vulnerable to natural hazards, which are expected to increase as sea level continues to rise.



Project Location Map **Figure 2-1**

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

The existing seawall is intended to protect the Waimānalo Paradise property from erosion and ocean-related hazards, but it is over 100 years old and in a deteriorated condition. A structural analysis of the seawall (Sea Engineering, Inc. (SEI), 2020) identified existing damage and structural deficiencies including cracks, delamination, spalling, abrasion, undermining, and sinkholes. The study found portions of the wall are structurally inadequate and fail to meet design soil and design wave loads.

If not repaired or replaced, the seawall will continue to deteriorate. As sea level rises, the magnitude and frequency of wave overtopping will increase. The existing structure is insufficient to protect the property against these current and future threats. Parcel 21 is particularly vulnerable because the seawall crest elevation is lower (by approximately 5 feet) and the seawall is in a more deteriorated condition than the section fronting Parcel 22.

The Proposed Action includes seawall repairs designed to achieve adequate resistance to design soil loads, reduce wave overtopping under design wave conditions, and increase the resilience of the property to sea level rise. A key component of the Proposed Action is increasing the crest elevation of portions of the seawall to +9.0 feet mean sea level (msl) to create a uniform wall height.

In summary, the objectives of the Proposed Action are to:

1. Repair portions of the seawall to improve structural integrity
2. Increase the resilience of the property to coastal hazards and sea level rise through 2070
3. Reduce wave overtopping under design wave conditions through 2070
4. Ensure that the existing seawall can provide adequate resistance to design soil loads

2.3 DESCRIPTION OF THE PROJECT SITE

2.3.1 Existing Uses

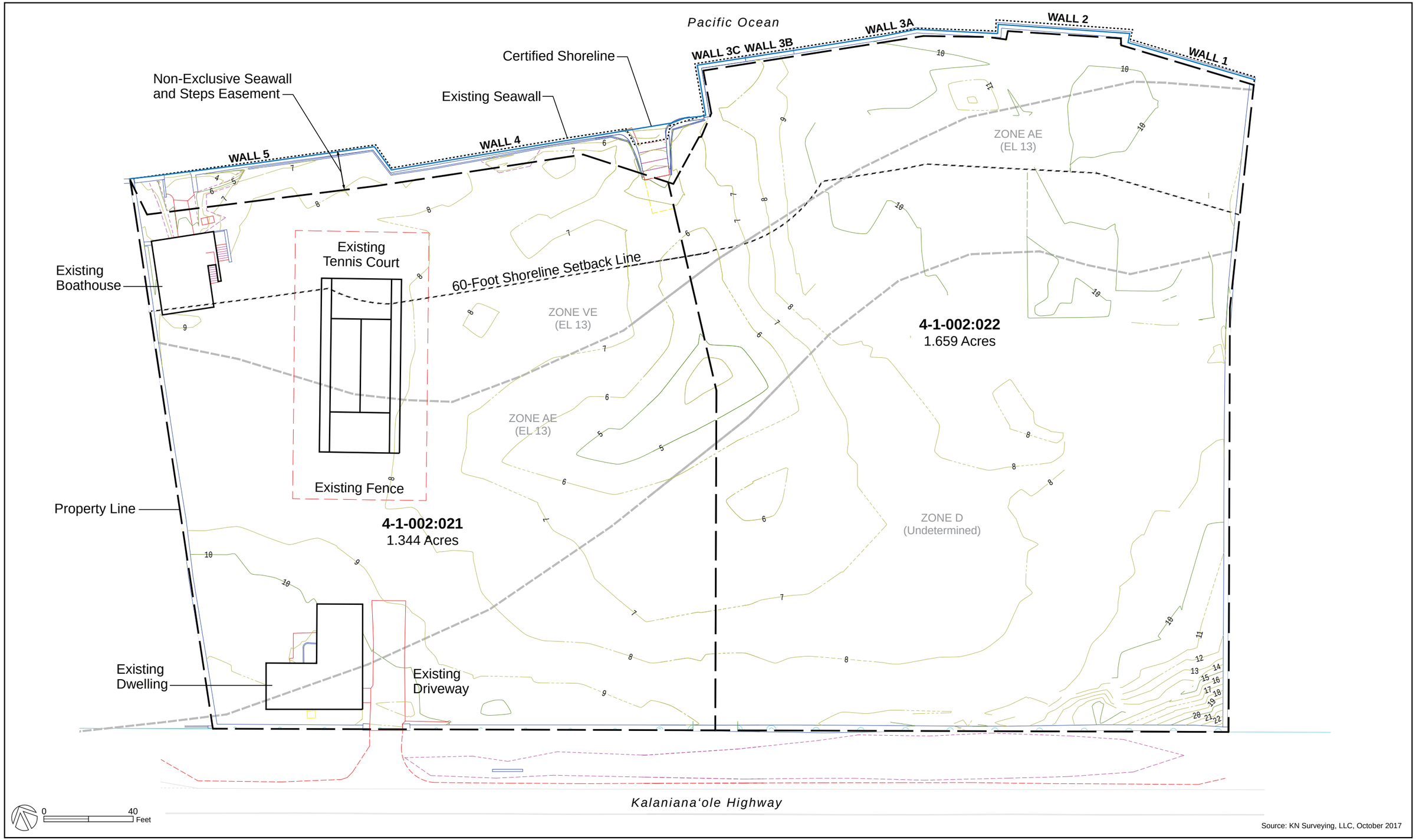
The Waimānalo Paradise property is the site of the former Anderson Estate–Pāhonu. The estate was completed in 1933, and largely demolished by 2019. A mortared basalt rock wall borders the Waimānalo Paradise property on the east, south and west sides. A mortared basalt seawall with concrete stucco runs along the northern edge of the property. There are several other residences adjacent to and near the property that also front Kalaniana‘ole Highway.

Figure 2-2 shows existing conditions on the two parcels that comprise the Waimānalo Paradise property, Existing structures on the site include a boathouse, dwelling (caretaker’s cottage) and tennis court. A residence that was formerly located on Parcel 22 was demolished in 2019. The property owner intends to construct a new residence on that parcel. These improvements are not part of the current Proposed Action, which is limited to the seawall repairs.

2.3.2 Existing Seawall

Physical Description

The existing seawall that fronts the Waimānalo Paradise property is constructed of stone and concrete grout, with a thin exterior layer of concrete grout. The seawall is 585 feet in length and although its construction history is unknown, historical records suggest that it was constructed between 1911 and 1928. The seawall has a nearly vertical face and recurved top that functions as a splash guard. Seawall crest elevations range from +5.0 feet to +11.0 feet mean sea level (msl). The crest elevation becomes progressively lower and the condition of the seawall becomes more deteriorated moving from east to west.



Source: KN Surveying, LLC, October 2017

Existing Site Plan

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

Figure 2-2

In the center of the property shoreline, there is an opening in the wall with concrete stairs that provide access between the property and the shoreline. The sand beach re-emerges within the western half of the property shoreline, though the beach is generally exposed only during lower tides. At high tide, the waves wash to the seawall. A boat ramp located near the western property line appears to have been constructed by removing a portion of the seawall. The seawall terminates at the northwest property corner, where it abuts the seawall of the neighboring Shriner's Beach Club. The top of the Shriner's seawall is at elevation +11 feet (msl).

Legal Status

The State of Hawaiʻi Department of Land and Natural Resources (DLNR) determined that the seawall is a legal, nonconforming structure. The legality of the structure was confirmed by a letter dated January 23, 1931, from the Chairman of the Hawaiʻi Board of Harbor Commissioners granting permission to put a concrete facing on the existing seawall. The seawall is considered nonconforming because it was in place prior to the adoption of the Conservation District Rules in October 1964. There is no additional documentation or evidence of repair, maintenance, or alterations to the seawall since 1931.

The seawall is located seaward of the record property boundary and is, therefore, encroaching on unencumbered State land (Figure 2-3). A Grant of Non-exclusive Easement for the seawall and concrete steps was approved by the Deputy Attorney General on June 22, 2015. The easement contains an area of 4,539 square feet and includes the unencumbered land between the seawall and the record property boundary. The easement is non-exclusive and does not confer land ownership rights. Rather, the easement confers unto the Grantee the "right, privilege, and authority to use, maintain, repair, replace and remove the existing seawall and steps over, under, and across State-owned land". The easement is valid for fifty-five (55) years and will expire in October 28, 2070, which corresponds with the 50-year planning horizon for the project.

The seawall can be categorized into seven (7) sections (1, 2, 3A, 3B, 32-16C, 4, and 5) based on observed differences in height and profile (Table 2-1).

Table 2-1: Seawall Sections

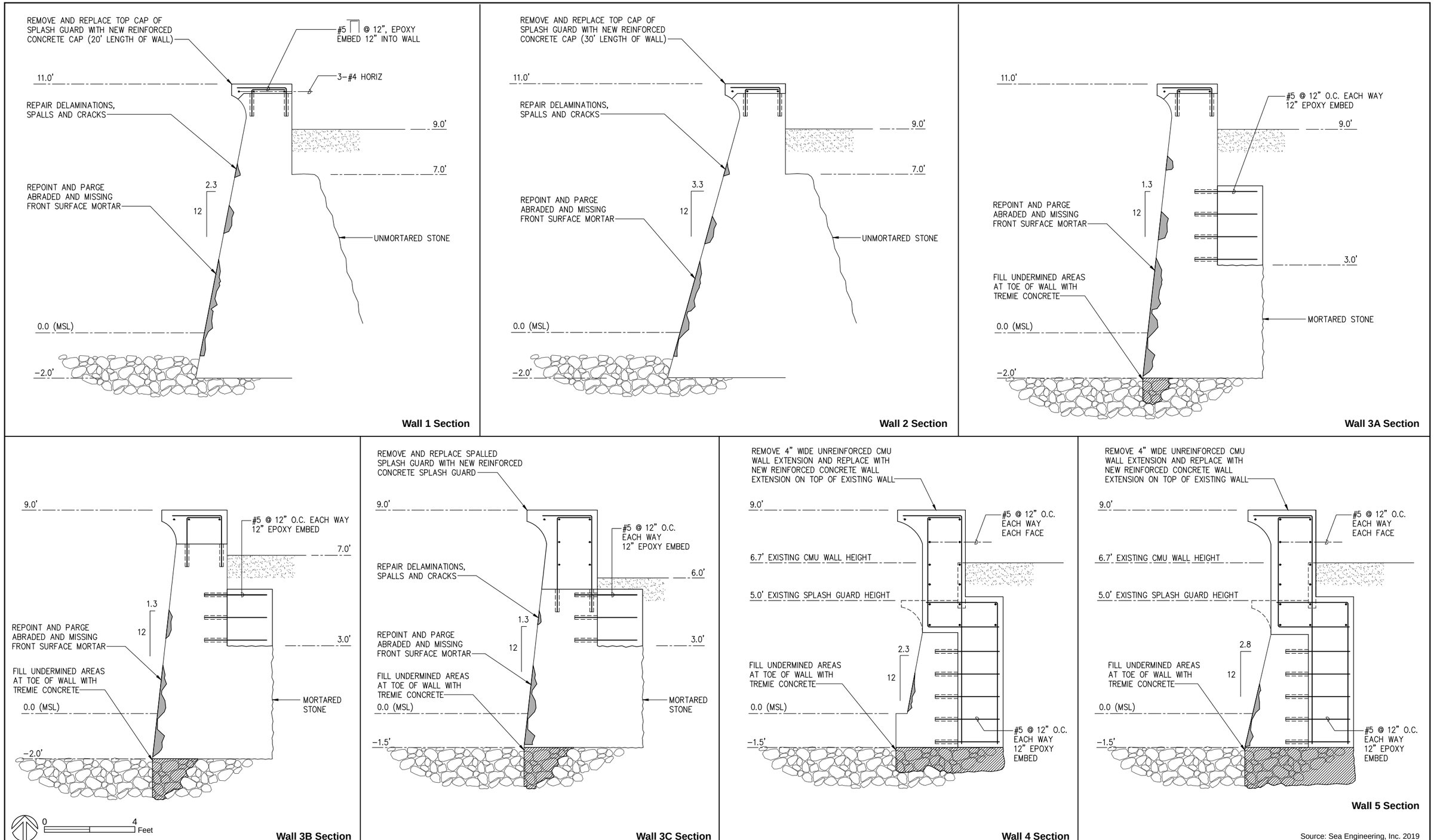
Wall	Lot	Length (feet)	Crest Elevation
1	021	65	+11.0 feet (msl)
2	021	65	+11.0 feet (msl)
3A	021	95	+11.0 feet (msl)
3B	021	30	+9.0 feet (msl)
3C	021	75	+7.0 feet (msl)
4	022	135	+5.0 feet (msl)
5	022	120	+5.0 feet (msl)

Figure 2-3: Property Line, Seawall and Easement Locations Source: SEI, 2020

2.4 PROPOSED ACTION

The Proposed Action was developed through an engineering alternatives analysis (SEI, 2020) that evaluated nine options. The options were evaluated for their suitability for existing site conditions and their ability to meet the project objectives. A comparison of the alternatives is provided in Section 2.5. The Proposed Action is Alternative 9, "Seawall Repair," which was preferred because of its ability to meet the project objectives in a cost-effective manner, while minimizing potential negative impacts to the environment and the adjacent shorelines.

The Proposed Action retains the existing seawall and proposes repair of delaminations, spalls and cracks in all wall sections. In addition to the repairs, modifications (e.g., replacing top cap of splash guard, increasing crest elevation, etc.) will be performed for individual wall sections. Figure 2-4 shows the proposed repairs and modifications. Figure 2-5 shows photographs of the affected wall sections. Proposed repairs will be conducted within the footprint and landward of the existing wall, minimizing potential impacts on natural beach processes, shoreline access, and existing viewplanes.



Source: Sea Engineering, Inc. 2019

Repair and Retrofit Sections

Figure 2-4

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

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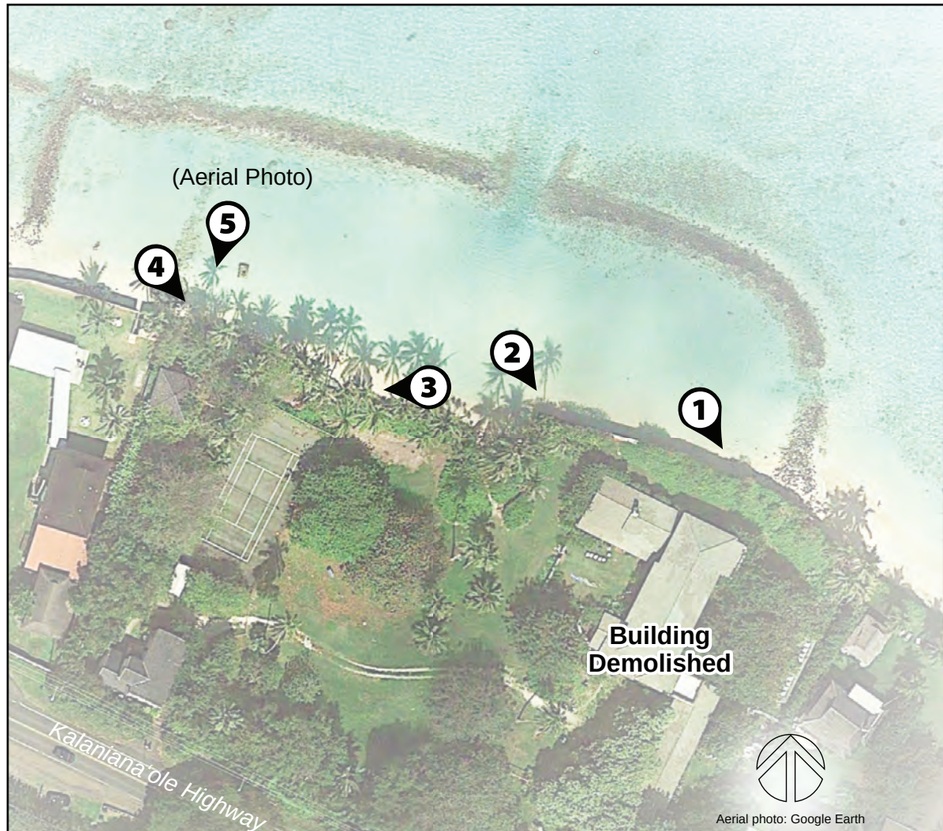

1: View of wall Sections 1 and 2.

2: View of Sections 3A, 3B, 3C.

3: View of wall Section 4.

4: View of wall Sections 5.

5: Aerial view of wall Section 5.

Site Photographs

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

Figure 2-5

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A key component of the Proposed Action is increasing the crest elevation of wall sections 3C, 4, and 5 to +9.0 feet (msl) to create a more uniform wall height. This will reduce wave overtopping and increase the resilience of the properties to sea level rise. Increasing the seawall crest to +9.0 feet (msl) would only be two feet above the existing grade in the terrestrial area of the properties and would not substantially change viewplanes to or along the shoreline.

2.4.1 Proposed Repairs

The Proposed Action includes the following repairs for all wall sections:

- Repair delaminations and spalls from isolated small steel connections and random embedded steel at the front surface of the wall.
- Patch vertical and diagonal cracks to mitigate potential loss of fines through cracks.
- Repoint and parge (fill and repair) abraded and missing front surface mortar.
- Increase scour resistance at the wall base by filling and replacing undermined areas at the toe of the wall with tremie concrete.
- Replace missing, settled and spalled concrete masonry unit (CMU) wall extensions with new reinforced concrete wall extensions.

2.4.2 Proposed Modifications

In addition to the above repairs, the following modifications are proposed for individual wall sections:

- **Wall 1 –** Remove and replace delaminated areas of the top cap of the splash guard. Construct a concrete rubble masonry (CRM) buttress wall.
- **Wall 2 –** Remove and replace delaminated areas of the top cap of the splash guard.
- **Wall 3A** – Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide adequate resistance to design overturning forces.
- **Wall 3B** - Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide adequate resistance to design overturning forces.
- **Wall 3C** - Remove and replace delaminated areas of the top cap of the splash guard. Increase wall crest elevation from +7.0 feet (msl) to +9.0 feet (msl).
- **Wall 4** - Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide adequate resistance to design overturning. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl).
- **Wall 5** - Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide adequate resistance to design overturning forces. Reconstruct a 15-foot section of wall that was previously removed (now functioning as boat ramp). Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl).

2.4.3 Ocean Access Wall and Buttress Wall

New structural elements will be included in the repair and modification of the existing seawall shared between Parcel 21 (west lot) and Parcel 22 (east lot) of the Waimānalo Paradise property. The structural walls are intended to provide additional stability for the existing seawall.

Ocean Access Wall

The new ocean access wall would be an approximately 24 inches-wide concrete site wall founded on a new 12-inch concrete mat slab. The design intent is to provide storm surge protection at the stair access while maintaining the existing seawall opening. The new ocean access wall would be located approximately 15 feet behind the existing ocean stair access and is partially on Parcel 21 and Parcel 22. The top of wall would be +8.0 feet (msl). The bottom of wall would be +4.0 feet (msl). The total length of new ocean access wall would be approximately 50 linear feet. The ocean access wall and all associated construction work would occur landward of the existing seawall. No in-water work is proposed.

Buttress Wall

The new buttress wall would be an 18-inch wide buttress wall founded on a new 5.0-foot-wide by 1.5-foot-deep footing. The design intent is to provide storm surge and scour protection at the southeast corner of the Parcel 22 (east lot) where the existing seawall stops at the property line. The new buttress wall would be behind the existing seawall, running parallel 10 feet to the southeast property line. The top of wall would be +8.0 feet (msl) or 1.0 feet below the existing grade. The bottom of the wall would be +2.5 feet (msl). The total length of the new buttress wall would be approximately 20 linear feet. The buttress wall and all associated construction work would occur landward of the existing seawall. No in-water work is proposed.

2.4.4 Construction Sequencing and Estimated Schedule

The work will be accomplished through the following construction sequence:

1. Mobilization of construction equipment, materials, mobile office, and supplies.
2. Condcut pre-construction inspection.
3. Installation of marine and terrestrial environmental controls (e.g., turbidity booms, erosion control sock, silt fencing, dust screens).
4. Repair voids with tremie concrete
5. Install concrete strengthening landward of existing wall and demo/remove boat ramp
6. Reconstruct removed section of Wall 5
7. Repair or replace delaminated splashguards
8. Repair cracks, spalls, and delamination on all wall sections
9. Install CRM ocean access walls at center of property
10. Install CRM buttress wall at east end of seawall
11. Demobilization

Construction is planned to commence in September 2020, with an estimated duration of 4 months. The budgetary construction cost estimate for the Proposed Action (seawall repair option) is $3.2 million.

2.5 ALTERNATIVES CONSIDERED

The objectives of the project are to: 1) Increase the resilience of the property to coastal hazards and sea level rise through 2070; 2) Reduce wave overtopping under design wave conditions through 2070; and 3) Ensure that the existing seawall can provide adequate resistance to design soil loads.

Nine alternatives (SEI, 2020) were evaluated for their ability to achieve the project objectives, as well as for their suitability for the site conditions and overall environmental impact. The nine alternatives are:

1. No Action
2. Managed Retreat

3. Beach Restoration
4. Beach Restoration with Stabilizing Structures
5. Revetment
6. Hybrid Seawall-Revetment
7. Seawall Removal
8. Seawall Replacement
9. Seawall Repair (Proposed Action)

The alternatives are described in the SEI Coastal Assessment (Appendix A) and summarized in this section. Alternative 9, Seawall Repair, was determined to be the preferred alternative and the Proposed Action in Section 2.4.

2.5.1 No Action

The No Action alternative would involve leaving the seawall in its existing location and condition with no repairs or modifications. Nothing would be done to improve the condition or functionality of the seawall. The seawall is over 100 years old and is in a deteriorated condition. If it is not repaired, it will continue to deteriorate. If the seawall deteriorates to a point that it is no longer serviceable, the structure may fail, or removal may be required.

The seawall protects the project site and adjacent properties from erosion and wave overtopping. If the seawall were to fail or be removed, the terrestrial area would be unprotected. Flooding would occur more frequently, and property damage would be expected. Failure or removal of the seawall would not improve the condition of the beach or improve lateral shoreline access and would also expose adjacent properties to increased hazard risk.

Because the seawall retains the terrestrial soils, its failure or removal would result in erosion and the release of terrigenous sediment into the nearshore waters. This could lead to sediment build up in the fishpond, which is a semi-enclosed structure. Increased sedimentation could also negatively impact water quality and marine habitat within the fishpond.

Advantages

- No cost.

Disadvantages

- Increases vulnerability of the project site to coastal hazards and sea level rise.
- Reduces wave overtopping under design wave conditions.
- Seawall would continue to provide inadequate resistance to design soil loads.

The No Action Alternative would have no immediate impacts to the project site, the nearshore waters, marine habitat, or adjacent properties. However, the likelihood of seawall failure or removal would increase significantly over the long-term. If no mitigative action is taken to repair the seawall, damage would continue and the level of deterioration of the seawall could eventually result in significant negative impacts to the project site, the nearshore waters, marine habitat, and adjacent properties. No Action fails to achieve the project objective of increasing the resilience of the project site to sea level rise and is therefore not a preferred alternative.

2.5.2 Managed Retreat

Managed retreat (also referred to as managed realignment) is a coastal management strategy intended to allow the shoreline to naturally move inland, rather than fixing the shoreline with engineered shore

protection structures. Managed retreat typically involves modification, relocation, or removal of existing structures to reduce hazard exposure and maintain a natural shoreline. Managed retreat strategies can be horizontal or vertical in nature. Horizontal retreat strategies seek to reduce hazard exposure by moving structures further inland. Vertical retreat strategies seek to reduce hazard exposure by elevating structures above the hazard.

Shoreline setbacks are a horizontal retreat strategy that require development to be set back a minimum distance from the shoreline. The City & County of Honolulu requires shoreline setbacks for new construction along the shoreline. The purpose of the shoreline setback is to protect and preserve the natural shoreline, lateral shoreline access, and open space along the shoreline. Shoreline setbacks are also intended to reduce risks to property from coastal hazards. The proposed development for the project site includes construction of two single-family homes. The City & County of Honolulu determined that the shoreline setback for the project site is 60 feet. The shoreline setback is a horizontal retreat strategy in that it creates a buffer zone that reduces the potential for the homes to be exposed to erosion and flooding.

Freeboard is a vertical retreat strategy that involves elevating structures above the BFE. The project site is located in a Special Flood Hazard Area (SFHA), which is subject to inundation by the 1% annual chance flood. The seaward portion of the subject property is located in Zone VE with a BFE of 13 feet. The landward portion of the property is located in Zone AE with a BFE of 13 feet, and Zone D where flood hazards are undetermined, but flooding is possible. The new homes would be constructed above the BFE. Elevating the structures above the BFE is a vertical retreat strategy in that it elevates the structures above the anticipated flood hazard.

The project site could be modified in the future to reduce risk to coastal hazards and sea level rise. For example, the ground floors of the homes could eventually be converted to non-habitable space and used for other purposes (e.g., parking or patio). This approach could be considered a vertical retreat strategy in that the at-risk infrastructure would be modified to accommodate flooding.

Another option for managed retreat could be a “phased reconfiguration” of the properties, which would involve gradually modifying or removing the structures closest to the shoreline and expanding and/or elevating the structures furthest from the shoreline. Modifying the infrastructure and development footprint in an incremental manner over time would provide the flexibility to adapt to changing conditions while maintaining the economic and recreational value of the property.

Advantages

- Reduces vulnerability of infrastructure to coastal hazards and sea level rise.
- Increases resilience of the project site to coastal hazards sea level rise.
- Avoids costs and requirements associated with shore protection or beach restoration.
- Allows the shoreline to migrate naturally.

Disadvantages

- Would not address the damages and structural deficiencies of the existing seawall.
- Would not reduce wave overtopping under design wave conditions.
- Seawall would continue to provide inadequate resistance to design soil loads.
- If the seawall were removed, the properties would be more vulnerable to coastal hazards.
- No existing rules, programs or policies to manage or facilitate the retreat process.
- Timeline for retreat is typically on the order of decades.

Managed retreat is a relatively new concept that is being evaluated for applicability in Hawaiʻi. The Hawaiʻi State Office of Planning (OP) recently published a report, *Assessing the Feasibility and Implications of Managed Retreat Strategies for Vulnerable Coastal Areas in Hawaiʻi* (2018). The study evaluated options to establish policies, regulations, tools, and programs to support a managed retreat strategy in response to sea level rise. The study found that retreat is one of three primary adaptation strategies, along with accommodation (e.g., freeboard) and protection (e.g., hybrid-seawall revetment), and that, prior to deciding upon retreat, accommodation and protection must be examined to determine which strategy is the best for the area dealing with coastal hazards, climate change and sea level rise. The study also found that retreat is only effective when done voluntarily and that economic incentive programs to fund retreat (e.g., buyouts, transferrable development rights, rolling easements) are unlikely to be effective due to the high cost of real estate in Hawaiʻi. The report also noted that retreat from chronic coastal hazards (e.g., erosion and sea level rise) is incremental and typically takes decades to complete. Managed retreat at the project site could potentially involve removal of the seawall, which would allow the terrestrial soils to erode and sand to migrate naturally along the beach.

Managed retreat would avoid the costs associated with design, permitting and construction of shore protection measures or beach restoration. However, the costs associated with modifying, relocating, or removing the existing structures would be substantial. In the absence of the seawall, the terrestrial area would be exposed to erosion and flooding, and the planned single-family homes would be more vulnerable to coastal hazards and sea level rise.

Managed retreat may be considered as a long-term option but is not necessary at this time. The existing seawall is in a serviceable condition. Repair and modification of the seawall would extend the life of the structure and increase the resilience of the property to sea level rise. Until retreat is determined to be desirable or necessary, and rules, programs and policies are in place to facilitate the retreat process, other appropriate solutions should be considered. Managed retreat would not achieve the project objective of increasing resilience to sea level rise and is therefore not the preferred alternative.

2.5.3 Beach Nourishment

Beach nourishment typically involves placement of beach fill to specified profiles that are designed to augment the natural morphology of the beach to offset the effects of chronic, seasonal, or episodic erosion. Regulatory agencies and the public are generally supportive of beach nourishment because it has minimal environmental impacts and is consistent with State and County policies that seek to preserve and enhance beach resources.

The DLNR Office of Conservation and Coastal Lands (OCCL) authorizes beach nourishment through the Small-scale Beach Nourishment (SSBN) program, which allows placement of compatible beach quality sand seaward of the shoreline in the State Conservation District. There are two categories of SSBN authorizations: Category I (up to 500 cubic yards of sand), and Category II (up to 10,000 cubic yards of sand).

Beach nourishment projects are regulated by Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, which regulate discharges of fill material into waters of the United States. Placement of fill material seaward of the mean higher high water line (mhhw) is generally prohibited. In general, placement of fill material is limited to areas where a stable beach is typically present and additional fill is required to maintain a stable beach profile.

Based on a review of historical aerial photographs, when a beach is present along the shoreline, average beach width is 10 to 15 feet. In order to achieve a stable beach profile, the beach would need to be approximately 120 feet wide and the beach crest elevation would need to be approximately +8.0 feet

msl. Beach nourishment at the project site would require placement of a large volume of sand fill inside the fishpond, which would cover a significant portion of the interior of the pond. Due to existing federal and state regulations, discharge of such a large volume of fill material into waters of the United States may not be permissible. A conceptual plan for beach nourishment at the project site is shown in Figure 2-6 and Figure 2-7.

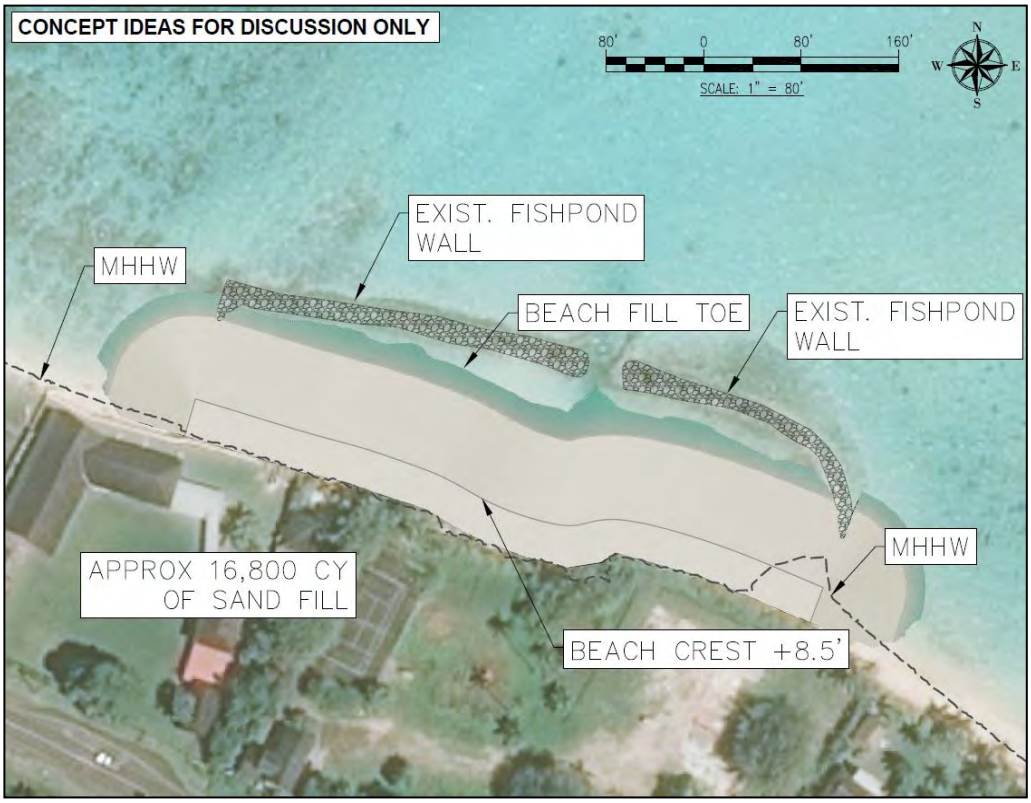
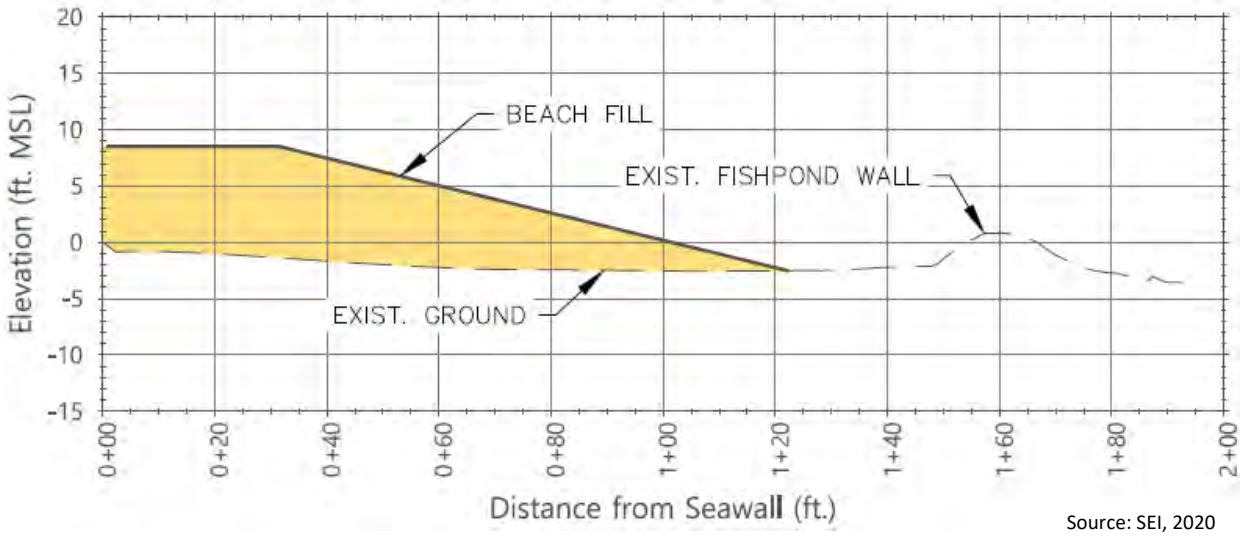


Figure 2-6: Conceptual Plan View for Small-scale Beach Nourishment Source: SEI, 2020



Source: SEI, 2020

Figure 2-7: Conceptual Section View for Small-scale Beach Nourishment

Advantages

- Provides a temporary increase in beach volume and width.
- Provides additional protection against wave overtopping.
- May provide some additional protection against wave overtopping.
- SSBN authorizations may allow for periodic renourishment.
- Agencies and the public are generally supportive of beach restoration projects.

Disadvantages

- Does not address the structural deficiencies of the existing seawall.
- Requires an adequate quantity of compatible beach quality sand.
- Requires discharge of fill material (sand) in waters of the United States.
- Sand is unlikely to remain stable without engineered stabilizing structures. Recurring costs for periodic renourishment could be high.

Beach nourishment would provide a short-term increase in beach volume and width at the project site. The existing fishpond walls would help to stabilize the sand fill. However, without stabilizing structures (e.g., groins), the beach profile would be unstable, and the sand would eventually be redistributed along the shoreline.

2.5.4 Beach Nourishment with Stabilizing Structure

One of the factors that can limit the effectiveness of beach nourishment projects is the loss of sand due to natural processes, such as longshore and cross-shore sediment transport. Some areas have natural features such as headlands, harbors, or reefs that disrupt sediment transport and naturally stabilize the sand. In some cases, it may be necessary to design engineered containment structures, such as groins, to maintain a stable beach. T-head groins decrease and reorient the amount of wave energy reaching the beach and create artificial littoral cells to stabilize the sand. An example of beach nourishment with stabilizing T-head groin structures is shown in Figure 2-8.

Figure 2-8: Beach Nourishment with T-Head Groins at Iroquois Point, O‘ahu, Hawai‘i Source: SEI, 2020

Beach nourishment accompanied by the construction of sand stabilization structure (such as groins) to minimize sand movement would be the most effective means for restoring and maintaining the beach resource, while providing long-term protection for the terrestrial area and infrastructure. A series of groin structures accompanied by beach fill would create stable, wide beach cells within the groins and stable fillets on the outside of each groin, and would reduce the loss of sand to the north and south.

A conceptual plan for beach nourishment with stabilizing structures at the project site is shown in Figure 2-9. The plan would consist of a single T-head groin aligned with the property boundary between the two TMK parcels, bounded by two L-head groins aligned with the east and west lateral boundaries of the properties. The plan would require demolition and removal of the existing fishpond walls and placement of a large volume of sand fill seaward of mhhw. Due to existing federal and state regulations, demolition of the fishpond and discharge of such a large volume of fill material into waters of the United States may not be permissible.

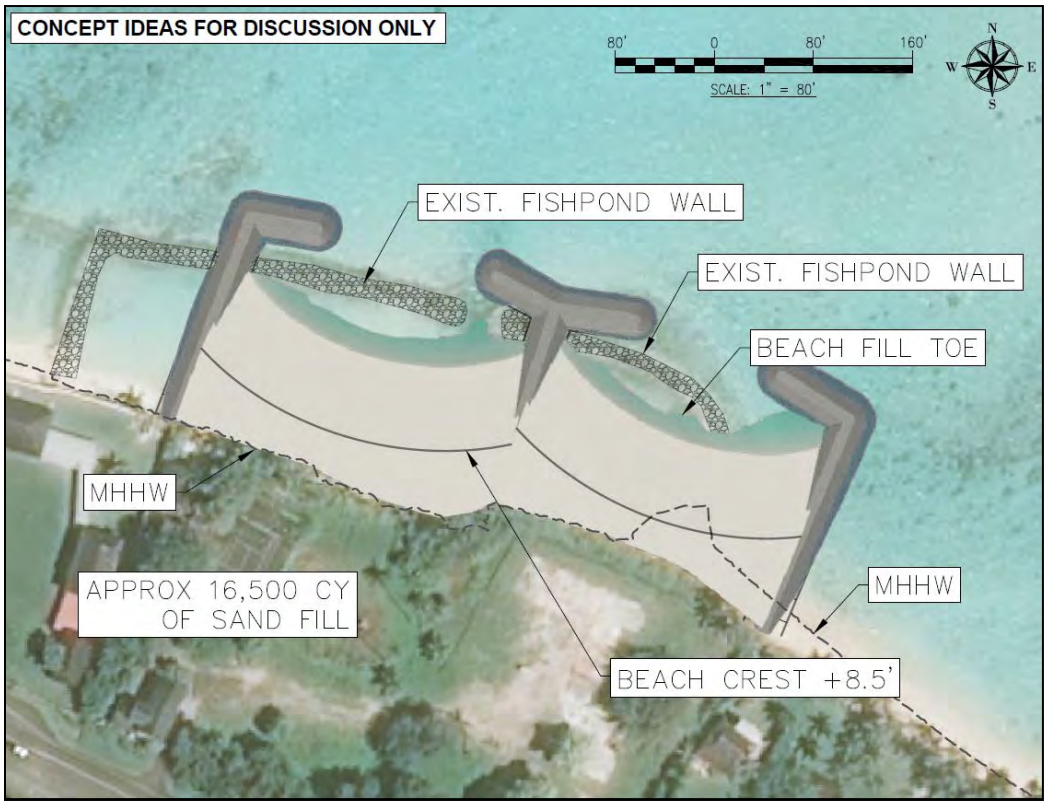


Figure 2-9: Conceptual Plan View for Beach Nourishment with T-Head Groins Source: SEI, 2020

Beach nourishment with stabilizing structures would disrupt longshore sediment transport which could potentially result in beach narrowing to the east of the project site. The groins would be located seaward of the shoreline, so an easement would likely be required for the structures.

Advantages

- Provides a permanent increase in beach volume and width.
- Provides some additional protection against wave overtopping and flooding.
- Requires low maintenance.
- Agencies and the public are generally supportive of beach nourishment projects.

Disadvantages

- Does not address the structural deficiencies of the existing seawall.
- Requires removal of the existing fishpond walls.
- Requires an adequate quantity of compatible beach quality sand.
- Requires discharge of fill material (sand) in waters of the United States.
- Groins and beach fill would have a very large structural footprint.
- Very high costs for design, permitting, construction, and easements.

Beach nourishment with stabilizing structures would create a stable beach, improve lateral shoreline access, and provide long-term protection for the terrestrial area and infrastructure. However, the project would have a very large structural footprint and would require removal of the historic fishpond. This option would not address the structural deficiencies of the existing seawall and is therefore not the preferred alternative.

2.5.5 Revetment

A revetment is a sloping, un-cemented structure constructed of wave-resistant material. The most common method of revetment construction is to place a layer of armor stone, sized according to the design wave height, over an underlayer of smaller rock that sits atop filter fabric. The underlayer is designed to distribute the weight of the armor layer and to prevent loss of fine material through voids in the revetment.

Revetments in Hawaiʻi are typically built on a slope of 1.5 to 2 horizontal to 1 vertical to ensure stability. Toe scour protection can be provided by excavating to place the toe on solid substrate, constructing the foundation below the maximum depth of anticipated scour, or extending the toe to provide a scour apron of excess stone. For large wave heights, a revetment may be constructed with a two-stone thick armor layer that uses a uniform stone size designed to be stable under the design wave conditions. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage. Should toe scour occur, the structure can settle and readjust without major failure. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs.

An advantage of a revetment is that the rough porous rock surface and sloping face of the structure will tend to absorb wave energy, reduce wave reflection, and may help to promote accretion of sand on a sandy beach when sufficient sand volume is available in the littoral environment. Additional advantages of revetments are that materials are readily available and localized damage can be easily repaired by placement of additional armor stone. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage.

A disadvantage of a revetment is that it would have a large structural footprint, which can be problematic in a coastal setting. The location of the revetment would affect the overall cost and permitting requirements. Revetments are typically constructed in areas where the terrestrial area is already threatened by erosion, such as along roadways. In these locations, the erosion threat is typically so severe that there is little terrestrial area to accommodate a revetment so the structure can only be constructed seaward of the shoreline. The Hawaiʻi Revised Statutes discourages construction of shore protection structures seaward of the shoreline in the State Conservation District. Construction of a revetment landward of the shoreline would require extensive excavation of the terrestrial soils. It is important to note that, even if the revetment were constructed landward of the shoreline, the future certified shoreline would likely be located at or near the crest of the structure, in which case an easement for the use of State submerged land may be required.

The rough and porous surface and flatter slope of revetments absorb and dissipate more wave energy than the smooth vertical surfaces of seawall structures. Revetments are more effective in reducing wave reflection, runup, and overtopping, which increases the potential for sand accumulation seaward of the structure. Because of its durability, flexibility, and reduced wave reflection, a revetment is often considered the best erosion control/shore protection measure for sites where shoreline hardening is considered appropriate. An example of a typical revetment structure is shown in Figure 2-10.

Figure 2-10: Typical rock revetment at Kahului, Maui SEI, 2020

Construction of a rock revetment at the project site would not necessarily require removal of the existing seawall. Given the location of the seawall and the open space inshore of the seawall, it is possible to leave the existing seawall in place and construct a new revetment entirely inshore of the seawall (as shown in Figure 2-11). The area over the revetment could be backfilled and landscaped to create usable open space. The existing seawall would remain the primary shore protection structure; however, if the seawall were to become critically damaged or fail, it could be removed, exposing the revetment. A revetment designed for the existing project site conditions would likely have a cross-shore footprint of more than 35 feet.

Advantages

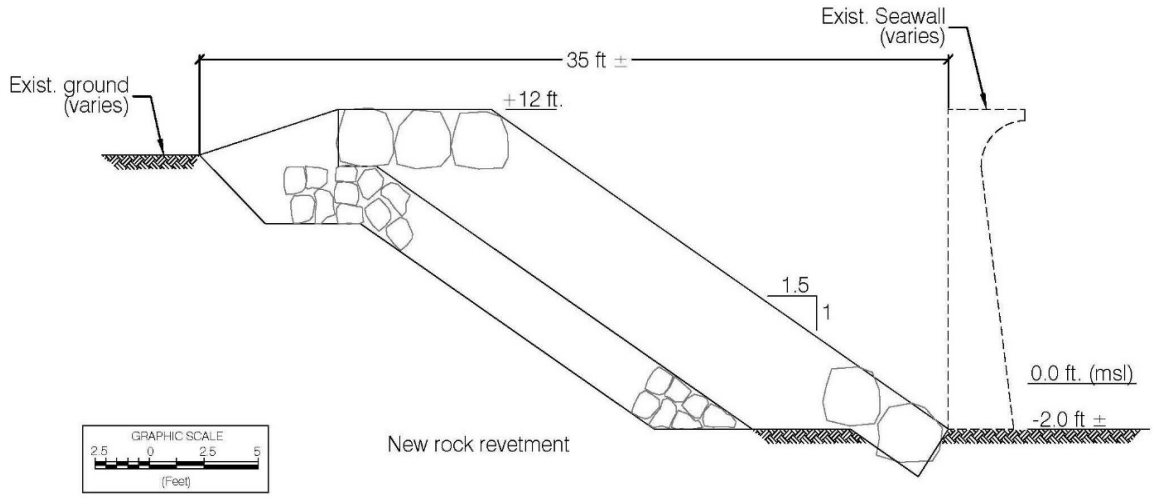
- Increases resilience to coastal hazards and sea level rise.
- Provides additional protection against wave overtopping.
- Construction landward of the shoreline would minimize potential environmental impacts.
- Better wave energy dissipation characteristics than a seawall.
- Less reflective than a seawall and may facilitate sand accretion seaward of the structure.
- Does not negatively impact lateral shoreline access.
- May not require removal of the existing seawall.

Disadvantages

- Largest structural footprint of the options considered.
- Very large structural footprint within the property.
- Very high costs for design, permitting, and construction.
- Existing boathouse would need to be removed or relocated.
- Existing seawall could be damaged during construction.

- Public could traverse the revetment, creating potential privacy, security, and liability issues.
- Uncertainty regarding entitlement implications and regulatory requirements.
- Agency and public opposition to construction of new shore protection structures.

A revetment is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the property to sea level rise. However, the seawall is in a serviceable condition, so replacement of the structure is not necessary at this time. Furthermore, due to the large structural footprint within the property, and high costs for design, permitting, and construction, a revetment is not the preferred alternative.



Source: SEI, 2019

Figure 2-11: Conceptual Section View for a Rock

2.5.6 Hybrid Seawall-Revetment

Another potential long-term engineering solution for the project site is a hybrid seawall-revetment, which is a shore protection structure that combines a vertical seawall with a sloping rock revetment. A hybrid seawall-revetment would be composed of two primary elements: a seawall (i.e. sheet pile, reinforced concrete, or cemented rock masonry) and a uniform armor rock rubble mound revetment. An example of a hybrid seawall-revetment is shown in Figure 2-12.

An advantage of a hybrid seawall-revetment is that the structure can be designed to be modified to withstand changing design wave conditions as sea level rises. Another advantage is that materials are readily available and localized damage can be easily repaired by placement of additional armor stone. Properly designed and constructed hybrid seawall-revetments are durable, flexible, and highly resistant to wave damage.

A disadvantage of a hybrid seawall-revetment is that it would have a relatively large structural footprint. The location of the revetment would affect the overall cost and permitting requirements. Hawai‘i State law discourages construction of shore protection structures seaward of the shoreline in the State Conservation District. Construction of a hybrid seawall-revetment landward of the shoreline would require extensive excavation of the terrestrial area. Even if a hybrid seawall-revetment were constructed landward of the shoreline, the future certified shoreline would likely be located at or near the crest of the structure, in which case an easement for the use of State submerged land may be required.

A hybrid seawall-revetment that is designed to account for sea level rise 50 years in the future would have a much larger structural footprint than is required for current conditions. This larger structure would impact viewplanes along the shoreline and from within the property. An alternative approach is to design a structure that can be modified as sea level rises. A conceptual design for a hybrid seawall-revetment at the project site is shown in Figure 2-13.

Advantages

- Increases resilience to coastal hazards and sea level rise.
- Provides additional protection against wave overtopping.
- Structure can be adapted to withstand future design wave forces (i.e. sea level rise).
- Construction landward of the shoreline would minimize environmental impacts.
- Better wave energy dissipation characteristics than a seawall.
- Less reflective than a seawall.
- May facilitate sand accretion seaward of the revetment.
- No negative impacts on lateral shoreline access.

Disadvantages

- Large structural footprint within the property.
- High costs for design, permitting, construction, and future modifications.
- Existing seawall could be damaged during construction.
- Potential exposure to personal injury liability.
- Agency and public opposition to construction of new shore protection structures.

A hybrid seawall-revetment is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the property to sea level rise. However, the existing seawall is in a serviceable condition, so replacement of the structure is not necessary at this time. Furthermore, due to the large structural footprint within the property and high costs for design, permitting, construction, and potential future modifications, a hybrid seawall-revetment is not the preferred alternative.

Figure 2-12: Hybrid Seawall-Revetment, Kapaʻa, Kauaʻi, Hawaiʻi Source: SEI, 2019

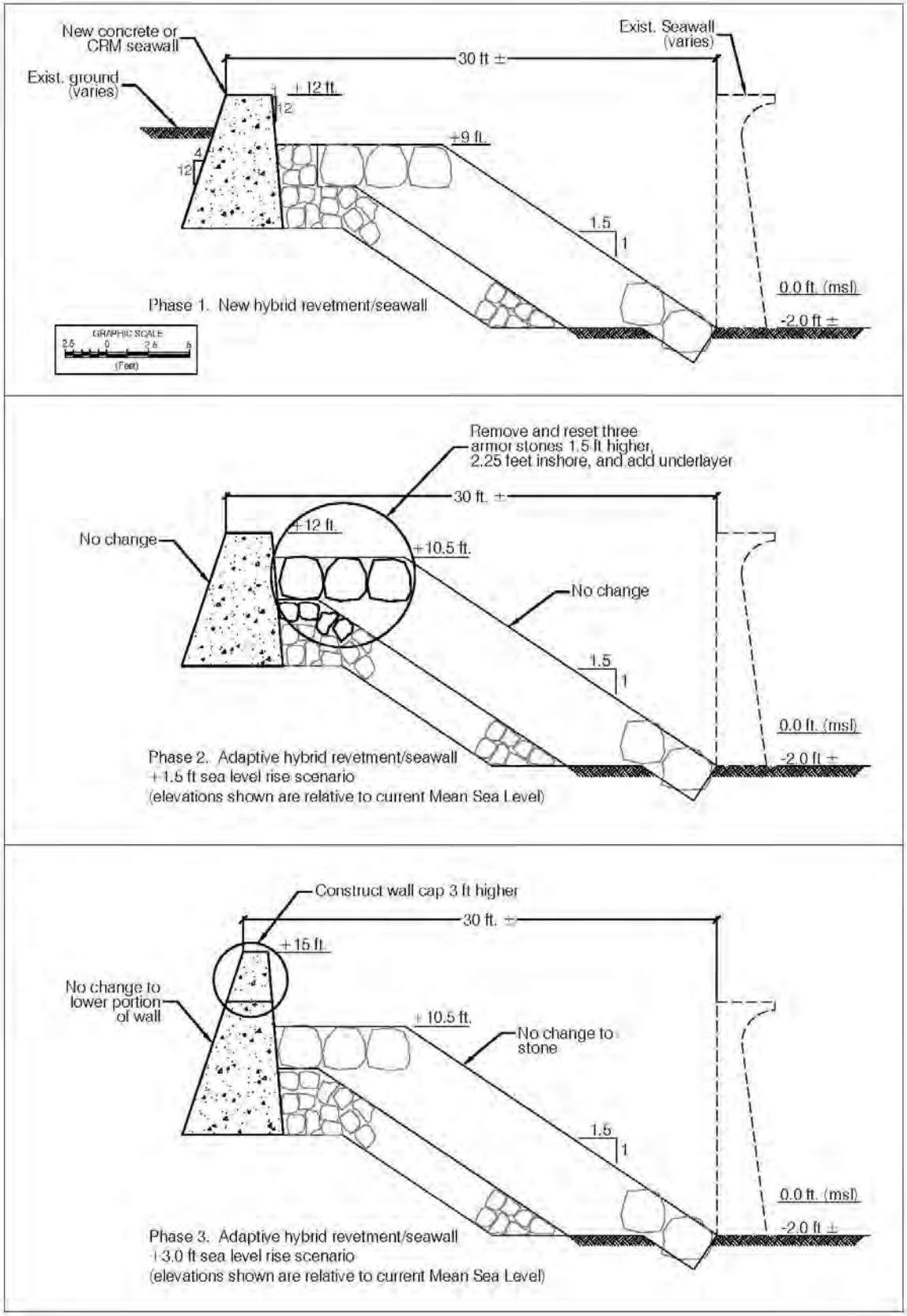


Figure 2-13: Conceptual Section View for a Hybrid Seawall-Revetment

Source: SEI, 2019

2.5.7 Seawall Removal

The seawall removal alternative would involve removing the existing seawall and allowing the shoreline to migrate naturally. As sea levels continue to rise, this would likely result in significant erosion, flooding, and permanent loss of land. The seawall is covered by an easement that confers unto the Grantee the "right, privilege, and authority to use, maintain, repair, replace and remove the existing seawall." The easement also requires that the Grantee "shall keep the easement area and the improvements thereon in a safe condition." If the existing seawall is substantially (greater than fifty percent) or completely destroyed, the easement shall cease and terminate automatically.

The seawall is over 100 years old and is in a deteriorated condition. Repairs are necessary to maintain it in a safe condition as required by the easement. If the seawall deteriorates to a point that it is no longer serviceable, removal may be required.

The seawall protects the project site and the adjacent properties from erosion and wave overtopping. If the seawall was removed, the terrestrial area would be exposed to erosion, wave overtopping would occur more frequently, and property damage would be expected. Removal of the seawall would not improve the condition of the beach or improve lateral shoreline access and would expose the adjacent properties to increased hazard risk.

The seawall also retains the terrestrial soils, which consist of a mixture of sand and clayey fill material. If the seawall was removed, erosion of the terrestrial area would result in the release of terrigenous sediment into the nearshore waters. The fishpond is a semi-enclosed structure and has the potential to impound eroded sediment. There does not appear to be a natural mechanism to transport sediment out of the fishpond. If the seawall failed or was removed, the terrestrial area would erode, and the influx of terrigenous material could result in sedimentation that could negatively impact water quality and habitat within the fishpond.

Removal of the seawall would require extensive excavation. The excavation would disturb a large volume of the existing soil in the terrestrial area making it more unconsolidated and prone to erosion. Removal of return walls would expose adjacent properties to increased hazard risk.

Advantages

- None.

Disadvantages

- High costs for demolition and removal.
- Increases vulnerability to wave overtopping.
- Decreases resilience to coastal hazards and sea level rise.
- Potential negative impacts on water quality and habitat within the fishpond.
- Potential environmental impacts during the demolition and removal process.

The Seawall Removal alternative would increase vulnerability to coastal hazards and sea level rise and is therefore not the preferred alternative.

2.5.8 Seawall Replacement

A seawall replacement alternative involves construction of a new reinforced concrete wall landward and independent of the existing walls. This alternative would increase the seawall's long-term durability and correct inherent structural deficiencies in the existing wall design.

A new seawall would be designed at a greater crest height to increase resilience to future sea level rise. Replacing the existing walls would also provide greater flexibility to integrate shoreline access. The SEI Coastal Assessment in Appendix A includes a conceptual drawing for a seawall replacement option.

Advantages

- Increases resilience to coastal hazards and sea level rise.
- Provides adequate protection against wave overtopping.
- Effective for the project planning horizon of 50 years.
- Designed to meet current structural code requirements.
- Provides long term resilience against spalling and abrasion.
- Founded on hard substrate to provide scour protection and mitigate long term undermining.
- Provides more options to improve the seawall (appearance, size, specs, ocean access).
- Reduces potential requirements and costs for future maintenance, repairs, or modifications.

Disadvantages

- Construction costs would be significantly higher than the repair option.
- Construction duration would be significantly longer than the repair option.
- Excavation to the depth required for scour resistance would be difficult and costly.
- May require demolition and removal of the existing wall.
- Requires adequate equipment access and clearance landward of the wall.
- Agency and public opposition to construction of new shore protection structures.

If a new seawall was constructed at the location of the existing wall, the existing seawall would need to be demolished and a temporary barrier constructed. Construction would be time and labor-intensive and additional care (i.e. higher level of best management practices) would need to be taken to mitigate potential adverse impacts to the fishpond with this more extensive construction.

A new seawall would require a deep foundation, requiring extensive excavation to uncertain depths. Construction of a new seawall would likely require demolition and removal of the existing walls, which would have significant costs and potential environmental impacts.

Seawall replacement is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the project site to sea level rise. However, due to the high costs for demolition and removal of the existing seawall, and regulatory restrictions on construction of new shore protection structures, seawall replacement is not the preferred alternative.

2.5.9 Seawall Repair (Proposed Action)

Seawall repair is the preferred alternative as described in Section 2.4 Proposed Action. The Seawall Repair alternative includes a combination of repairs and modifications designed to achieve adequate resistance to design soil loads, reduce wave overtopping under design wave conditions, and increase the resilience of the property to sea level rise. The proposed increase in the crest elevation of walls 3C, 4, and 5 to +9.0 feet (msl) will create a uniform wall height and will not substantially alter existing viewplanes to and along the shoreline. The proposed repairs and modifications included in this alternative are described and illustrated in Section 2.4.

Advantages

- Increases resilience to coastal hazards and sea level rise.
- Provides adequate resistance to design soil loads for all wall sections.
- Reduces potential for wave overtopping with sea level rise for Walls 3C, 4, and 5.

- Construction costs would be significantly lower than the seawall replacement option.
- Construction would be less invasive and significantly faster than the seawall replacement option.
- Does not require demolition and removal of the existing walls.
- No negative impacts on lateral shoreline access or coastal processes.
- No negative impacts on viewplanes to or along the shoreline.

Disadvantages

- Repairs are labor intensive and require specialized materials.
- Does not improve potential for sand accretion.

Seawall repair is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the project site to sea level rise. The seawall is in a serviceable condition and replacement of the structure is not necessary. The proposed repairs and modifications are the most cost-effective and least environmentally impactful approach to maintain the existing seawall and reduce potential for wave overtopping with sea level rise. Seawall repair is therefore the preferred alternative.

2.6 ENVIRONMENTAL PERMITS AND APPROVALS REQUIRED

The Proposed Action will require approvals from the State and City for the following regulatory permits:

- Board of Land and Natural Resources Approval
- Shoreline Setback Variance (SSV)
- Building Permits

A Conservation District Use Permit (CDUP) from the DLNR-OCCL is not required because the seawall and easement area are not located in the Conservation District, which includes all lands makai of the certified shoreline. The shoreline for the Property was certified by the State of Hawaiʻi on June 5, 2018. The certified shoreline reconfirmed that the property boundary is located “along the seaward face of the seawall.”

The Department of the Army has determined that the Proposed Action is not subject to their regulatory jurisdiction and does not require authorization under Section 404 of the Clean Water Act (33 U.S.C. 1344; “Section 404”) or Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403; “Section 10”). This determination obviates the requirements for a Nationwide Permit, Water Quality Certification, and Coastal Zone Management Consistency Determination (see Appendix G, Department of the Army letter dated January 24, 2020).

2.6.1 Board of Land and Natural Resources Approval

The Hawaiʻi State Legislature is the lawmaking body of the State of Hawaiʻi. The DLNR is the designated lead agency with regulatory authority over Public Trust lands, which includes unencumbered state land and submerged land. The unencumbered state land seaward of the record boundary, including the seawall, is covered by a non-exclusive easement. The BLNR governs land uses in the easement area. Therefore, the proposed seawall repairs would require approval from the BLNR.

2.6.2 Shoreline Setback Variance

The City and County of Honolulu Department of Planning and Permitting (DPP) is the designated lead agency with regulatory authority over development landward of the shoreline within the Special

Management Area (SMA). Chapter 205-2 HRS establishes the types of land uses that are permissible within the SMA, which is considered the most sensitive area of the coastal zone. The proposed seawall repairs would require a SSV from the City and County of Honolulu.

2.6.3 Building Permit

Alteration of any building or structure requires a Building Permit from the DPP. The Building Permit application would include stamped engineering plans, specifications, and cost estimates. Building Permit fees are calculated by the building official and are based on the total value of all construction work for which the permit is issued.

Table 2-2: List of Permits and Approvals Required

Permit/Approval/Consultation	Agency
State of Hawai‘i	
Chapter 343, HRS	City and County of Honolulu Department of Planning and Permitting
Approval for work within easement area	Board of Land and Natural Resources
Section 6E-8 Historic Preservation Review	Department of Land and Natural Resources, Historic Preservation Division
Community Noise Permit	Department of Health, Indoor and Radiological Health Branch
City and County of Honolulu	
Building, Engineering and Construction Permits	City and County of Honolulu Department of Planning and Permitting

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3. NATURAL AND PHYSICAL ENVIRONMENT

3.1 CLIMATE

3.1.1 Existing Conditions

Located at the northern edge of the tropics, the Hawaiian Islands enjoy a moderate climate with almost continual trade winds. Generally, the islands' climate has little day-to-day and month-to-month variability.

The Waimānalo ahupuaʻa (traditional land division) is generally drier than the rest of Windward Oʻahu. The Waimānalo Paradise property is located along the coast and in the shadow of the Koʻolau mountains, and the climate is generally hotter and dryer than in the broad valley plain of the ahupuaʻa. There is little variation in temperature with the average monthly high of 77.32° Fahrenheit in August and the average monthly low of 70.14° Fahrenheit in January and February (Giambelluca et al. 2014).

Mean annual rainfall is 31.4 inches with the wettest months between October and May and the driest months between April and September (Giambelluca et al. 2013). December receives the most precipitation (4.70 inches) and September receives the least (0.73 inches).

The prevailing winds throughout the year are the northeasterly tradewinds. Average frequency varies from more than 90 percent during the summer season to only 50 percent in January, with an overall annual frequency of 70 percent. Westerly or Kona winds occur primarily during the winter months and are generated by low pressure or cold fronts that typically move from west to east past the islands (see Section 3.3.1).

3.1.2 Potential Impacts and Mitigation

The Proposed Action will have no effect on immediate climate conditions and no mitigation is required. The larger relationship of the Proposed Action to global climate change and sea level rise is discussed in Section 3.8. As noted in Chapter 2, one of the primary goals of the proposed seawall improvements is to increase the resilience of the Waimānalo Paradise property to sea level rise, which is being exacerbated by global climate change. Although the Proposed Action does not impact the climate or climate change, it is being implemented largely in response to long-term climate trends.

3.2 PHYSICAL SETTING

3.2.1 Existing Conditions

Regional Conditions

The project site is situated at the southern end of Waimānalo Bay on the southeast coast of Oʻahu. The shoreline west of the project site is characterized by sandy beaches that extend north to Wailea Point. Notable features west of the project site include Kaiona Beach Park, Waimānalo Beach Park, Waimānalo Bay State Recreation Area, and Bellows Air Force Station. The shoreline east of the project site transitions to a rocky coastline with limestone outcrops, basalt boulder deposits, and small pocket beaches that extend south to Makapuʻu Point. Notable features east of the project site include Kaupō Beach Park, Mānana (Rabbit Island), Makai Research Pier, Makapuʻu Beach Park, and Makapuʻu Lighthouse.

Geology and Soils

The surficial geology of the Waimānalo coastline is primarily unconsolidated Holocene carbonate beach and dune deposits and alluvium (Sherrod et al., 2007). The terrestrial soils are designated as Jaucas sand (JaC) with 0 to 15 percent slopes. Areas of the Waimānalo Paradise property closest to Kalaniana‘ole Highway include Kawaihapai very stony clay loam, 0 to 15 percent (KIbC) (Figure 3-1). Jaucas sand is described as excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean on all islands. These soils developed in wind- and water deposited sand from coral and seashells. On this soil, permeability is rapid. Runoff is very slow to slow, and the hazard of water erosion is slight, but wind erosion is a severe hazard where vegetation has been removed (USDA, 1972). Subsurface investigations within the property revealed large volumes of clayey fill material and basalt boulders in the area immediately inshore of the seawall.

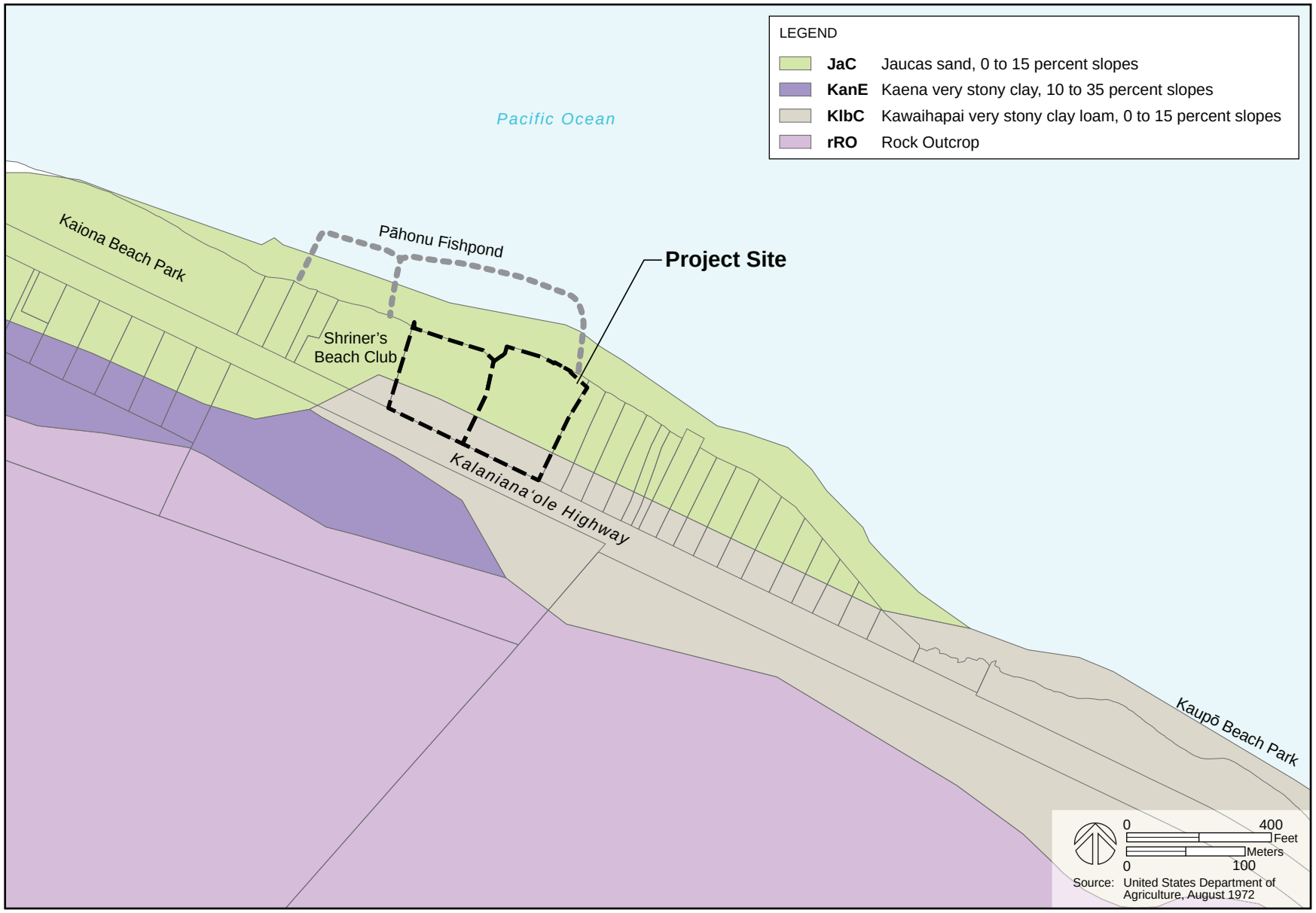
Topography

A topographic survey of the Waimānalo Paradise property was conducted by KN Surveying, Inc. in October 2017. Terrestrial elevations on the West Lot ranged from +5 to +8 feet (msl). Terrestrial elevations on the East Lot ranged from +5 to +11 feet (msl). The East Lot is at a slightly higher elevation than the West Lot. A circular depression is located in the middle of the property between the two lots. Elevations within the depression range from +3 to +5 feet (msl).

Bathymetry

The Waimānalo coast is dominated by a broad, shallow fringing reef that begins just south of the project site and becomes increasing wider toward Wailea Point. The broad reef is bordered by a wide nearshore lagoon. The combined reef and lagoon system give Waimānalo Bay its unique character. Figure 3-2 shows water depths (in fathoms) relative to msl offshore of the project site.

Nearshore water depths are generally one fathom (6 feet) or less in the inner lagoon and reef, which extends approximately 2,000 feet offshore. Water depths along the reef crest range from 1 to 3 fathoms (6 to 18 feet). Water depths on the outer reef range from 3 to 5 fathoms (18 to 30 feet) before dropping off into deeper waters offshore. A bathymetric survey of the nearshore waters within the fishpond was conducted by SEI on July 17, 2019. The minimum elevation within the fishpond was -5.4 feet (msl) at the tidal channel near the middle of the outer wall of the fishpond. The maximum elevation was +3.2 feet (msl) at the east end of the dry beach area where the fishpond abuts the seawall.



NRCS Soil Classifications

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

Figure 3-1

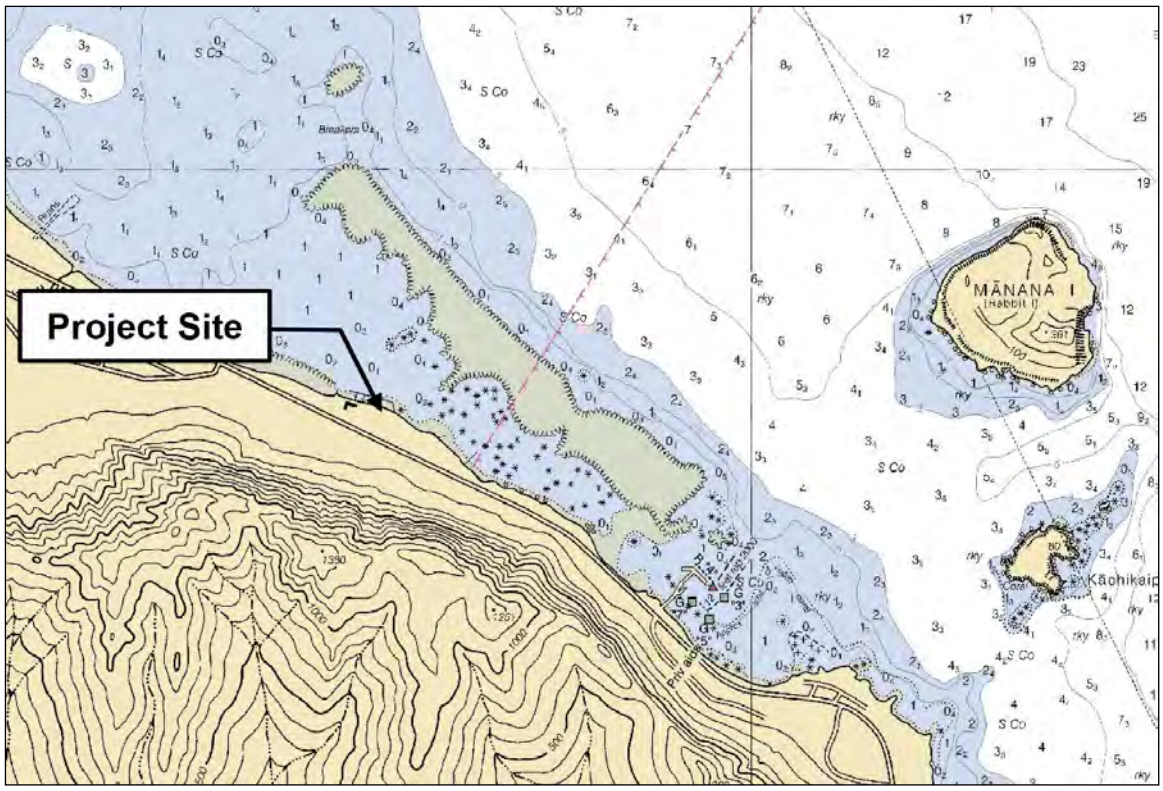


Figure 3-2: Bathymetry Source: SEI, 2020

3.2.2 Potential Impacts and Mitigation

The Proposed Action will have no impact on geology and soils, topography or bathymetry. However, these existing conditions were taken into consideration when evaluating the seven project alternatives and recommending a preferred alternative. The existing soil and geotechnical conditions influence the bearing capacity of the wall foundations and the recommended design, materials, and construction methods proposed to stabilize the wall.

A geotechnical assessment was completed as part of the *Coastal Assessment* (SEI, 2020) and included the excavation of four test pits along the inshore side of the seawall. The test pits were excavated to depths of 6.0 to 13.0 feet below grade, and an air jet probe was used to measure sand thickness and estimate the depth to hard substrate along the base of the seawall. A structural engineering analysis was conducted by MKE Associates LLC to determine the condition of the wall and bearing foundation. The Proposed Action is a result of the evaluation of the existing condition of the seawall and an assessment of existing geological, soils and topographic conditions. The Proposed Action represents the most feasible, cost effective, and least environmentally impactful method to meet the project objectives.

3.3 OCEANOGRAPHIC AND COASTAL ENVIRONMENT

A *Coastal Assessment for Waimānalo Paradise Seawall Repairs* was conducted by Sea Engineering, Inc. (SEI) in 2020, and is included as Appendix A. The objectives of the *Coastal Assessment* were to: 1) assess existing site conditions; 2) evaluate coastal engineering alternatives to increase resilience to sea level rise; and 3) identify the recommended engineering alternatives. Most of the information in this EA

regarding the marine environment is taken from the *Coastal Assessment*, including the description of the existing shoreline and coastal processes, coastal hazards, description of improvements, and evaluation of alternatives.

3.3.1 Existing Conditions

Oceanographic Setting

Winds. The prevailing winds throughout the year are the northeasterly tradewinds. Average tradewind frequency varies from more than 90 percent during the summer season to only 50 percent in January, with an overall annual frequency of 70 percent. Westerly or Kona winds occur primarily during the winter months and are generated by low pressure systems that typically move north of the islands from west to east. Figure 3-3 shows a wind rose diagram that is applicable to the project site. The diagram is based on wind data recorded daily at Marine Corps Base Hawaii (MCBH) in Kāneʻohe, Oʻahu.

Tradewinds are produced by the outflow of air from the Pacific Anticyclone high-pressure system, also known as the Pacific High. The center of this system is located well north and east of the Hawaiian Islands and moves to the north and south seasonally. In the summer months (May through September), the center moves to the north, causing the tradewinds to be at their strongest. In the winter months (October through April), the center moves to the south, resulting in decreasing tradewind frequency. During these months, the tradewinds continue to blow; however, their average monthly frequency decreases to 50 percent.

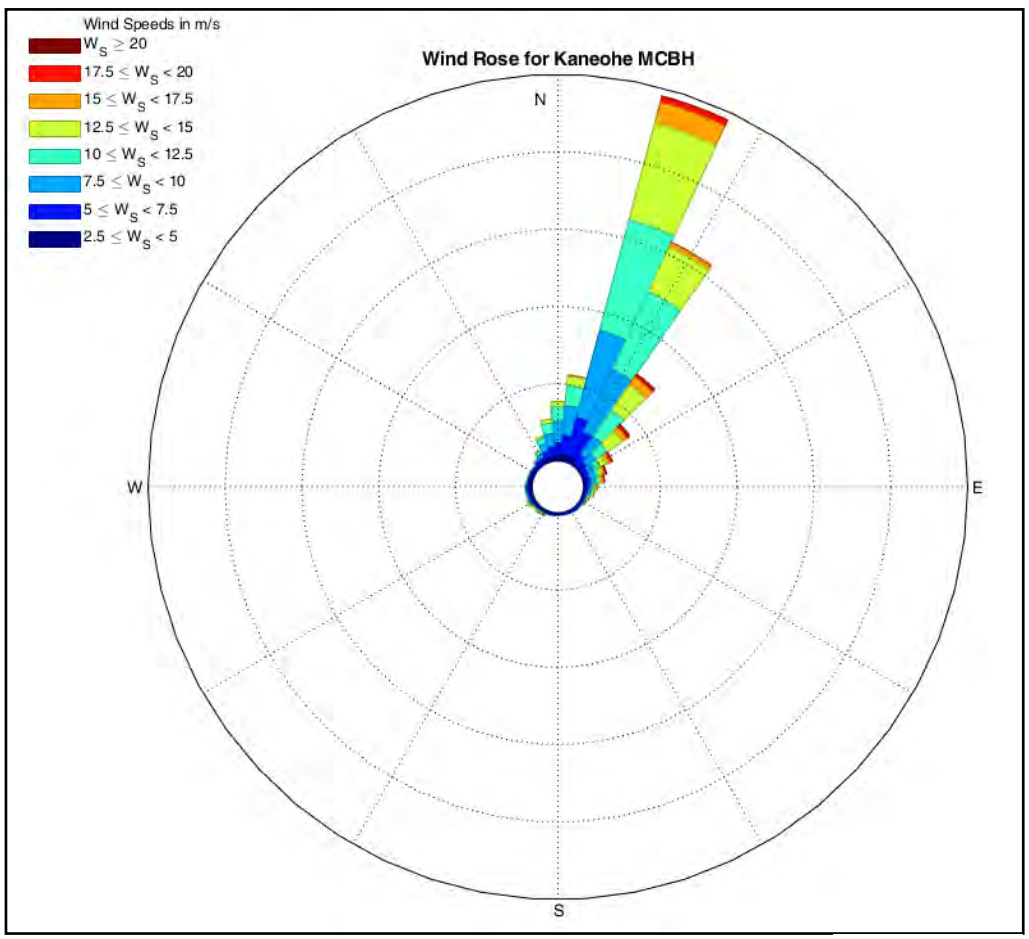


Figure 3-3: Wind Rose, Kāneʻohe MCBH (July 2016 to July 2018)

Source: SEI, 2020

During the winter months, wind patterns of a more transient nature increase in prevalence. Winds from extra-tropical storms can be very strong from almost any direction, depending on the strength and position of the storm. The low-pressure systems associated with these storms typically track west to east across the North Pacific north of the Hawaiian Islands. At Honolulu International Airport, wind speeds resulting from these storms have exceeded 60 mph on several occasions. Kona winds are generally from a southerly to a southwesterly direction and are usually associated with slow-moving low-pressure systems known as Kona lows situated to the west of the Hawaiian Islands. These storms are often accompanied by heavy rains.

Tides. Hawaiʻi tides are semi-diurnal with pronounced diurnal inequalities (i.e. two high and low tides each 24-hour period with different elevations). A modulation of the tidal range results from the relative position of the moon and the sun. During full moon and new moon phases, the moon and sun act together to produce larger "spring" tides; when the moon is in its first or last quarter, smaller "neap" tides occur. The cycle of spring to neap tides and back is half the 27-day period of the moon's revolution around the earth and is known as the fortnightly cycle. The combination of diurnal, semi-diurnal and fortnightly cycles dominates variations in sea level throughout the Hawaiian Islands.

Tidal predictions and historical extreme water levels are provided by the NOAA NOS Center for Operational Oceanographic Products and Services. A tide station is located at Moku o Loʻe (Coconut Island) in Kāneʻohe Bay. Water level data based on the 1983 to 2001 tidal epoch is shown in Table 3-1.

Table 3-1: Water level data for Moku o Loʻe (Coconut Island), Station 1612480 (NOAA)

Datum	Elevation (feet, mllw)	Elevation (feet, msl)
Mean Higher High Water	+2.1	+1.1
Mean High Water	+1.8	+0.8
Mean Sea Level	+1.1	0.0
Mean Low Water	+0.3	-0.7
Mean Lower Low Water	0.0	-1.1

Source: SEI, 2020

Hawaiʻi is also subject to periodic extreme tide levels due to large oceanic eddies and other oceanographic phenomena that have recently been recognized and that sometimes propagate through the islands. Mesoscale eddies produce tide levels that can be up to 0.5 foot higher than normal for periods up to several weeks (Firing and Merrifield, 2004). An additional temporary sea level rise of 0.5 feet has also been associated with phenomena related to the El Niño /Southern Oscillation.

Waves. The general wave climate in Hawaiʻi is dominated by long period swell generated by distant storm systems, relatively low-amplitude, short-period waves generated by local winds, and occasional bursts of energy associated with intense local storms. Typically, Hawaiʻi receives five general surface gravity wave types: 1) northeast tradewind waves; 2) southeast tradewind waves; 3) southern swell; 4) North Pacific swell; and 5) Kona wind waves.

Tradewind waves occur throughout the year and are the most persistent April through September when they usually dominate the local wave climate. These winds result from the steady tradewinds blowing from the northeast quadrant over long fetches of open ocean. Tradewind deepwater waves are typically between 3 and 8 feet high with periods of 5 to 10 seconds, depending upon the strength of the

tradewinds and how far the fetch extends east of the Hawaiian Islands. The direction of approach, like the tradewinds themselves, varies between north-northeast and east-southeast and is centered on the east-northeast direction. The project site is directly exposed to tradewind waves and these waves represent a significant source of wave energy reaching the project site.

During the winter months in the northern hemisphere, strong storms are frequent in the North Pacific in the mid-latitudes and near the Aleutian Islands. These storms generate large North Pacific swells that range in direction from west-northwest to northeast and arrive at the northern Hawaiian shores with little attenuation of wave energy. These are the waves that have made surfing beaches on the North Shore of Oʻahu famous. Deepwater wave heights often reach 15 feet and in extreme cases can reach 30 feet. Periods vary between 12 and 20 seconds, depending on the location of the storm. While sheltered from northwesterly wave approach, the project site is directly exposed to North Pacific swell approaching from the north and northeast directions and these waves represent a significant source of wave energy reaching the project site.

Southern swell is generated by storms in the southern hemisphere and is most prevalent during the summer months of April through September. Traveling distances of up to 5,000 miles, these waves arrive with relatively low deepwater wave heights of 1 to 4 feet and periods of 14 to 20 seconds. Depending on the positions and tracks of the southern hemisphere storms, southern swells approach between the southeasterly and southwesterly directions. The project site is well sheltered from the direct approach of southern swell by the island of Oʻahu, and only a portion of the wave energy refracting and diffracting around the southeast corner of the island reaches the project site shoreline.

Kona storm waves also directly approach the island of Oʻahu; however, these waves are relatively infrequent, occurring only about 10 percent of the time during a typical year. Kona storm waves typically approach from the southwest and range in heights from 5 to 10 feet with periods from 6 to 10 seconds. Located on the windward side of Oʻahu, Waimānalo is sheltered from the direct approach of Kona storm waves by the island of Oʻahu itself, and only a portion of the wave energy refracting and diffracting around the southeast corner of Oʻahu may reach the project site shoreline.

Severe tropical storms and hurricanes obviously have the potential to generate extremely large waves, which in turn could potentially result in large waves along this stretch of shoreline. Recent hurricanes impacting the Hawaiian Islands include Hurricane Iwa in 1982 and Hurricane Iniki in 1992. Iniki directly hit the island of Kauaʻi and resulted in large waves along the southern shores of all the Hawaiian Islands. Damage from these hurricanes was extensive. Although not a frequent or even likely event, they should be considered in the design of shoreline structures, both in the water and on land near the shoreline.

3.3.2 Potential Impacts and Mitigation

The Proposed Action, seawall repair and modifications, will not directly impact the oceanographic and coastal setting. It will also not affect the wind, wave and tide conditions described in Section 3.3.1. . However, these existing coastal conditions were considered in the development of the Proposed Action. The winds, tides, waves and other shoreline change trends were evaluated to assess the vulnerability of the property to long-term coastal hazards. Existing conditions were also considered in developing appropriate alternatives and recommendations to increase the resilience of the property, while minimizing adverse impact to the coastal environment.

3.4 MARINE WATER QUALITY

3.4.1 Existing Conditions

HAR §11-54 defines the State standards for particular parameters in Hawaiʻi waters and is defined by both narrative and numerical criteria. State waters are classified as either inland waters or marine waters. HAR §11-54-3 (c) defines classifications for marine waters. The marine waters within and around Waimānalo are defined as "Class AA." It is the objective of Class AA waters that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused sources or actions. (HAR §11-54-3 (c)(1)). All marine waters are categorized as embayments, open coastal, or oceanic. The marine waters within the vicinity of the project site are defined as "open coastal."

The Baseline Assessment of the Marine Environment was conducted by Marine Research Consultants, Inc. (MRCI) (2019), to assess the physical, chemical and biological composition of nearshore waters that may be affected by the Proposed Action. The study is included as Appendix B. Findings regarding water quality are summarized in the following section.

Methodology

The purpose of the MRCI water quality assessment was to provide a quantitative depiction of the existing condition of marine water chemistry in the area that has the potential to be affected by the proposed seawall retrofit project. Evaluation of the existing condition of the water chemistry provides an insight into the physical and chemical factors that influence the marine setting. Understanding the existing physical and chemical conditions of the marine environment provides a basis for predicting the project's potential effects.

Water chemistry field collection was conducted on July 15, 2019. Water chemistry was assessed by collecting four linear sets of samples (i.e. transects) extending perpendicular to the shoreline, extending from the highest wash of waves to approximately 50 meters offshore. The location of the four transects and water sampling stations are shown in the study (see Appendix B). Water samples were collected at four locations along each transect starting at the most landward end adjacent to the beach. This sampling scheme is designed to span the greatest range of salinity with respect to potential freshwater efflux at the shoreline. Sampling was more concentrated in the nearshore zone because this area is closest to the proposed seawall work. At sampling stations within 10 meters of the shoreline, water samples were collected at a single depth approximately in the mid-point of the water column. Beyond 10 meters from the shoreline two samples were collected at each station; a surface sample was collected within 10 centimeters of the air-water interface and a bottom sample was collected within 20 centimeters of the sea floor.

Water quality parameters evaluated included all specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (b) (Open Coastal waters) of the State of Hawaiʻi Department of Health Water Quality Standards (HDOH-WQS). These criteria include total nitrogen (TN), nitrate + nitrite nitrogen (NO3- + NO2-, hereafter referred to as NO3-), ammonium nitrogen (NH4+), total phosphorus (TP), Chlorophyll a (Chl *a*), turbidity, temperature, pH, and salinity. In addition, silica (Si) and orthophosphate phosphorus (PO4-3) were reported because these constituents are sensitive indicators of biological activity and the degree of groundwater mixing.

Distribution of Chemical Constituents

The nearshore area off the fishpond consists of a seawall that abuts a rubble boulder base. Seaward of the seawall and within the rock walls that comprise the fishpond boundaries, bottom composition

consists of a shallow surface of coarse sand. The outer wall of the fishpond contains an opening that provides a tidal channel (mākāhā) facilitating exchange of water between the pond and the open ocean. The partial isolation of the fishpond is reflected in the patterns of water chemistry distribution.

The MRCI study (Appendix B) includes tables with the results of all water chemistry analyses on samples collected off the Waimānalo Paradise property on July 15, 2019. In the study, the concentrations of eight dissolved nutrient constituents, as well as the values of salinity, Chl *a*, turbidity, pH, temperature, and dissolved oxygen are plotted as functions of distance from the shoreline.

The data shows elevated values of several nutrient constituents at the shoreline, decreasing with distance from shore. The report notes that this pattern of elevated Si and lower salinity is indicative of freshwater entering the ocean at the shoreline.

The concentrations of NO3-, NH4+, and TN on all transects show a general trend of elevated values at the shoreline with decreasing concentrations moving seaward. All four transects showed depressed salinity in the nearshore waters. The source of these elevated nutrients is likely from groundwater input at the shoreline.

Considering physical properties of the water column, turbidity, Chl *a*, temperature, dissolved oxygen, and pH all display similar patterns, with peak values at the shoreline, and decreasing values with distance seaward. At the shoreline, the values of all these physical properties were highest at the transect located at the western boundary of the Waimānalo Paradise property.

Compliance with HDOH-WQS Criteria

Areas offshore of the Waimānalo Paradise property are listed as “open coastal water” in Chapter §11-54-6(b) HRS. The State of Hawaiʻi Department of Health (DOH) has two sets of standards depending on whether an area receives more than 3 million gallons per day (mgd) of freshwater input per shoreline mile (“wet standards”), or less than 3 mgd of freshwater input per shoreline mile (“dry”). As the study area off the northeast coast of Oʻahu probably receives more than 3 mgd per mile, wet criteria were used for this evaluation.

The HDOH-WQS were separated into three standards: 1) geometric means, 2) “not to exceed more than 10 percent of the time,” and 3) “not to exceed more than 2 percent of the time.” As all these classifications require multiple samplings, they cannot be used for a strict evaluation of whether a single sampling is within compliance standards. However, these values provide a guideline to evaluate the overall status of sampled waters relative to State water quality standards.

The data was compared to the DOH “not to exceed” standards under “wet” conditions. On several transects, nitrate nitrogen (NO3-) exceeded the standard within 10 meters of the shoreline. On all four transects, several measurements of ammonia nitrogen (NH4+) exceeded the 10 percent limits. As discussed above, the elevated concentrations of dissolved nutrients near the shoreline are likely a result of mixing of groundwater with ocean water. As the water quality standards do not take into account such natural mixing, and nutrient concentrations of all offshore samples are within the HDOH-WQS limits, it appears that the waters off the Waimānalo Paradise project do not exceed water quality standards.

Values of turbidity at the shoreline of three transects exceeded the HDOH-WQS 10 percent limit. The elevated turbidity near the shoreline is likely a result of resuspension of the fine-grained sediment that comprises the floor of the fishpond. Concentrations of TP and Chlorophyll *a* did not exceed HDOH-WQS limits at any of the sampling sites.

The study concluded that overall, with the exceptions described above, most of the area within the general vicinity of the project site are close to or below the specific criteria of the HDOH-WQS, with the caveat that this consideration is for a single sample set. As a result, it does not appear that there are any significant inputs of materials from land beyond the immediate shoreline that are impacting coastal ocean waters offshore off the project site.

Summary of Findings

The analysis of a series of water samples collected along transects that extended from the shoreline to 50 meters offshore indicates that there is input of groundwater at the shoreline along the seawall. Naturally occurring groundwater contains substantially higher nutrients than seawater, resulting in concentrations in nearshore samples above the HDOH-WQS. Values of turbidity near the shoreline are also elevated relative to offshore values. The elevated values of turbidity are primarily a response to wave-resuspended fine sediment near the shoreline. Overall, the study concluded that water quality off the project site represents typical marine settings in Hawaiʻi with no indication of any contamination from activities on land.

3.4.2 Potential Impacts and Mitigation

The Proposed Action involves seawall repair and modification including repair of delaminations, spalls and cracks, filling of undermined wall areas with tremie concrete, and removal of delaminated and spalled areas. Appropriate best management practices will be employed to ensure that adequate protective measures are in place during construction to protect water quality and minimize adverse environmental effects.

The water quality assessment (MRCI 2019) concluded that, based on the results of the water quality survey, with proper management and mitigation practices to limit to the extent possible any release of construction-related materials to the water column, the proposed seawall repairs should have little or no potential for significant effects to the existing marine environment.

3.5 TERRESTRIAL BIOLOGICAL RESOURCES

3.5.1 Existing Conditions

Flora

Due to the presence of the seawall that forms the makai border of the property and abuts the water's edge, shoreline vegetation is almost non-existent. The residential portion of the Waimānalo Paradise property has been disturbed and in continuous residential use for decades. All vegetation on the residential portion of the site has been introduced as part of the cultivated and maintained landscape, and includes indigenous, naturalized plants. Plants on the property include ulu or breadfruit (*Artocarpus altilis*), kukui or candlenut trees *(Aleurites moluccanus),* mahoe or hau tree *(Hibiscus tiliaceus),* naupaka kahakai *(Scaevola gaudichaudii),* coconut palm trees*, (Cocos nucifera),* hala or Pandanus/Screwpine trees *(Pandanus tectorius),* false kamani/kamani haole/sea almond trees *(Terminalia catappa),* areca palm *(Dypsis lutescens),* shower trees *(Cassia fistula),* and umbrella/octopus trees *(Schefflera actinophylla).* Sea grape tree *(coccoloba uvifera)* is also very much present on site.

Fauna

Terrestrial fauna in the vicinity of the project site consists of introduced species common to lowland areas of O'ahu. Typical bird species found in the area include common myna (*Acridotheres tristis*), red-crested cardinal (*Paroaria coronata*), and house sparrow (*Passer domesticus*). It is also likely that feral cats and rats are present.

Comments received from the USFWS during the pre-assessment consultation period were limited to marine biology. However, for other projects in the project vicinity, the USFWS has noted that the federally endangered Hawaiian coot (*Fulica alai*), Hawaiian duck (*Anas wyvilliana*), Hawaiian moorhen (*Gallinula chloropus sandvicensis*), Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian hoary bat (*lasiurus cinereus semotus*) have been observed in the Waimānalo area. Additionally, the federally threatened Newell's shearwater (*Puffinus auricularis newelli*) and the Migratory Bird Treaty Act-protected wedge-tailed shearwater (*P. pacificus*), are known to fly through the area (City and County of Honolulu Department of Design and Construction 2012).

There are no federally designated or proposed critical habitat or presence of threatened or endangered species in the terrestrial areas of the project site.

3.5.2 Potential Impacts and Mitigation

The Proposed Action is limited to seawall repairs and modifications. Development on the residential portion of the Waimānalo Paradise property is not part of the proposed project. However, construction equipment and machinery will access the project site through the residential property and will be temporarily staged on the property. Potentially affected areas are previously disturbed, dominated by introduced species, and there are no species of concern or sensitive habitats.

The proposed seawall repairs and modifications will not impact or attract feral or domesticated predators (e.g., mongoose, dogs, cats) that could affect protected bird populations. Hawaiian hoary bats, which have been observed in the Waimānalo area, roost in woody vegetation, but are unlikely to occur on the property. No trees are proposed for clearing as part of the Proposed Action. There will be no nighttime construction or use of lighting which could have an adverse effect on overflying migratory sea birds. There is no critical habitat on or adjacent to the project site that could be impacted by the proposed seawall repair activities.

3.6 MARINE BIOTA

The *Baseline Assessment of the Marine Environment* conducted by MRCI (2019) assessed the biological composition of the nearshore waters that may be affected by the Proposed Action. The study is included as Appendix B. Findings regarding marine biota are summarized in the following section.

3.6.1 Existing Conditions

The nearshore marine environment fronting the seawall is composed of several distinct habitats, defined by both physical and biotic composition. These habitats types are delineated in Figure 3-4 as colored polygons, with some of the typical features listed in Table 3-2 below. The map numbers (6 through 11) reflect the numbering in the MRCI study (Appendix B), and the report includes numerous photographs of these habitat areas.

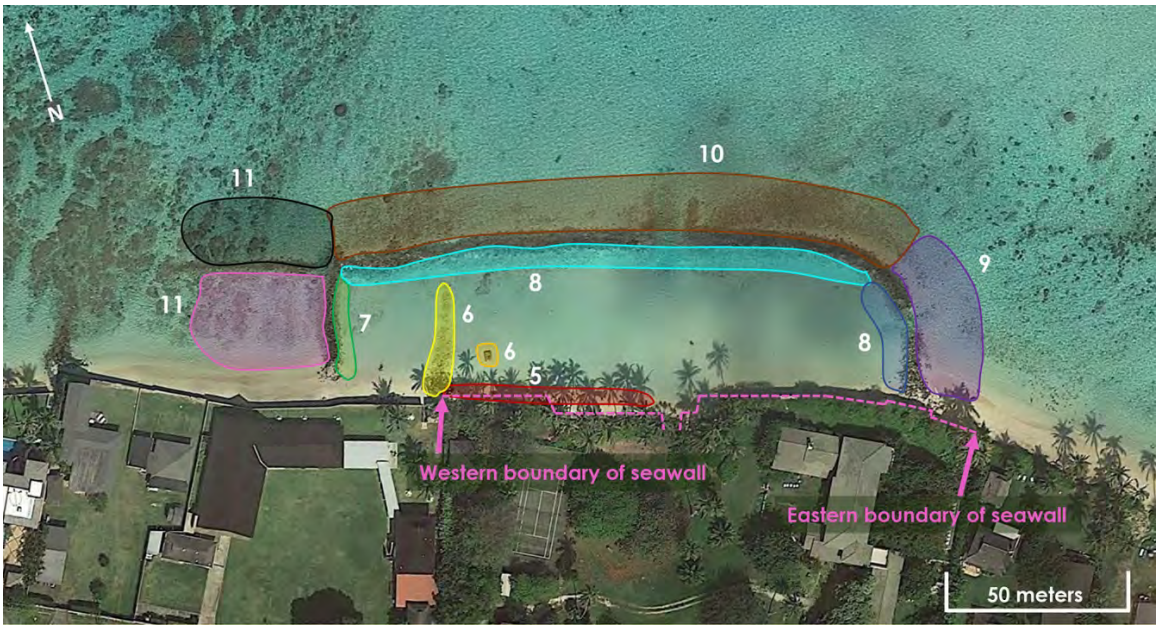


Figure 3-4: Marine Biotic Habitats

Source: SEI, 2020

Table 3-2: Marine Biotic Habitats

MRCI Map Number	General Location	Observed Habitat Composition
5	Seawall extending the length of the property	Base of seawall consists of rocks and boulders. No corals or other attached macrofauna observed on submerged seawall or boulder base.
6	Concrete block on sand surfaces and submerged boulder finger	No corals observed on submerged portions of the concrete block and no fish or other vertebrates observed around block. Corals growing on boulders include *Porites lobate, Pocillopora damicornis, and Montipora capitata.*
7	Submerged boulder wall on inner west side of fishpond	Observed biota in this area include black-lipped pearl oyster *(Pinctada margaritifera).* Red/brown unidentified cyanobacteria; coral including *Montipora capitata*.
8	Inside outer wall of fishpond	Fishpond includes sandy floor with corals along base of wall including *Porites lutea*; *Porites lobata*; *Pocillopora meandrina; Montipora capitata*. Shell and debris piles found adjacent to east wall of the fishpond.
9	Seafloor outside of east side of fishpond	Open ocean outside fishpond consists of shallow sand bottom interspersed with patches of coral rock.
10	Outside offshore wall of fishpond	On east side of fishpond wall, large spherical colonies of *Montipora capitata* were interspersed over the bottom.
11	Outside west side of fishpond	Large coral colonies very abundant, primarily spherical growth forms of *Porites* spp. and *Montipora capitate.*

Source: SEI, 2020

The following is a description of the distinct habitats that occur in the marine environment of the Waimānalo Paradise property shown in Figure 3-4.

Seawall

The most shoreward region of the marine habitat is bounded by the concrete seawall that extends the length of the property. The base of the seawall and intertidal area consists of rocks and boulders that form a band extending one to two meters offshore. No corals or other attached macrofauna were observed on the submerged seawall or boulder base. Schools of juvenile convict tangs (*Acanthurus triostegus*) were observed in the shallow rocky area along the base of the seawall.

Inside Fishpond

The physical structure of the intertidal marine habitat adjacent to the seawall is composed of boulders and rocks. Seaward of the rock base, the floor of the fishpond consists of a uniform sand bottom. Seaward of the shoreline, two structures occur on the sand floor of the fishpond. These consist of a square concrete block and a submerged boulder finger that extends perpendicular to the shoreline. No corals were observed on the submerged portions of the concrete block and no fish or other vertebrates were observed around the block.

The boulders comprising the finger that extends off the seawall, as well as the boulders that form the inner margins of the fishpond are similar in biotic composition. The most common corals colonizing the boulders are *Montipora capitata*, *Porites lobata, P. lutea, Pocillopora meandrina* and *P. damicornis*. None of these corals covered large expanses of the walls, and generally existed as isolated colonies. Other macroinvertebrates observed in this area were the sea urchins *Echinometra mathaei* and *Tripneustes gratilla*, the black-lipped pearl oyster *Pinctada margaritifera*, the sea cucumber *Holothuria atra,* and a single octopus *(Octopus sp.).* None of these invertebrates were abundant.

The boulder walls provided sheltered habitat for several fish species (see Appendix B, Table 3). The most abundant species inside the fishpond were the convict tang (*Acanthurus triostegus*), goatfish (*Mulloidichthys flavolineatus, M. vanicolensis*) and the damselfish (*Dasyllus albisella*). Other genera of reef fish that were observed within the fishpond included several butterflyfish, wrasses, and triggerfish.

The floor of the fishpond consisted of a white sand surface with areas of concentrated shell fragments and other debris. No seagrass was observed on the sand floor, although some green algae were noted, primarily of the genus *Caulerpa*.

Outside Fishpond

The open ocean marine habitat outside the fishpond consisted of a shallow sand bottom interspersed with patches of coral rock. On the eastern side of the fishpond wall, large spherical colonies of *Montipora capitata* were interspersed over the bottom. Many of these colonies were up to two meters in diameter indicating they were decades old. The size of these colonies indicates that they have survived recent El Niño induced bleaching events and other episodic instances of environmental stress. These large colonies were less common off the central part of the fishpond wall.

The marine community structure on the western side of the fishpond was substantially different than off the central region. Large coral colonies were very abundant, consisting primarily of spherical growth forms of *Porites* and *Montipora*. The difference in density of corals between the west and central areas outside of the fishpond is evident in the higher cover of dark areas in Figure 3-4. The probable reason for the higher cover to the west of the fishpond is increased protection from tradewind generated waves that arrive at the shoreline from the northeast.

No seagrass was observed outside the fishpond walls, and benthic macroalgae was not present in significant amounts. Sea urchins and other motile macrobenthos were also scarce outside the seawall. Species of fish that were noted only outside the fishpond included several surgeonfish (*Acanthurus xanthopterus, A. unicornis,* and *Naso unicornis).*

The marine communities directly off Waimānalo Paradise seawall where repairs are planned do not represent any rare or unique components. Within the inner boundaries of the fishpond, corals occur, although there are no expansive areas of colonization, nor are any of the species considered rare. Outside the fishpond, and particularly off the western boundary, coral communities are well developed, consisting of large colonies that are at least several decades old. No seagrass is present within, or outside, the fishpond.

Threatened and Endangered Species

Several species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly throughout the Hawaiian Islands and is frequently observed in the nearshore areas of O‘ahu. The endangered hawksbill turtle (*Eretmochelys imbricata*) is known infrequently from Hawaiian waters. No sea turtles were observed within the survey area during the present study, although they undoubtedly occur in the area.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) winter in the Hawaiian Islands from December to April. While the present survey was conducted in August when whales are absent from Hawaiian waters, the survey area is not conducive to whale habitation owing to shallow depth and lack of access across the outer Waimānalo reef. The Hawaiian monk seal, (*Monachus schauinslandi*) is an endangered earless seal that is endemic to the waters off the Hawaiian Islands.

Monk seals commonly haul out of the water onto sandy beaches to rest. No seals were observed during the present survey work at Waimānalo Paradise, although the sand beaches in the area could provide haul-out areas.

3.6.2 Potential Impacts and Mitigation

The MRCI study (2019) assembled baseline information to evaluate the potential impacts to the marine environment from the proposed seawall repair. The information provides the basis to understand some of the important processes that are operating in the nearshore ocean in order to address any concerns that might be raised in the planning process for the proposed project.

The physical structure of the intertidal marine habitat adjacent to the seawall is composed of boulders and rocks. Seaward of the rock base, the floor of the fishpond consists of a uniform sand bottom.

Results of biotic surveys adjacent to the seawall reveal that the rock does not serve as settling surfaces for corals, other benthic macroinvertebrates or seagrass. The boulder surfaces within the fishpond are colonized by scattered corals of the most common Hawaiian species. While corals occur on the boulders forming the fishpond walls, there were no areas where corals can be considered abundant, or unique. No seagrass was observed on the sand bottom of the fishpond.

The marine habitat outside the fishpond consists primarily of a shallow sand bottom. The outer surfaces of the boulders forming the seawall are colonized by similar scattered coral colonies as the inside of the fishpond. On both the eastern and western sides of the fishpond, the corals occur as large (1–2 meters diameter) spherical colonies of *Montipora capitata* and *Porites* spp. The density of these large corals is

substantially higher on the west side of the fishpond, likely as a result of shelter from waves emanating from the northeast.

Although the name of the fishpond—Pāhonu—indicates that its original purpose was to provide a captive space for sea turtles, none were in the pond at the time of the survey. As the pond presently contains an opening to the ocean to promote flushing, it no longer serves as an effective containment area for turtles. The possible small temporary changes to water quality that might occur from the seawall repair process should not be of a magnitude to affect turtle behavior, as they seem unaffected by turbid waters.

During construction, best management practices will be implemented to minimize sediment runoff and demolition debris from inadvertently entering the water. A biosock filter will be placed around the terrestrial work area. During in-water work, best management practices include a turbidity curtain and wooden form around the work area to control sedimentation and turbidity. Visual scans will be conducted prior to in-water work to ensure that there are no sea turtles or monk seals present near the construction area. If turtles or monk seals are present, a mitigation plan will be implemented and work will be postponed until the animals leave the area.

Based on the results of the study, it can be concluded that with proper management and mitigation practices to limit to the extent possible any release of construction-related materials to the water column, the proposed seawall repairs should have little or no potential for significant effects to the existing marine environment.

3.7 COASTAL HAZARDS

3.7.1 Existing Conditions

Coastal hazards were addressed in the *Coastal Assessment* prepared by SEI in 2020 (Appendix A). The project site is in Waimānalo Bay on the southeast corner of Oʻahu. The shoreline is northeast facing and exposed to a range of hazards including but not limited to tsunamis, hurricanes, erosion, and sea level rise. The Overall Hazard Assessment within the vicinity of the subject property is *high* (SEI, 2020).

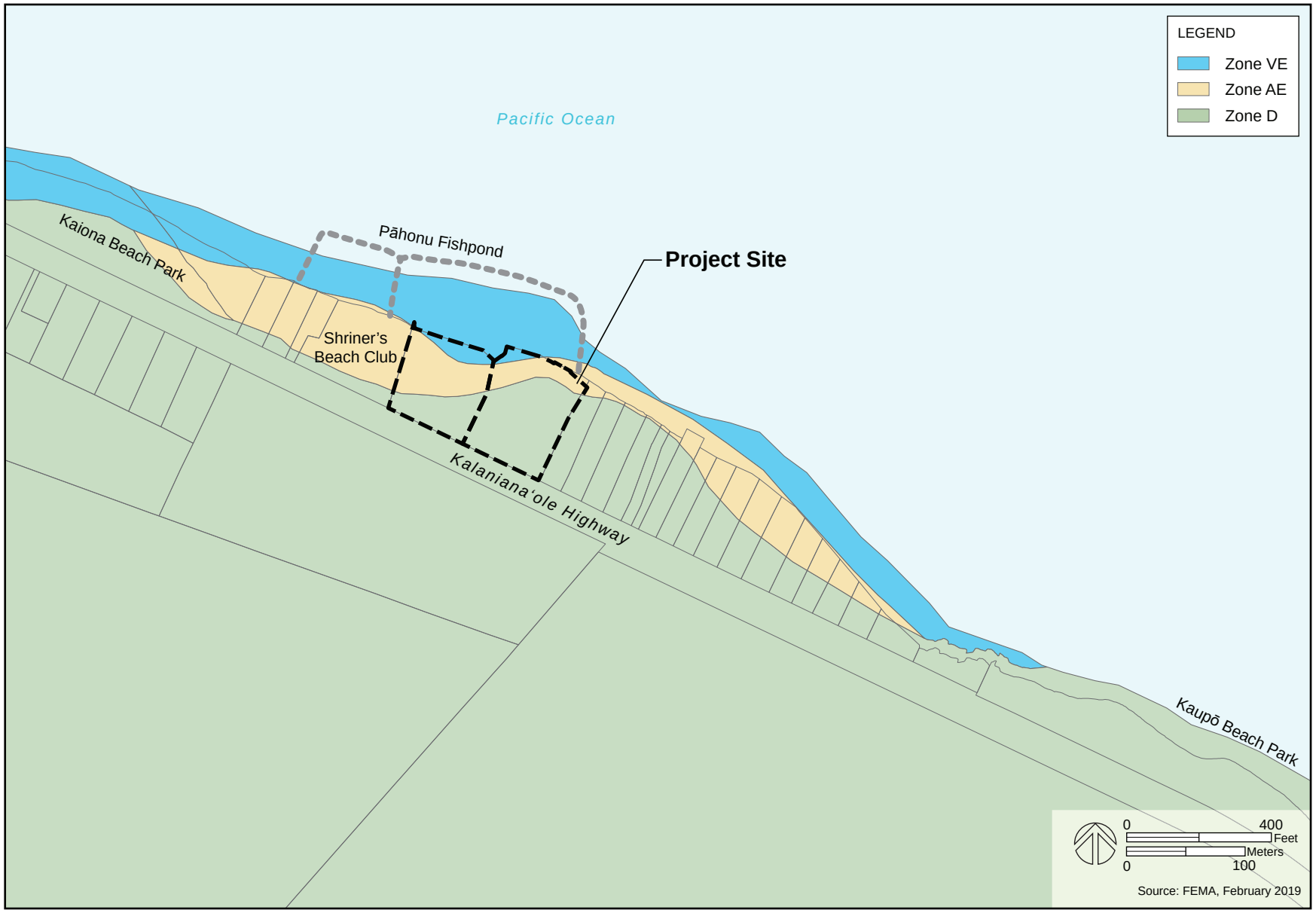
Coastal Flooding

The National Flood Insurance Program, which is administered by the Federal Emergency Management Agency (FEMA), maintains Flood Insurance Rate Maps (FIRM) for use in developing base flood elevations (BFE). Local floodplain managers work with permitting agencies to incorporate these BFE data into building codes, establishing guidelines for safe building in flood prone regions.

The Waimānalo Paradise property, as identified on FIRM Panel 15003C0385G (January 19, 2011), is in a Special Flood Hazard Area subject to inundation by the 1 percent annual chance flood. The seaward portion of the subject property is in Zone VE with a BFE of 13 feet. The landward portion of the property is in Zone AE with a BFE of 13 feet, and Zone D where flood hazards are undetermined, but flooding is possible. Figure 3-5 shows the FEMA FIRM designations for the property.

Hurricane Waves

The Hawaiian Islands are annually exposed to severe storms and storm waves generated by passing low-pressure systems (Kona storms) and tropical cyclonic storms (hurricanes). Kona storms occur when the winter low pressure systems that travel across the North Pacific Ocean dip south and approach the islands. Strong southerly and southwesterly winds generated by these storms result in large waves on exposed shorelines, and often heavy rains. Hurricanes, the worst-case tropical cyclones, are caused by



Flood Zones

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

Figure 3-5

intense low-pressure vortices that are usually spawned in the eastern tropical Pacific Ocean and travel westward.

While it is not uncommon for hurricanes to head towards Hawaiʻi after generating in the east or central Pacific, they often change course or deteriorate by the time they reach Hawaiian waters. While direct hits are rare, hurricane passage north or south of the Hawaiian Islands is not infrequent and can generate large, dangerous waves that can affect the coastlines of all islands. The *Coastal Assessment* (Appendix A) presents the historical tracks of hurricanes that passed in the vicinity of Hawaiʻi from 1948 to 2018, and the historical tracks of tropical storms and tropical depressions. In recent years, Hurricane Iwa (1982) and Hurricane Iniki (1992) directly hit the island of Kauaʻi and resulted in large waves along southern shores of Oʻahu. Damage from these hurricanes was extensive, not only on Kauaʻi which was subject to both high winds and waves, but also along coastal areas of other islands exposed to the large waves. The 2014 hurricane season was notable for the passage of three hurricanes near the islands, including Hurricane Iselle which made landfall at the east shore of Hawaiʻi Island with winds of 70 mph. The 2015 hurricane season was the second most active Pacific hurricane season on record behind the 1992 season, with three Category 4 hurricanes east of the International Date Line reported for the first time in history (SEI, 2020). Although these hurricanes resulted in little damage to Oʻahu, the storm tracks serve as reminders of Hawaii's vulnerability. In 2018, Hurricane Lane was forecast for potential landfall on Oʻahu's south shore (Figure 3-6). The storm, which stalled west of Hawaiʻi Island before rapidly dissipated, still caused severe damage across the eastern half of the state.

Figure 3-6: Satellite image of Hurricane Lane approaching Hawaiʻi, August 2018

Tsunami

Tsunami are sea waves that result from large-scale seafloor displacements, commonly caused by an earthquake (magnitude 7.0 or greater) adjacent to or under the ocean. If the earthquake involves a large segment of land that displaces a large volume of water, the water will travel outwards in a series of waves, each of which extends from the ocean surface to the sea floor where the earthquake originated. Tsunami waves are only a foot or so high at sea, but they can have wave lengths of hundreds of miles and travel at 500 miles per hour. When they approach shore, they begin to interact with the seafloor and slow down, but not into a surf-shaped wave. Instead the water increases greatly in height and pushes inland at considerable speed. The water then recedes at considerable speed and the recession often causes as much damage as the original wave front itself.

Most tsunamis in Hawaiʻi originate from the tectonically active areas located around the Pacific Rim (e.g., Alaska and Chile). Waves originating with earthquakes in these areas take hours to reach Hawaiʻi, and the network of sensors that is part of the Pacific tsunami warning system can give Hawaiʻi several hours advance warning of tsunami from these locations. Less commonly, tsunamis originate from seismic activity in the Hawaiian Islands, and there is much less advance warning for these events. The 1975 Halape earthquake (magnitude 7.2) produced a wave that reached Oʻahu in less than a half hour, for example. The *Coastal Assessment* (Appendix A) includes a history of tsunami on the Island of Oʻahu.

Ten of the 26 tsunamis with flood elevations greater than 3.3 feet (1 meter) that have made landfall in the Hawaiian Islands during recorded history have had "significant damaging effects on Oʻahu." This means that, on average, one damaging tsunami reaches Oʻahu every 19 years. The recent record (1946 to the present) has seen four tsunami cause damage on Oʻahu, a rate that is very close to the longer-term average. In view of this, the U.S. Geological Survey has given the Waimānalo coastal zone a high (4) tsunami hazard assessment. Waimānalo was inundated by the 1946 tsunami to an elevation of +8 feet (msl), with inundation to elevation +37 feet (msl) at nearby Makapuʻu. This was the only tsunami to produce inundation data for the Waimānalo area.

Tsunami flooding for the Waimānalo Paradise property was calculated by SEI using *the Manual for Determining Tsunami Runup Profiles on Coastal Areas of Hawaiʻi*. The methodology calculates the inundation water level 200 feet inland of the shoreline. For initial planning purposes, the calculated inundation elevation can be considered to be the tsunami crest elevation within the project site. The calculated tsunami inundation elevations for a range of tsunamis are shown in Table 3-4.

Table 3-4: Tsunami Return-Period Inundation Elevations

Return period (years)	Inundation elevation above msl (feet)
10	1.0
25	5.4
50	8.7
75	10.6
100	12.0

Source: SEI, 2020

The calculations produce estimated tsunami inundation elevations of 1.0 to 8.7 feet above msl during the 50-year planning horizon of this project. The *N*-year Return Period tsunami is defined as the tsunami that has a probability of 1/N of occurring in any given year. For example, the 10-year return period tsunami has a 1/10 chance (10 percent) and the 50-year return period tsunami has a 1/50 chance (2 percent) of occurrence in any given year. The inundation elevation for the 100-year tsunami is generally consistent with the 13-foot BFE determined by the FEMA Flood Insurance Study, should that tsunami occur this year. These calculations, however, were made using a methodology that does not account for sea level rise.

Erosion and Shoreline Change

Historical Shoreline Change (1911 to 2005). The *Coastal Assessment* includes a discussion of historical shoreline change in Waimānalo from 1911 to 2005 based on analysis by the University of Hawaiʻi Coastal Geology Group (CGG). The data shows that the dominant historical shoreline change trend for the project site has been erosion at an average annual rate of 0.59 feet/year. This rate represents the average, long-term trend from 1911 to 2005, and does not account for fluctuations in beach width that may have occurred since 2005.

At the project site, the seawall represents a fixed landward boundary that separates the terrestrial area from the active coastal profile. The historical shoreline change trend may not be an accurate indicator of historical or future shoreline change for the project site. It was noted that the seawall creates a physical boundary between the terrestrial and marine environments and protects the terrestrial area from erosion. There is no expectation of terrestrial erosion while the seawall is serviceable (SEI, 2020).

Modern Shoreline Change and Sediment Transport Rates (1996 to 2005). SEI used the CGG data to produce shoreline change maps for the more recent time period of 1996 to 2005, as part of the U.S. Army Corps of Engineer's *Regional Sediment Management Plan for Southeast O'ahu* (2009). In addition to the updated shoreline change trends (1996 to 2005), the analysis included a sediment trend analysis and regional sediment budget calculations. While the updated analysis did not revise the shoreline change trends for the Waimānalo Paradise property, it provides insights into shoreline change and sediment transport dynamics in the general vicinity.

The resulting shoreline change maps are included in the *Coastal Assessment* in Appendix A. The maps show the modern shoreline change trends (1996 to 2005) and sediment transport rates for the Kaiona Beach sector which extends 1.6 miles west of the project site and the Kaupō Beach sector which extends 1.2 miles east of the project site. The shoreline change maps reveal that much of the Waimānalo shoreline has historically accreted, with the exception of Kaiona Beach Park to the west which shows erosion. The more recent trend is erosion throughout most of Waimānalo Bay, with accretion at Kaiona Beach Park. The analyses also showed that recent shoreline change east of the Waimānalo Paradise project site varies between accretion and erosion.

3.7.2 Potential Impacts and Mitigation

The *Coastal Assessment* (SEI, 2020) noted that the Overall Hazard Assessment within the vicinity of the project site is high, including for hurricane and tsunami inundation. Although the site's potential for erosion is listed as high, the presence of the seawall has mitigated this hazard.

Table 3-5: Overall Hazard Assessment for the Waimānalo Paradise Property

Category	Rating
Geology	Developed / Fringing Reef / Beach
Coastal Slope	(2) >20% and <45%
Tsunami	(4) High
Stream Flooding	(3) High
High Waves	(3) Moderate-High
Storms	(4) High
Erosion	(4) High
Sea Level	(2) Low
Volcanic / Seismic	(3) Moderate-High
Overall Hazard Assessment	**(6) High**

Source: SEI, 2020 (adapted from Fletcher et.al., 2004)

The Proposed Action, seawall repairs, is intended to increase the resilience of the Waimānalo Paradise property to the coastal hazards described in this section, all of which are being exacerbated by sea level rise. The *Coastal Assessment* evaluated these coastal hazards and the property's vulnerability to each hazard, to inform the development of appropriate engineering alternatives. The preferred alternative (i.e. the Proposed Action) was determined to be the most cost effective and least environmentally impactful method to increase the property's resilience to these coastal hazards over the 50-year planning period. The Proposed Action represents the proposed mitigation to these ongoing coastal hazards.

3.8 CLIMATE CHANGE AND SEA LEVEL RISE

3.8.1 Existing Conditions

Climate Change

Climate change is a long-term shift in patterns of temperature, precipitation, humidity, wind and seasons. Scientific data show that earth's climate has been warming and mostly attributable to rising levels of carbon dioxide and other "greenhouse gases" generated by human activity. These changes are already impacting Hawaiʻi and the Pacific Islands through rising sea levels, increasing ocean acidity, changing rainfall patterns, decreasing stream flows, and changing wind and wave patterns.

While the earth's climate experiences natural change and variability over geologic time, the changes that have occurred over the last century due to human input of greenhouse gases into the atmosphere are unprecedented (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2017).

Sea Level Rise Projections

Sea level is rising at increasing rates due to global warming of the atmosphere and oceans and melting of the glaciers and ice sheets. NOAA estimates the present rate of global mean sea level change to be +3.4 millimeters (± 0.4 millimeters)/year (NOAA, 2017), where a positive number represents a rising sea level. The relative sea level trend for Honolulu Harbor for the period of 1905 to present is +1.41 millimeters (± 0.21 millimeters)/year based on monthly data for the period 1905 to present. The data also shows interannual anomalies exceeding 0.5 feet (15 centimeters) in Honolulu Harbor.

NOAA recently revised their sea level change projections through 2100, taking into account current scientific research and measurements. Revised projections from NOAA indicate that global sea level rise—as shown under the *Extreme* scenario—could be as high as 8.2 feet by the year 2100. NOAA (2017) also identifies specific regions that are susceptible to a greater-than-average rise in sea level. Hawaiʻi thus far has seen a rate of sea level rise less than the global average; however, this is expected to change. Hawaiʻi is in the "far field" of the effects of melting land ice. This means that effects have been significantly less in Hawaiʻi compared to areas nearer to the ice melt. Over the next few decades, this effect will spread to Hawaiʻi, which is projected to experience sea level rise greater than the global average.

SEI participated in the Hawaiian Islands and Affiliated Pacific Islands regional climate assessment team, which contributed to the *4th National Climate Assessment*. The consensus from the regional team, which included representatives from NOAA, the U.S. Geological Survey (USGS), and the University of Hawaiʻi (UH), was that the NOAA *Intermediate-High* scenario projections are recommended for planning purposes in Hawaiʻi. The *Intermediate-High* scenario projects that sea level in Hawaiʻi will rise 1.7 feet by the year 2050, 3.2 feet by the year 2070, and 6.3 feet by the year 2100.

The *Sea Level Rise Vulnerability and Adaptation Report for Hawaiʻi ("Hawaiʻi SLR Report")* discusses the anticipated impacts of projected future sea level rise on coastal hazards, and the potential physical, economic, social, environmental, and cultural impacts of sea level rise in Hawaiʻi (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2017). A key recommendation of the report was that 3.2 feet of sea level rise should be adopted as a statewide vulnerability zone for planning purposes.

In accordance with the findings and recommendations of the City's Climate Change Commission, Mayor Kirk Caldwell issued Directive 18-02 (July 16, 2018) to establish policies to address, minimize risks from and adapt to the impacts of climate change and sea level rise. The Mayor's Directive requires all City departments and agencies to take a proactive approach in both reducing greenhouse gas emissions and

adapting to impacts caused by sea level rise, and to align programs wherever possible to help protect and prepare the infrastructure, assets, and citizens of the City for the impacts of climate change. Besides adapting land use policies, shoreline regulations and development standards to incorporate climate change and sea level rise impacts, the procedures specified in the Mayor's Directive support adaption measures to protect critical infrastructure systems and public facilities and to maintain a natural, dynamic shoreline where possible. Permanent shoreline armoring is generally discouraged unless "it supports significant public benefits and will result in insignificant negative impacts to coastal resources and natural shoreline processes." In addition, the guidance authored by the City's Climate Change Commission recommends a planning benchmark up to 6 feet sea level rise toward the end of 2100 for critical infrastructure projects (City and County of Honolulu, 2018), consistent with the *4th National Climate Assessment* and the *Hawai'i SLR Report* (2017).

The planning horizon for the Waimānalo Paradise site is 50 years, which corresponds with the NOAA *Intermediate-High* scenario projection of 3.2 fee3-19t of sea level rise by 2070. Planning for 3.2 feet of sea level is consistent with the recommendations from the *4th National Climate Assessment,* the *Hawai'i SLR Report* (2017) and the Mayor's Directive for Climate Change (2018).

3.8.2 Potential Impacts and Mitigation

Sea level rise has the potential to impact beaches and shorelines in Hawai'i, including the Waimānalo Paradise project vicinity. Impacts may include beach narrowing and beach loss, loss of terrestrial land due to erosion, and infrastructure damage due to inundation and flooding. Due to increasing sea level rise, average shoreline recession (erosion) in Hawai'i is expected to be nearly twice the historical extrapolation by the year 2050, and nearly 2.5 times the historical extrapolation by the year 2100. The impacts from anomalous sea level events (e.g., king tides, mesoscale eddies, storm surge) are also likely to increase (SEI, 2020).

The *Hawai'i SLR Report* (2017*)* discusses the anticipated impacts of projected future sea level rise on coastal hazards, and the potential physical, economic, social, environmental, and cultural impacts of sea level rise in Hawai'i. A key component of the report was a numerical modeling effort by the University of Hawai'i (UH) to estimate the potential impacts of a 3.2-foot rise in sea level. The models looked at the potential for: 1) passive flooding, 2) annual high wave flooding and 3) coastal erosion as a result of a 3.2-foot sea level rise. The UH model results for the Waimānalo Paradise area are discussed and illustrated in the *Coastal Assessment* (Appendix A).

Passive Flooding

Passive flooding includes areas that are hydrologically connected to the ocean (marine flooding) and low-lying areas not hydrologically connected to the ocean (groundwater). The model projects no passive flooding on the Waimānalo Paradise property with 3.2 feet of sea level rise.

Annual High Wave Flooding

The model for annual high wave flooding reflects the maximum annually recurring wave, and the spatial extent of inundation that is greater than 10 centimeters in depth. The high wave model reveals that large areas of the Waimānalo Paradise property will be impacted by the annual high wave flooding event, assuming there is no seawall.

Coastal Erosion

The model for erosion estimates areas that could be exposed to erosion with 0.5 to 3.2 feet of sea level rise. This model is based on historical erosion rates and is most useful at an island or community, rather

than an individual parcel level. The model is further limited by the implicit assumption that the affected system is composed entirely of freely moving sand along the dry and submerged coastal profile. This is not true for much of O'ahu's coastline, including Waimānalo, where shallow fringing reefs dominate the nearshore and clay and rock are present along and within much of the terrestrial area. The *Coastal Assessment* notes that the seawall at the project site creates a physical boundary between the terrestrial and marine environments. The seawall protects the terrestrial area from erosion and there is no expectation of terrestrial erosion while the seawall is serviceable.

Combined Hazard

The footprint of these three hazards (passive flooding, annual high wave flooding, and coastal erosion) were combined to define the projected extent of chronic flooding due to sea level rise, referred to as the *sea level rise exposure area (SLR-XA)*. Flooding in the SLR-XA is associated with long-term, chronic hazards punctuated by annual or more frequent flooding events. Figure 3-6 illustrates the combined hazard exposure area at the Waimānalo Paradise property.

In summary, sea level rise has the potential to exacerbate adverse impacts due to passive flooding, annual high wave flooding and coastal erosion. The UH model shows that these combined hazards have the potential to adversely impact the Waimānalo Paradise property over the next 50 years. The existing seawall is intended to mitigate these hazards, but the structure is in deteriorating condition. By repairing and maintaining the seawall, the Proposed Action will increase the resilience of the property to the long-term effects of sea level rise.

Source: PacIOOS (SEI, 2020)

Figure 3-7: Combined Hazard Exposure with 3.2 Feet of Sea Level Rise

4. HUMAN ENVIRONMENT

4.1 EXISTING AND SURROUNDING LAND USE

4.1.1 Existing Conditions

The shoreline fronting the Waimānalo Paradise property is used primarily for recreational purposes. The beach is a recreational destination for shoreline fisherman, limu (seaweed) collectors, snorkelers, swimmers, spear fishers, and tourists. Public shoreline access is available through Kaiona Beach Park, 400 feet west of the project site, and Kaupō Beach Park, 1,500 feet east of the project site. Though the shoreline is actively used by beach goers, there is limited parking and large portions of the beach are often submerged at high tide. The Waimānalo Paradise property was made famous by the 1980's television series "Magnum, P.I." and, as a result, the beach fronting the project site is popular with tourists as a curiosity for fans of the show. The area offshore of the property is fronted by a fishpond formed by a semi-enclosed, low rock-wall (referred to as a pāhonu or turtle pond). The fishpond is listed on the Hawai'i Register of Historic Places and is popular with swimmers and beachgoers. There are no notable surf breaks directly offshore of the project site.

The adjacent property to the northwest of the project site is the Shriners Beach Club. This oceanfront property owned by the Aloha Shriners Club includes a large pavilion style "long house" and an open courtyard that can accommodate up to 400 guests. It is available for rent to the public on Saturdays and is reserved for Shriners use on Sundays and holidays.

4.1.2 Potential Impacts and Mitigation

The Proposed Action is limited to seawall repair and will have no adverse impact on existing and surrounding land uses. During work on the seawall, portions of the beach and area immediately around the seawall may be closed to public access for short periods for safety reasons. This will be temporary, and once improvements in that wall section are complete, access will be reopened. Public access to the offshore (i.e. ocean) areas, including the fishpond, will continue to be open throughout the construction period. There will be no impact to the public beach access at Kaiona or Kaupō Beach Parks at any time. There will be no impact on offshore activities such as swimming, snorkeling or fishing.

The proposed seawall repairs will be conducted landward of the existing seawall and will have no impact on shoreline access, nor reduce the public beach area fronting the property.

4.2 AIR QUALITY

4.2.1 Existing Conditions

Ambient air quality pertains to the purity of the general outdoor atmosphere, external to buildings, to which the general public has access. Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 CFR, while state AAQS are defined in HAR Chapter 11-59. Both national and state AAQS have been established for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), ozone (O_3) and concentrations of airborne particulate matter (less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$)). In addition, the State has also established a standard for hydrogen sulfide (H_2S).

The two types of national standards are primary and secondary standards. Primary standards define limits to protect public health with an "adequate margin of safety," including the health of sensitive

populations such as asthmatics, children and the elderly. Secondary standards define limits to protect public welfare from "any known or anticipated adverse effects of a pollutant," which includes protection against decreased visibility, diminished comfort levels, and damage to animals, crops, vegetation and the man-made environment. State AAQS, which are designed "to protect public health and welfare and to prevent the significant deterioration of air quality," are generally more stringent than national standards.

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow a specified number of exceedances each year.

The DOH collects data on selected gaseous and particulate air pollutants from a statewide network of monitoring stations. There are currently four air quality monitoring stations on Oʻahu, none of which are on the windward side of the island. The closest monitoring station to the project site is the Honolulu Station, located on Punchbowl Street in downtown Honolulu. This station measures four air quality parameters: carbon monoxide (CO); sulfur dioxide (SO2); particulate matter, 10 microns (size) or smaller (PM10); and fine particulate matter, 2.5 microns (size) or smaller (PM2.5).

Based on the *State of Hawaiʻi Annual Summary Air Quality Data* prepared by the Department of Health Clean Air Branch, the Honolulu monitoring station recorded criteria pollutant levels that were below both state and national AAQS standards for the years 2012 to 2016. Excluding exceedances due to the volcano on Hawaiʻi Island, the State of Hawaiʻi was in attainment of all national AAQS in 2016 (State Department of Health 2016).

Air pollution is caused by many different man-made and natural sources, including industrial sources such as power plants and refineries; mobile sources such as vehicles, trucks and boats; agricultural sources such as cane burning; and natural sources such as windblown dust and volcanic activity. Present air quality at the project site is mostly affected by air pollutants from vehicular and natural sources.

4.2.2 Potential Impacts and Mitigation

The Proposed Action will have a negligible impact on local air quality. Short-term, temporary air emissions such as fugitive dust and exhaust emissions from construction equipment will be generated during the construction period. These potential impacts would be minor and short-lived. The construction contractor will be required to employ BMPs to minimize particulate emissions during seawall repairs. All construction activities will comply with the provisions of HAR 11-60.1-33 (Fugitive Dust). Because the State of Hawaiʻi is in attainment of the national AAQS, the Proposed Action is not subject to the Clean Air Act's General Conformity Rule.

4.3 NOISE

4.3.1 Existing Conditions

Human-induced noise in the vicinity of the project site is due largely to vehicle traffic on Kalanianaʻole Highway. Ambient noise is caused by waves lapping on the shore and against the seawall, and sometimes by beach users, events at the adjacent Shriners Beach Club, and overflying aircraft.

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and have set noise limits as a function of land use. The State of Hawaiʻi's Community Noise Control Rule (HAR §11-46) identifies three classes of zoning districts and specifies maximum permissible sound levels due to stationary noise sources. Noise related to construction activities is also regulated. For Class A zoning districts—the equivalent to lands zoned residential, public space and open space—the maximum permissible sound levels are 55 A-weighted decibels (dBa) for daytime (7 a.m. to 10 p.m.) and 45 dBa for nighttime (10 p.m. to 7 a.m.). Noise sources above the permissible sound levels are required to obtain a permit prior to the related activities.

4.3.2 Potential Impacts and Mitigation

There will be temporary construction noise during seawall repair that may affect adjacent residential properties (to the east and west). Noise-generating construction equipment and vehicles may include a cement mixer, concrete trailer pump, concrete vibrator, concrete drill, forklift, loader/backhoe, flatbed truck, pick-up truck, hydraulic ram, air compressor, oxy-acetylene torch, and gas-powered generator (SEI, 2020). All stationary equipment will be staged and used landward of the seawall on the Waimānalo Paradise property.

The noise level of typical construction equipment is estimated to range between 75-95 dBA at a distance of 50 feet (EPA, 1971), although actual noise levels relate to the methods employed during each stage of the construction. There are structures at the Shriners Beach Club to the west and at the residential property to the east that are located within 50 feet of the project seawall that may be impacted by construction noise. Limiting construction work to day-time hours established by the DOH will minimize noise disturbances experienced by surrounding residences.

Compliance with the DOH standards for allowable noise levels (HAR §11-46) will help to minimize construction-related noise impacts. The use of appropriate measures, such as scheduling activities during specific times of the day (i.e. no nighttime work near noise-sensitive uses), installing mufflers on construction equipment and vehicles with exhaust systems and installing noise barriers, will further minimize potential noise impacts to surrounding neighbors. Once seawall repairs are complete, there will be no measurable increase in ambient noise above current levels.

4.4 HISTORIC AND ARCHAEOLOGICAL RESOURCES

An *Archaeological Inventory Survey for the Proposed Waimānalo Paradise Seawall Repair Project* was completed by Cultural Surveys Hawaiʻi (CSH) (2019) and is included as Appendix C. The archaeological inventory survey (AIS) supports the proposed project's historic preservation review under HRS §6E-42 and HAR §13-284, as well as the environmental review under HRS §343. The AIS is also intended to support any project-related historic preservation consultation with stakeholders such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. Although the Proposed Action may extend into the State of Hawaiʻi coastal lands, it is considered a "private" project needing historic preservation review. The AIS, which is a requirement to obtain permits to repair or modify the seawall, was accepted by the State Historic Preservation Division (SHPD) by letter dated December 20, 2019.

The AIS investigation fulfills the requirements of HAR §13-276 and was conducted to identify, document, and make significance assessments of any historic properties. Four trenches, each approximately 10 to 20 feet long and 12 feet wide, were excavated against the mauka side of the existing seawall. The testing strategy was approved by the SHPD on March 29, 2019. The location of the trenches can be found in the AIS (Appendix C).

In a letter dated March 29, 2019 (Log No.:2018.01746, Doc. No.:1903SL06) which is included in Appendix C, SHPD had two requests for the current project: 1) that an AIS specific to the seawall be conducted; and 2) that the seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian. Both requirements have been met and are described in this section.

4.4.1 Existing Conditions

Historical Background of Waimānalo

The AIS includes an extensive historical background for Waimānalo. Data indicate that in the pre-Contact and early historic period, traditional Hawaiian settlements tended to be concentrated along Waimānalo Stream, or in its upper tributaries, and were focused on wetland taro and sweet potato cultivation.

Ranching in Waimānalo. In 1828, Englishman Thomas Cummins arrived in Hawaiʻi, and soon after married into the Kamehameha family, providing connections to the throne that resulted in a lease of nearly 7,000 acres of land in Waimānalo. Thomas Cummins and his son, John A. Cummins then proceeded to build a large cattle and horse ranch in Waimānalo. A landing was constructed at Waimānalo Bay, as access to Waimānalo prior to the construction of Nuʻuanu Pali road was primarily by sea. A railroad line was also constructed to connect the landing to the Cummins Estate.

In general, the introduction of livestock to Hawaiʻi had a negative impact on the natural environment and contributed to the demise of transitional Hawaiian life. Without walls and fences to contain the vast herds of cattle, sheep and horses, the animals trampled the small scattered homesteads and stripped the land of native vegetation.

The Waimānalo Sugar Company. In 1876, the Hawaiian Kingdom entered a Reciprocity Treaty with the United States, which provided the burgeoning Hawaiian sugar industry with a free market, and the potential for great profits. John A. Cummins, recognizing the potential for sugar production in Waimānalo, established the Waimānalo Sugar Company and constructed a sugar mill approximately 3.1 miles northwest of the project site. By the early 20th century, the Waimānalo Sugar Company had expanded to encompass fields stretching across the floor of Waimānalo Valley to the base of the Koʻolau range, almost extending as far south to the Waimānalo Paradise property.

Military Development in Waimānalo. In 1917, the Waimānalo Military Reservation was established, and included approximately 1,500 acres along the northern coastal portion of Waimānalo. In 1933, it was renamed Bellows Field. Development at Bellows Field accelerated during World War II, but declined after the war, with much of the area only used for military recreational purposes and as an emergency landing field. The area, now officially known as Marine Corps Training Area Bellows, currently serves as a military training area and recreation area for active and retired military and Department of Defense civilian employees.

Residential Development in Waimānalo. The primary residential area in Waimānalo during the early 1900s was in the vicinity of the Waimānalo Sugar Company mill and consisted mainly of housing for plantation workers and their families. Further residential development was hampered by the lack of available land, as much of Waimānalo was under sugarcane cultivation, and the lack of adequate overland transportation routes to Honolulu, which was Oʻahu's commercial, civic, and political center. In the early 1900's, an improved Nuʻuanu Pali route to link the windward side of the island with Honolulu was still in its nascent stages.

The completion of the asphalt macadam Kailua-Waimānalo Road in 1924 vastly improved overland access. Also, in 1924, the Nuʻuanu Pali Road officially opened, linking Waimānalo to both Honolulu and Kailua. The new roads eliminated the need for the landing's use for shipping and transportation.

With improved accessibility and visibility of the area, the first successful significant sale of Waimānalo lands to the public occurred with the establishment of the Waimānalo Beach Lots subdivision in 1925. Additional residential development occurred in the coastal portion of central Waimānalo with the establishment of Waimānalo Homestead by the Hawaiian Homes Commission in 1925.

In contrast to the award of residential lots in the Waimānalo Homesteads to qualifying Hawaiians, the Waimānalo Beach lot parcels were auctioned off by the Territory of Hawaiʻi based on the ability to submit (and pay) the highest bid. The pattern of Hawaiian aliʻi and other affluent Oʻahu citizens building grand oceanfront estates began in the 1870s and 1880s in Waikīkī and lasted until the 1960s, although the development and redevelopment of these properties continues into the present day.

Development of the Anderson Estate-Pāhonu. In 1930, Julia Grossman Wall, daughter of a prominent Chicago businessman and widow of pioneer Hawaiʻi dentist Dr. Moses Edmund Grossman, purchased land from the Territory of Hawaiʻi which had been subdivided into lots in preparation for auction. In an effort to build a large beach-front home, Julia Grossman Wall also purchased two adjacent privately-owned parcels, resulting in a contiguous 3-acre ocean front property, the current Waimānalo Paradise area. Her total investment in the property was reported at upwards of $60,000 and the Honolulu Advertiser reported that *she "plans to establish an estate on which she will build a pretentious home. Her plans, it is said, contemplate beautification of the entire area which she now owns at Waimānalo."* (Honolulu Advertiser, 21 August 1930:1). The Wall's home was designed by Louis E. Davis, a prominent local architect renowned for his work in the spanish colonial revival architectural styles and whose other well-known work included President William McKinley High School and the Honolulu Police Station on Merchant Street. The estate, commonly known as "Pāhonu," was subsequently passed on to Julia and Ormand Wall's daughter, Eva Glover, and then later inherited by Eva's husband James Glover and their children, Reed and Eve. Throughout the 1950s and 1960s, the home at Pāhonu continued to function as the site for many social affairs and fundraisers. Descendant Eve Glover Anderson is a well-known citizen on Oʻahu, an accomplished swimmer, athlete, outdoorsperson and community advocate, as well as former Republican State Representative for District 51 (Waimānalo) from 1995 to 1996. Eve Glover Anderson was also the longest tenured resident of the property, having lived there most of her life. In addition to the prominent role the estate played in social and fundraising events, it was also well known as a site location for television and film production, primarily the television show *Magnum P.I.*

Previous Archaeological Research

The AIS report (Appendix C) identifies numerous previous archaeological studies in the Waimānalo area, most of them focusing on the Bellows/MCTAB area and to a lesser extent, the Waimānalo State Recreation Area. These studies and their findings are described in the AIS report. Previously identified historic properties in the vicinity of the project site are shown in Figure 4-1.

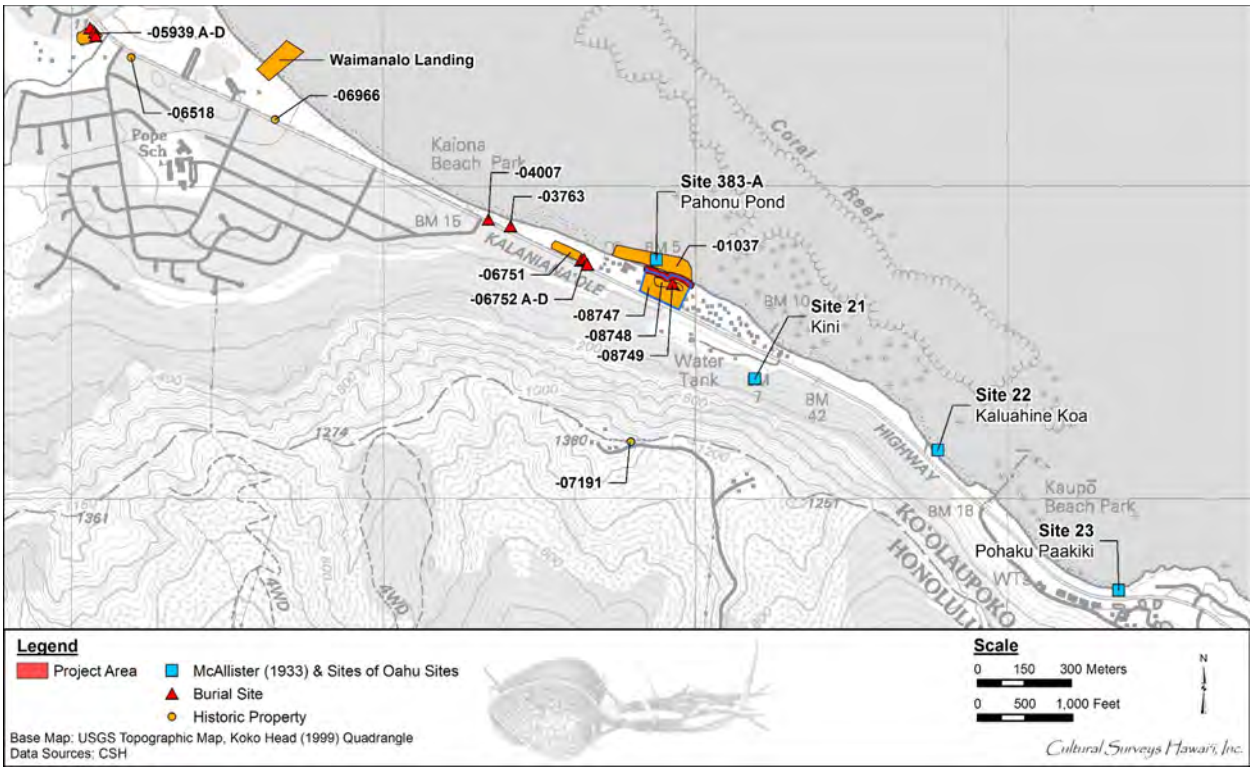


Figure 4-1: Previously Identified Historic Properties in the Waimānalo Vicinity

Waimānalo Paradise Subdivision AIS (Crowell et al., 2019). A separate AIS was conducted for the subdivision and residential development at the Waimānalo Paradise property by CSH (Crowell et al., 2019). This AIS was accepted by SHPD by letter dated March 29, 2019. Three newly identified historic properties were documented including the Anderson Estate-Pāhonu remnants (SIHP # 50-80-15-8747) distinguished by 12 features; a culturally expressed A horizon (SIHP # 50-80-15-8748) distinguished by 14 features; and a human burial (SIHP # 50-80-15-8749).

The boundaries of the historic property SIHP # -8747 (Anderson Estate-Pāhonu remnants) were determined to be the entire former estate property (TMK [1] 4-1-002:021 and 022). The 12 extant features, which are distributed throughout the property, include: two extant buildings (Feature 1) and a pool/boathouse and boat ramp (Feature 2); four structures consisting of a perimeter wall on the east, south, and west boundaries (Feature 3); landscape terraces/decorative feature on the south perimeter wall (Feature 4); seawall and stairs on the north boundary (Feature 5); tennis court (Feature 6); five structural remnants consisting of one large concrete pad and foundation of the former main house (Feature7); three partially demolished sidewalls (Feature 8 through Feature 10); one subsurface wall remnant (Feature 11); and a subsurface privy/cesspool remnant (Feature 12).

The subsurface investigation for the Crowell et al. AIS observed a buried A horizon (SIHP # -8748) that developed on naturally deposited Jaucas sand, representing the former land surface prior to the construction of the seawall in the 1920s and the Anderson Estate in the 1930s. The site is described as a discontinuous, culturally expressed A horizon that contains midden deposits and artifacts indicative of both traditional Hawaiian and historic use. The midden material observed and sampled from both the A horizon and the features were consistent: marine shells, turtle shell, faunal osseous remains (mainly pig, but also dog), fish bone, sea urchin, fire-affected rock, and charcoal. Only a few traditional Hawaiian artifacts, or historic materials, were identified and collected.

SIHP # -8749 consists of a single set of human remains that was identified during the Crowell et al. AIS. Burial treatment was subsequently conducted in May 2019 in accordance with a burial site component of a preservation plan accepted by the SHPD by letter dated February 28, 2019. Treatment consisted of a protective plywood box placed around the burial, installation of a concrete cap and plaque inscribed with "KAPU CALL DLNR SHPD # -8749," and placement of sand until level with the ground surface. To provide perpetual protection for the burial area, the burial preserve has been recorded with the State of Hawai'i Bureau of Conveyances.

Archaeological Research for the Proposed Seawall Repair Project (2019)

The scope of the current AIS for the proposed seawall repairs (Proposed Action) was based on consultation with the SHPD. In a letter dated March 29, 2019, SHPD had two requests (see Appendix C):

1) An AIS be conducted for the current project as specified by Stipulation 28 in the Grant of Non-Exclusive Easement S-6083 between the State of Hawai'i, Board of Land and Natural Resources (Grantor) and Waimānalo Paradise LLC (Grantee), dated October 29, 2015. Stipulation 28 states "The Grantee shall conduct an archaeological inventory survey, including assessment of the seawall, prior to the issuance of any future permit involving ground-disturbing activities."

2) The seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian who meets the qualifications set forth in HAR §13-824-4 or HAR §13-381-5; the assessment included in the AIS (Crowell et al. 2019) was completed by an archaeologist. The AIS identifies the seawall (SIHP # -8747, Feature 5) as a component of the former Anderson Estate–Pāhonu, which was completed in 1933. Most of the estate (including the seawall) were assessed as lacking sufficient integrity of design, setting, materials, workmanship, feeling, and association and, thus, SIHP # 50-80-15-8747 was evaluated as not being a significant historic property.

Fieldwork for the AIS consisted of the historic property identification effort focused on a subsurface testing program where four test excavations were excavated, documented, and sampled. A 100%-coverage pedestrian inspection of the project site was undertaken for the purpose of historic property identification and documentation. The pedestrian survey was accomplished on both sides of the seawall.

SIHP # 50-80-15-8747, Anderson Estate-Pāhonu remnants. Fieldwork for the historic property identification effort focused on subsurface testing, including four test excavations, and a 100 percent-coverage pedestrian inspection on both sides of the seawall. SIHP # 50-80-15-8747 is the remnants of the former Anderson–Pāhonu estate, which is now mostly demolished. The AIS also documented additional components of Feature 5 (seawall). The location of SIHP # -8747 and its component features is shown in Figure 4-2.

SIHP # 50-80-15-8748, Subsurface cultural deposit. This site is a culturally expressed A horizon documented by a previous AIS, and recorded as 14 associated features, and included a human burial (SIHP # -8748). During the current AIS, SIHP # -8748 was observed in two of four test excavations in the northwestern portion of the project site (Figure 4-3). The observed portions of SIHP # -8748 were recorded between 7 to 15 inches thick near the ground surface overlying natural Jaucas sand with abundant charcoal flecking. No new features were observed.

Figure 4-2: Historic Properties SIHP # -8747, Anderson Estate-Pāhonu Remnants

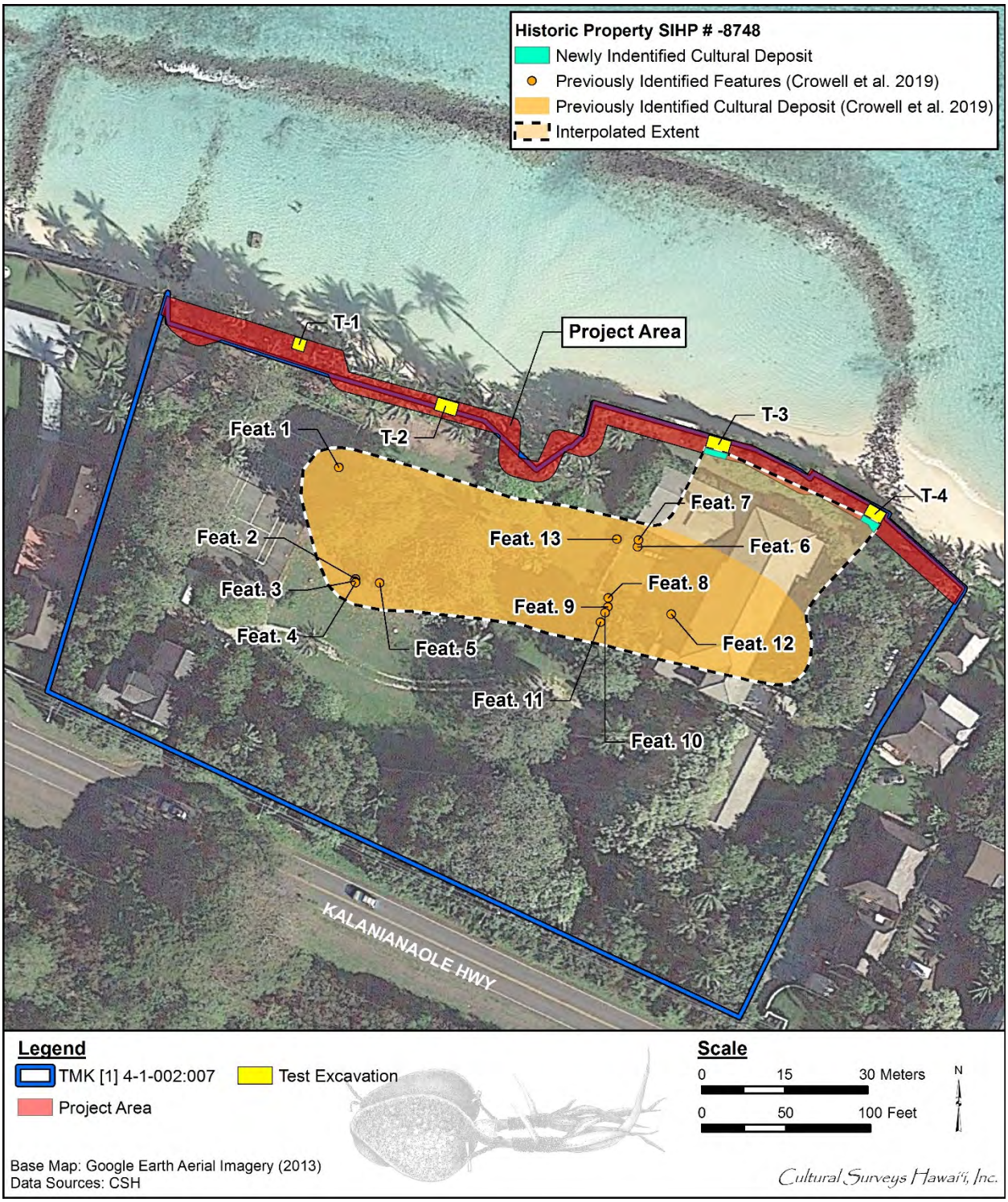


Figure 4-3: Historic Properties SIHP # -8748, Subsurface Cultural Deposit

SIHP # 50-80-15-8748, a pre- to post-Contact subsurface cultural deposit, is assessed as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history). This is based on the historic property's potential to yield additional information related to traditional Hawaiian and historic land use and activities in the Waimānalo area.

The historic property retains sufficient integrity of location, design, and materials but does not retain integrity of setting, workmanship, feeling, and association due to layers of fill over the top of the historic property and the historic and modern disturbance from the construction of the seawall and the Anderson-Pāhonu estate.

Significance Assessment

SIHP # 50-80-15-8747 is the remnants of the former Anderson-Pāhonu estate, now mostly demolished. While SIHP # -8747 would most certainly have been assessed as significant under Hawaiʻi State historic property significance Criteria b and c had it remained standing, the remaining remnants only retain sufficient integrity of location because it is on the same site where it was built. Most of the historic property has been demolished and the partial remnants do not retain sufficient integrity of design, setting, materials, workmanship, feeling, and association. The AIS indicates that SIHP # -8747 is not significant under any of the Hawai'i State historic property criteria because it lacks integrity, and that nothing further is needed to address architectural branch concerns for this feature.

SIHP # 50-80-15-8748, a pre- to post-Contact subsurface cultural deposit, is assessed as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history). This is based on the historic property's potential to yield additional information related to traditional Hawaiian and historic land use and activities in the Waimānalo area. The historic property possesses sufficient integrity of location, design, and materials but does not retain integrity of setting, workmanship, feeling, and association due to layers of fill over the top of the historic property and the historic and modern disturbance from the construction of the seawall and the Anderson-Pāhonu Estate.

Recent Findings

During recent groundwork for the new residences, new potential features related to SIHP # -8747 and SIHP # -8748 were identified. Features related to SIHP # -8747 include the basement of the former main house located within the eastern portion of the property and a possible concrete cesspool located within the southwestern portion of the property (directly makai of the existing guesthouse). Features related to SIHP # -8748 were also observed: one consisting of two possible fire pits and the other consisting of dog interments. The two fire pits were located within the northwestern portion of the property (mauka of the existing boathouse) in proximity to each other. The contents consisted of fire affected basalt boulders and cobbles with abundant charcoal; no midden or faunal remains were recovered. The dog interments were located near the eastern portion of the property boundary, and contained a dog burial sandwiched between two sets of cremation remains that were stored in plastic bags tied with metal twist ties and placed in corroded metal containers within a wooden box. The cremated remains, which are not human, are believed to be dog remains.

An inadvertent burial find was located within the northwestern portion of the property in January 2020. This burial, designated as IBF 01-10-20 IBF, was documented to consist of two adult individuals, partially in situ within a burial pit. It is possible that these remains were previously disturbed. SHPD History and Culture Branch Burial Sites Specialist was notified and was on-site to discuss the find and appropriate

disposition. Per SHPD guidance, the burial was disinterred and placed in a secure on-site interim curation facility with air conditioning.

4.4.2 Potential Impacts and Mitigation

The Proposed Action, repair and modification to an existing seawall, will potentially affect one significant historic property (SIHP # -8748) within the Waimānalo Paradise property. The project-specific effect recommendation is "effect, with agreed upon mitigation commitments" pursuant to HAR §13-284-7. Mitigation commitments consist of archaeological monitoring (a form of data recovery). The agreed upon mitigation commitments outlined below will mitigate the project's effect on the significant historic properties.

Archaeological monitoring of all ground-disturbing activities is agreed upon for the entire Waimānalo Paradise property. On-site archaeological monitoring will be conducted to identify and document any features associated with SIHP #-8747, including those already identified and those that may be newly identified, additional exposures of SIHP # -8748, and any newly identified historic properties that may be identified during construction.

4.5 CULTURAL RESOURCES

A Cultural Impact Assessment (CIA) was prepared by CSH for the proposed seawall repairs (2019) to comply with the State of Hawaiʻi's environmental review process under HRS Chapter 343 and HAR §11-200.1. The CIA is included as Appendix D.

HRS Chapter 343 requires consideration of the project's potential effect on cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control's *Guidelines for Assessing Cultural Impacts*), which may include traditional cultural properties (TCPs). These TCPs may be significant under State of Hawaiʻi significance Criterion e, which refers to historic properties that "have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity" (HAR §13-275-6 and §13-284-6). The CIA also supports the project's historic preservation review under HRS §6E and HAR §13-275 and §13-284.

The CIA gathered information through consultation with NHOs, agencies, and community members including descendants of the area to identify individuals with cultural expertise and/or knowledge of the ahupuaʻa of Waimānalo. A list of NHOs, individuals, organizations and agencies contacted is included in the CIA (Appendix D). Potential informants were asked for their input and guidance on:

- General history as well as present and past land use of the project vicinity
- Knowledge of cultural sites which may be impacted by future development—for example, historic and archaeological sites, as well as burials
- Knowledge of traditional gathering practices in the project vicinity, both past and ongoing
- Cultural associations, such as moʻolelo and traditional uses
- Referrals of kupuna or elders and kamaʻāina who might be willing to share their cultural knowledge of the project vicinity and surrounding ahupuaʻa lands
- Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project

4.5.1 Existing Conditions

Results of Background Research

Background research for the CIA yielded the following results which are presented in approximate chronological order:

1. Koʻolaupoko, the traditional name for the moku (district) encompassing Waimānalo, translates literally as "the short windward" in contrast to the northern half of this coastline known as Koʻolauloa, "the long windward." This may reflect the relative short distance from the sea to the great pali (cliff) of the Koʻolau Mountains, which seem to loom directly over much of this district.
2. Towering above the northern mauka section of Waimānalo ahupuaʻa are the peaks of Lanipō and Puʻu o Kona, while the peaks of Makapuʻu and Puʻu o Molokaʻi characterize the southern makai section.
3. The overall wind name for Waimānalo is Limulīpuʻupuʻu. Pāhonu has a specific wind called Alopali.
4. Waimānalo, Puhā, and Muliwaiʻōlena are streams found in this ahupuaʻa. A mauka spring called Waikupanaha can also be found. Two companion springs, one mauka, Kupunakāne, and one makai called Kupunawahine, were reported to cry out to each other in soft voices on sunny days.
5. The fishpond was built for an aliʻi (chief) who was fond of turtle. Turtle were forbidden and only aliʻi were allowed to eat the turtle.
6. At the time that Kamehameha became the sole ruler of the main Hawaiian islands and subsequently divided the conquered lands among his warrior chiefs and counselors, he retained the ahupuaʻa of Waimānalo as his personal property. His sons Liholiho and Kauikeaouli—Kamehameha II and Kamehameha III, respectively—inherited most of Waimānalo ahupuaʻa.
7. As a result of the Kuleana Act of 1850, the ahupuaʻa of Waimānalo was awarded to Victoria Kamāmalu and subject to the kuleana (land holding of the tenant) claims of the commoners. In total, 113 kuleana land claims were awarded in Waimānalo. Three Land Commission Awards are found in the vicinity of the Waimānalo Paradise property, with one located on the project site.
8. John A. Cummins saw the potential of sugar production at Waimānalo and organized the Waimānalo Sugar Company in 1880 with construction of a sugar mill. As the plantation grew, former ranch lands were converted to cane fields, new irrigation ditches and railroad lines were constructed, and improvements were made to the mill and Waimānalo Landing.
9. By the 1920s, plantation sugarcane fields stretched across the floor of Waimānalo Valley to the base of the Koʻolau Range.
10. The intense cultivation of sugar in Waimānalo led to diverse forms of agriculture that continue today. The Waimānalo Sugar Company sold its fee-simple land holdings and the remaining years of its lease of government-owned lands to the Waimānalo Agricultural Development Company in 1947.
11. There were piers along the shoreline, with Waimānalo Landing being the main pier for shipping sugar cane and other goods in and out of Waimānalo.

4.5.2 Potential Impacts and Mitigation

Based on information gathered from the cultural and historical background and approved community consultations, the CIA identified the following potential impacts and recommendations:

Potential for Iwi Kupuna and Cultural Finds

A set of iwi kupuna (ancestral bones) was found within the Waimānalo Paradise residential property. Although not in the area directly affected by seawall improvements, some community members voiced concerns. One individual noted that there are burial caves towards the mountain side of the Waimānalo Paradise property, and that if one set of iwi kupuna were found, then others may be present in the area.

Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that iwi kūpuna and/or cultural finds are encountered during construction, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended. Project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance.

Waimānalo Limu Hui

The Waimānalo Limu Hui is a community-based group made up largely of Waimānalo residents seeking to restore and revive the limu (edible seaweed) that was once found throughout Waimānalo Bay. The Hui is also restoring the rock wall that forms the fishpond. Community workdays to restore the fishpond wall are scheduled once a quarter, and limu planting is scheduled on a monthly basis. Representatives of the Waimānalo Limu Hui expressed concerns regarding the project's impact on the organization's mission and goals. Concerns expressed by members of the Waimānalo Limu Hui about the proposed seawall repairs are summarized:

- Access to the fishpond. How will construction of the seawall affect access to the pond?
- Use of loose rocks. The Waimānalo Limu Hui uses loose rocks found along the existing seawall to rebuild the fishpond wall. Will loose rocks around the seawall be moved and used to repair the seawall?
- Depth of the wall and how far it will go into the ground. Two freshwater underground water flows feed into the fishpond. The fresh water is needed to create a more conducive environment for sea life to flourish. What is the depth of the sea wall? How will proposed repairs impact the fresh water flow?
- Desire to collaborate with the landowner and work together to repair both the seawall and the fishpond wall. If the contractor will need access to the fishpond or will be utilizing any of the loose rocks, is it possible for the contractor to help dig out other nearby rocks for the fishpond wall?

The Proposed Action is not expected to result in impacts to fishpond restoration and limu planting activities. Any impacts would be minor and short-lived, dependent on the duration of the construction schedule. Construction activities would be confined to the footprint of the seawall and contained within the landward portion of the privately-owned property. No construction equipment is planned in the shoreline, except for construction barriers such as turbidity curtains placed in the water. Work on the

seawall may require that portions of the shoreline immediately adjacent to the construction zone be closed during short periods for safety reasons. However, construction activities would not prohibit access to adjacent shoreline areas or to the fishpond. To minimize conflicts with scheduled fishpond restoration and limu planting activities, the construction contractor would maintain communications to inform Hui representatives about the construction schedule.

The proposed repair work will not use loose rocks found along the shoreline. As such, there will be no effect on the availability of material used for the fishpond restoration work.

Changes in the amount of groundwater that flows into the ocean environment as a result of the proposed repairs and modifications have not been determined. The water samples collected for the water quality assessment indicates an input of groundwater at the shoreline along the seawall, with concentrations in nearshore samples above the HDOH-WQS (MRCI, 2019). Any reduction in the groundwater flow is unlikely to have a noticeable effect on marine life because the concentration of groundwater entering the ocean dissipates quickly once it mixes with the ocean water.

Shoreline and Off-Shore Access

Many kūpuna (elders) and community members interviewed reflected on family gatherings and quality time spent at Kaiona Beach Park and the fishpond. They questioned whether and how the proposed seawall repairs will affect access to these recreation areas.

The proposed seawall repairs will be conducted landward of the existing seawall and will have no impact on shoreline access, nor reduce the public beach area fronting the property. During work on the seawall, portions of the beach and area immediately around the seawall may be closed to public access for short periods for safety reasons. Such closures will be temporary, and once improvements in that wall section are complete, access will be reopened. Public access to the offshore (i.e. ocean) areas, including the fishpond, will continue to be open throughout the construction period. There will be no impact to the public beach access at Kaiona or Kaupō Beach Parks at any time. There will be no impact on offshore activities such as swimming, snorkeling or fishing.

4.6 VISUAL ENVIRONMENT

4.6.1 Existing Conditions

The project site is located at the shoreline area of a large oceanfront residential property fronting Waimānalo Bay. The visual environment at the Waimānalo Paradise property is backdropped by the rugged cliffs of the Koʻolau mountains, with the makai view dominated by the expanse of the clear, aqua tinted waters of Waimānalo Bay. The land and sea boundary along the seaward property line is visually defined by the seawall, and the white sand beach at the base of the seawall varies in width throughout the day with the rise and fall of the tides. At times, the waters of the bay come up to the face of the seawall, and at other times the waters recede, providing a strip of sandy shore. The dark lava rocks of the fishpond are visible, some sections partially or fully submerged. The fishpond extends outward from the shore, forming a semi-circular cove that is popular for swimming and wading.

In the view of Waimānalo Bay toward the eastern horizon, the distinctive profile of Mānana (Rabbit Island) can be seen prominently in the distance.

4.6.2 Potential Impacts and Mitigation

The Proposed Action will repair an existing seawall and does not include design features that change the existing aesthetic character of the wall or that extend the wall height above the tallest wall sections. Certain sections of the seawall that are currently stepped down will be raised to match the existing height of the taller wall sections and create a uniform wall height. The improvements will not obstruct or alter views from the property or public views along the coast. No adverse impacts to the visual environment, public viewplanes, or scenic resources will result from the Proposed Action.

4.7 INFRASTRUCTURE AND UTILITIES

4.7.1 Existing Conditions

The Waimānalo Paradise property and surrounding residential areas in Waimānalo are served by electrical, water, sewer and telecommunication service. Hawaiian Electric Company provides electrical service to Waimānalo. Telephone and cable service are provided by Hawaiian Telcom, Inc. and Spectrum/Charter Communications, respectively. Overhead electrical and telephone lines are located along both sides of Kalaniana‘ole Highway within the highway right-of-way. Cellular telephone and internet connectivity are available through a variety of providers. The Honolulu Board of Water Supply provides municipal water service, and the City and County of Honolulu provides sewer service.

4.7.2 Potential Impacts and Mitigation

The Proposed Action will have no impact on utility demand, service, or infrastructure. The seawall repair will not result in any new land uses or activities that could require utility service. There will be no disruption to utility service during construction.

4.8 TRANSPORTATION AND ROADWAYS

4.8.1 Existing Conditions

The Waimānalo Paradise property is located on Kalaniana‘ole Highway (State Route 72), a State of Hawai‘i road that is maintained by the Hawai‘i Department of Transportation (HDOT). In the project vicinity, Kalaniana‘ole Highway is a coastal, two-lane highway with a posted speed limit of 35 miles per hour. The highway has an unpaved grassy shoulder on the mauka side of the road, with occasional turn out areas that are used by beach goers and visitors as roadside parking. No parking is allowed on the makai side of the highway. There are no sidewalks along either side of Kalaniana‘ole Highway.

HDOT traffic counts for Kalaniana‘ole Highway fronting the property (from mile marker 6.16 to 8.04) taken in 2017 indicate that traffic volumes in this section of highway are relatively low when compared to other major highways on O‘ahu. The average annual daily traffic—defined as the total volume of vehicle traffic for the year divided by 365 days—is 9,900 vehicles per day along this stretch of highway (https://histategis.maps.arcgis.com/apps/MapSeries/index.html?appid=39e4d804242740a89d3fd0bc76d8d7de).

The Waimānalo Paradise property is served by TheBus, operated for the City and County of Honolulu by O‘ahu Transit Services, Inc. There are bus stops in both directions on Kalaniana‘ole Highway near the Waimānalo Paradise site. Two bus routes serve the area. Route #67 (Kailua-Waimānalo-Sea Life Park) is a new route (effective August 2019) which incorporates parts of former Route #57 and connects Kailua

and Waimānalo to Ala Moana Center in Honolulu. Route #69 (Kāneʻohe-Windward Mall) provides service between Waimānalo/Sea Life Park and Windward Mall in Kāneʻohe.

There is no bicycle infrastructure on this stretch of Kalanianaʻole Highway, but the *Oʻahu Bike Plan 2019 Update* (City and County of Honolulu, 2019) identifies this area as a "proposed shoulder bikeway." The proposed route is intended to extend from Waimānalo east past Makapuʻu around to east Honolulu.

Ingress and egress to the Waimānalo Paradise property is via private driveway directly off Kalanianaʻole Highway. Along this rural stretch of Kalanianaʻole Highway, there are no traffic signals past Waimānalo Town center, until the coastal highway rounds Makapuʻu Point and the Kaiwi Coast and reaches Kealahou Street near Sandy Beach Park.

4.8.2 Potential Impacts and Mitigation

The Proposed Action will not modify or directly impact Kalanianaʻole Highway or the property's driveway or access. No adverse impacts to transportation or roadways are anticipated.

During construction, there may be temporary, short-term traffic impacts associated with the arrival of construction employees, materials and equipment along Kalanianaʻole Highway. Construction vehicles and equipment will include large, slow moving vehicles which may affect traffic on the highway, especially when entering and exiting the property. Construction debris will also be transported from the site via Kalanianaʻole Highway. In order to avoid adverse traffic impacts, construction materials, equipment, and large vehicles will transit to and from the site during off-peak hours. No lane closures are anticipated. Off-duty police officers or trained construction personnel will flag and direct traffic at the property entry as needed during equipment or material transport. All vehicles will park, load and unload on site, and will not obstruct traffic or block pedestrian access along the highway.

The following mitigation is proposed during the construction period:

- Schedule deliveries and transportation of construction materials and equipment during non-peak traffic hours (typically 8:30 am to 3:30 pm) to minimize possible disruption to traffic on Kalanianaʻole Highway and surrounding the local streets. Delivery hours would be confirmed as part of the construction management plan.
- Use BMP controls at the construction site to prevent trailing of dirt and debris onto adjacent roadways.
- Require construction-related vehicles and construction workers to park on the property, off the highway.
- Provide off-duty police officers and/or trained construction flagmen for traffic control.

4.9 PUBLIC SERVICES

4.9.1 Existing Conditions

Police, Fire and Emergency Response

The City and County of Honolulu Police Department (HPD) provides police protection to the entire island of Oʻahu. The Waimānalo Paradise property falls within the jurisdiction of the HPD's District 4, Kāneʻohe/Kailua/Kahuku, which extends from Makapuʻu Point to Kawela Bay on the windward side of Oʻahu. District 4 is divided into four sectors. The property is within Sector 1, Waimānalo. The nearest police substation is the Kailua Substation on Kuʻulei Road, located eight miles to the north in Kailua.

The City and County of Honolulu Fire Company 27 is located at 41-1301 Kalaniana‘ole Highway in Waimānalo, located 2.7 miles north of the property. The station includes ambulance service. The nearest emergency hospital is Adventist Health Castle (Castle Medical Center) in Kailua, 6.7 miles to the north.

Schools

The community of Waimānalo is located within the State of Hawai‘i Department of Education’s Kailua-Kalāheo Complex. The public schools located in Waimānalo include Waimānalo Elementary, Mālama Honua Charter School, and Blanche Pope Elementary School. Kamehameha Schools Preschool Waimānalo is an independent school. The closest high school serving the community is Kailua High School, located roughly seven miles from the Waimānalo Paradise site.

Health Care and Social Services

Waimānalo is served by the Waimānalo Health Center, a community-based non-profit that provides primary health services. Waimānalo Health Center is located on Kalaniana‘ole Highway approximately 2.8 miles to the north. Emergency and hospital facilities are provided by Castle Medical Center in Kailua, approximately 6.7 miles to the north.

Parks, Open Space and Recreational Facilities

Waimānalo includes a variety of county owned and operated parks, including the Waimānalo District Park, Kaiona Beach Park, Kaupō Beach Park, Waimānalo Beach Park, Waimānalo Bay Beach Park, and Makapu‘u Beach Park. Kaiona Beach Park provides a popular picnic area. Kaupō Beach Park is primarily used by fishers and surfers, and Makapu‘u is a popular spot for body surfing. Bellows Field Beach Park, while owned by the military, is accessible to the public on weekends and holidays and provides camp sites. Other recreational facilities include the 18-hole Olomana Golf Links, a popular course among local golfers.

4.9.2 Potential Impacts and Mitigation

The Proposed Action will have no impact on police, fire, and emergency medical services. There will be no increase in population or demand for these services. As stated previously, there may be some short-term traffic impacts to Kalaniana‘ole Highway during seawall repair when equipment and materials are transported to and from the site. This will not place a demand on City and County police, as the cost of any traffic control personnel needed will be borne by the landowner.

The Proposed Action will not impact area population or public services such as education or cultural facilities, medical facilities, or recreation facilities. The seawall improvements will not impact public shoreline access, which is from Kaiona Beach Park or Kaupō Beach Park. During construction of the seawall repairs, shoreline access immediately fronting the property may be temporarily closed for safety reasons. The seawall is located at the edge of the waterfront, and other than during low tide, there is very little sandy beach. During construction, there will be no restrictions on access to ocean areas, including the fishpond, so swimming in the area will continue to be allowed. Once seawall repairs are completed, there will be no change in recreation or other public services.

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5. RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

This chapter discusses the proposed project's conformance with relevant state and county land use plans, policies and controls. State plans and policies include the State Land Use District, Hawaiʻi State Plan (HRS Chapter 266) and the State Coastal Zone Management program. County-level plans and policies include the Honolulu General Plan, the Koʻolau Poko Sustainable Communities' Plan, Special Management Area (HRS Chapter 205A) and zoning.

5.1 STATE OF HAWAIʻI

5.1.1 State Land Use

Pursuant to HRS Chapter 205, all lands in the State of Hawaiʻi are classified into one of four major land use districts by the State Land Use Commission. The four land use districts are the Urban, Rural, Agricultural and Conservation Districts. Permitted uses within the State Land Use Districts are prescribed under Chapter 205, HRS and the State Land Use Commission's Administrative Rules (HAR Title 13, Chapter 13).

Discussion: Figure 5-1 shows the State land use district boundaries in relation to the project site. The project site and adjacent properties are designated within the State Urban District, which is defined to include "lands characterized by 'city-like' concentrations of people, structures, streets, urban level of services and other related land uses" (HAR §15-15-18 (1)). Permitted uses within the Urban District are regulated by the ordinances and land use controls of the respective county, which on Oʻahu is the City and County of Honolulu. The Proposed Action is consistent with the intent of the Urban District and does not require any action or approval from the State Land Use Commission to amend the existing land use designation.

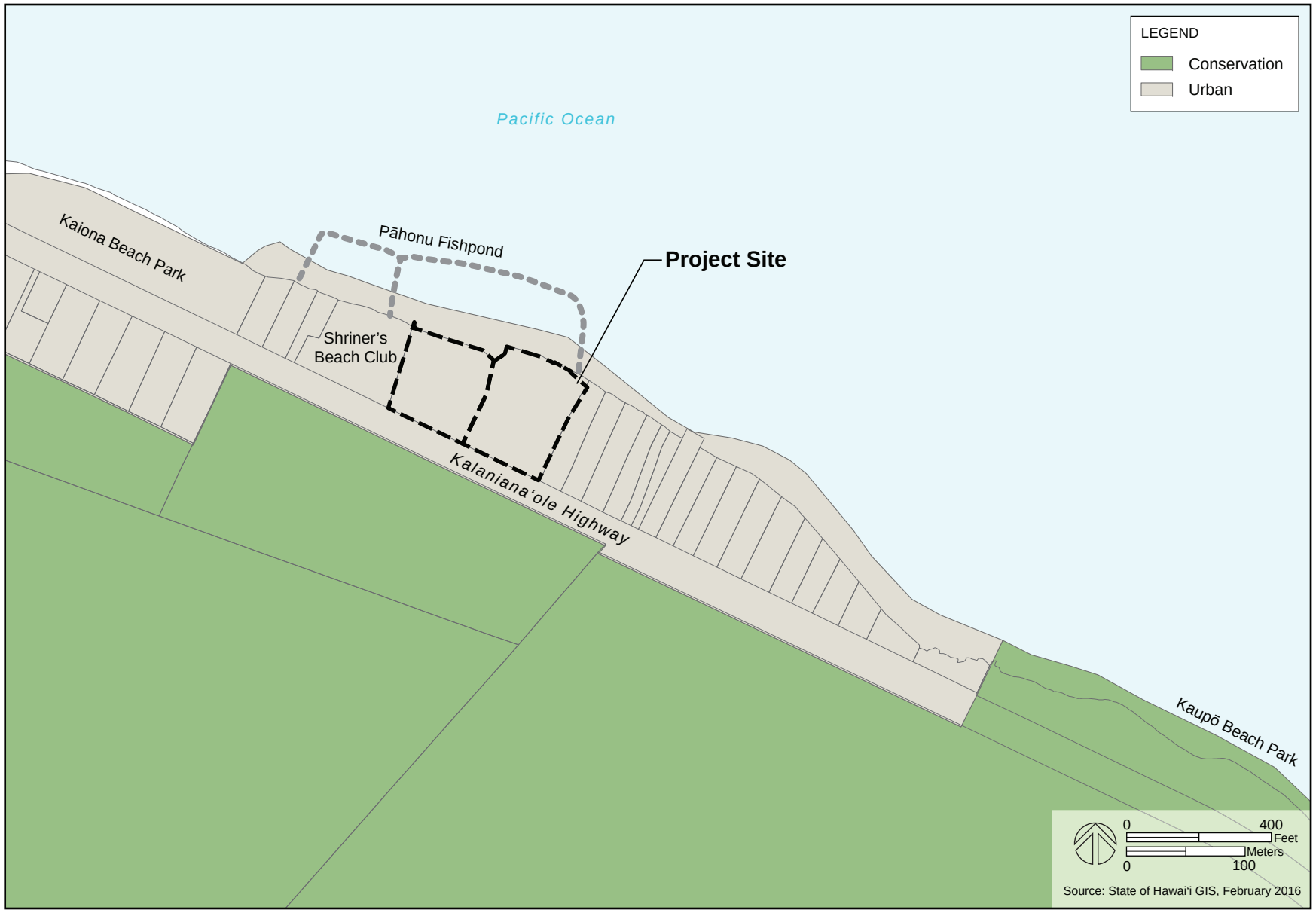
5.1.2 Hawaiʻi State Plan, HRS Chapter 266

The Hawaiʻi State Plan (HRS Chapter 226, as amended) is a long-range comprehensive plan that establishes the overall theme, goals, objectives, policies, and priority guidelines for statewide planning. The Plan provides a framework for determining priorities, allocating public resources, and improving coordination between State and county plans, policies, programs, projects, and regulatory activities.

The Hawaiʻi State Plan is divided into three parts:

- *Part I, Overall Theme, Goals, Objectives, and Policies*. Part I focus on general topic areas including population, economy, physical environment, facility systems, and socio-cultural advancement.
- *Part II, Planning Coordination and Implementation*. Part II establishes a statewide planning system to coordinate major state and county activities and to implement the overall theme, goals, objectives, policies, and priority guidelines. These are implemented through State Functional Plans.
- *Part III, Priority Guidelines*. This part of the State Plan establishes overall priority guidelines to address areas of statewide concern.

Discussion: Review and analysis of HRS Chapter 226 indicates that the Proposed Action is consistent with the State Plan policies listed below. The Proposed Action is limited to seawall repair and modifications to provide protection to safeguard the property against coastal hazards and sea level rise. The improvements also maintain the existing shoreline features associated with the fishpond, which is a cultural asset and a popular ocean area used by the local community. In addition, the improvements



State Land Use Districts

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

Figure 5-1

not impact the existing visual character along the shoreline, obstruct existing viewplanes to or along the shoreline, or affect existing public access to ocean resources. Construction activities will comply with all applicable laws and regulations to ensure that the physical environment is not adversely impacted.

§226-4 State goals.

(2) A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.

(3) Physical, social, and economic well-being, for individuals and families in Hawaii, that nourishes a sense of community responsibility, of caring, and of participation in community life.

§226-6 Objectives and policies for the economy—in general.

(b)(19) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.

§226-11 Objectives and policies for the physical environment—land-based, shoreline, and marine resources.

(b)(1) Exercise an overall conservation ethic in the use of Hawaii's natural resources.

(b)(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.

(b)(3) Take into account the physical attributes of areas when planning and designing activities and facilities.

(b)(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.

(b)(8) Pursue compatible relationships among activities, facilities, and natural resources.

(b)(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.

226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources.

(b)(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.

(b)(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

§226-13 Objectives and policies for the physical environment--land, air, and water quality.

(b)(2) Promote the proper management of Hawaii's land and water resources

(b)(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.

(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

(b)(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.

(b)(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors.

§226-23 Objective and policies for socio-cultural advancement--leisure.

(b)(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.

(b)(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.
(b)(5) Ensure opportunities for everyone to use and enjoy Hawaii's recreational resources.
(b)(10) Assure adequate access to significant natural and cultural resources in public ownership.

§226-25 Objective and policies for socio-cultural advancement--culture.
((b)(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawaii.

5.1.3 Hawai‘i Coastal Zone Management Program

The objectives and policies of the Hawai‘i CZM Program are described in HRS Chapter 205A-2, Part I. The objectives of the program are intended to promote the protection and maintenance of valuable coastal resources. All lands in the state and the area extending seaward from the shoreline are classified as valuable coastal resources within the State’s CZM area.

Part II of HRS Chapter 205A contains the general objectives and policies upon which all counties, including the City and County of Honolulu, have established special management areas. The project site is within the boundaries of the City and County's SMA, which requires compliance with the provisions of the county SMA rules (Chapter 25 Revised Ordinances of Honolulu) discussed in Section 5.2.4.

The following discussion assesses the project’s conformance with the objectives of the State’s CZM program (HRS Chapter 205A-2 (b)).

(1) Recreational Resources
(A) Provide coastal recreational opportunities accessible to the public.

Discussion*:* The Proposed Action will not affect existing public access to coastal recreational resources. The existing seawall, which serves as the interior boundary for the fishpond, will be repaired and modified. The coastal setting and existing access to the shoreline for swimming, fishing and ocean access is being maintained.

(2) Historic Resources
(A) Protect, preserve, and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Discussion*:* The AIS prepared for the Proposed Action (Appendix C) concluded that: (1) SIHP # -8747, the former Anderson Estate-Pāhonu remnants, is not significant under any of the Hawai‘i State historic property criteria because it lacks integrity; and (2) SIHP # -8748, a pre- to late post-Contact subsurface cultural deposit, is significant and retains sufficient integrity pursuant to HAR §13-284-6. On-site archaeological monitoring conducted in accordance with an accepted archaeological monitoring plan will mitigate the project’s effect on significant historic properties and any newly identified historic properties that may be identified during construction.

(3) Scenic and Open Space Resources
(A) Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.

Discussion*:* The Proposed Action will not alter or obstruct existing coastal scenic views or open space resources. Repairs and modifications proposed for the existing seawall will raise the height of portions of the seawall to result in a uniform 9-foot height across the top of the wall. This additional height will not impede existing panoramic views of the towering Koʻolau mountains from the shore or change the physical characteristics of the shoreline.

(4) Coastal Ecosystems
- *(A) Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*

Discussion*:* The Proposed Action will repair and modify an existing seawall that protects and stabilizes the shoreline from erosion, and ultimately keeps soil and vegetation from entering the ocean and polluting adjacent coastal waters. Best management practices will be employed during construction to control pollutants and prevent the release of construction-related debris from entering the water column and negatively impacting water quality and coastal resources. The *Baseline Assessment of the Marine Environment* (MRCI, 2019) concluded that marine communities directly off the seawall where repairs are proposed do not represent any rare or unique components. Some small common species of corals exist within the inner boundaries of the fishpond, although large, well-developed coral colonies are found outside the western boundary of the fishpond.

(5) Economic Uses
- *(A) Provide public or private facilities and improvements important to the State's economy in suitable locations.*

Discussion*:* The existing seawall forms the interior boundary of the fishpond, which is a cultural and recreational asset used by the public. Repair and modification of the existing seawall will provide long-term benefits for both the landowner of the privately-owned residential property and the general public that enjoys the fishpond and the adjacent coastal resources. This stretch of Waimānalo shoreline is well-known among tourists as a result of the 1980's television series "Magnum, P.I."

(6) Coastal Hazards
- *(A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.*

Discussion*:* The purpose of the Proposed Action is to protect the terrestrial area of the property from erosion and wave overtopping, and to increase resilience to coastal hazards and sea level rise.

(7) Managing Development
- *(A) Improve the development and review process, communication and public participation in the management of coastal resources and hazards*.

(8) Public Participation
- *(A) Stimulate public information, education and participation in coastal management.*

Discussion*:* The EA review process provides opportunity for public input at various stages, including the pre-assessment consultation process and a Draft EA 30-day public comment period during which the public has an opportunity to provide their input on the project. Early consultation with applicable government agencies and organizations was conducted as part of the preparation for this Draft EA (see Chapter 6 for consulted agencies and organizations). The SSV application process will require a public hearing. At that time, individuals will be able to provide comments on the proposed project.

(9) Beach Protection

(A) Protect beaches for public use and recreation.

Discussion*:* Large portions of the existing beachfront are often submerged at high tide. No impacts to the nearby beachfront are anticipated, except for temporary, short-term closures in the immediate vicinity of the seawall during the construction period. Public access to the offshore areas, including the fishpond, as well as public beach access at Kaiona Beach Park and Kaupō Beach Park, will continue throughout the construction period. Repair of the seawall is necessary to preserve the physical boundary between the terrestrial and marine environments, and thus protect from shoreline erosion.

(10) Marine Resources

(A) Promote the protection, use and development of marine and coastal resources to assure their sustainability.

Discussion*:* Appropriate best management practices will be used during construction to prevent the release of materials that have the potential to impact marine and coastal resources. The purpose of the Proposed Action—to protect the adjacent property from erosion and wave overtopping—keeps the existing shoreline intact and provides the additional benefit of protecting marine and coastal ecosystems from deteriorated conditions caused by coastal erosion.

5.2 CITY AND COUNTY OF HONOLULU

5.2.1 General Plan

The *General Plan for the City and County of Honolulu* was first adopted in 1977 and has been subsequently amended (most recently in 2002). A revised plan (*O'ahu General Plan Proposed Revised Draft,* 2017) was transmitted from the Planning Commission to the City Council in April 2018, and is currently pending Council review and approval (Resolution 18-093).

The Plan is a comprehensive statement of the long-range social, economic, environmental and design objectives for the general welfare and prosperity of the people of O'ahu, including broad policy statements that facilitate the attainment of the Plan's objectives. It is organized into 11 subject areas: population; economic activity; the natural environment; housing; transportation and utilities; energy; physical development and urban design; public safety; health and education; culture and recreation; and government operations and fiscal management. The growth policy presented in the Plan calls for full development of the Primary Urban Center (including lands between Kahala and Pearl City), development of the secondary urban center at Kapolei and the 'Ewa and Central O'ahu urban-fringe areas, and management of the physical growth and development in the remaining urban-fringe and rural areas to maintain their low densities.

Discussion*:* The Proposed Action is consistent with the following objectives and policies of the *General Plan* (1992 edition, amended in 2002). The Proposed Action reinforces an existing shoreline structure that was originally constructed roughly 100 years ago and is in deteriorating condition and in need of repair and rehabilitation. Construction of the Proposed Action provides protection from coastal hazards such as tsunami and wave damage, while also maintaining the existing configuration of the shoreline and the adjacent fishpond, which is a popular recreational resource for both residents and visitors. The proposed improvements will not affect scenic views or introduce new uses that could alter the physical character of the surrounding neighborhood. In addition, the proposed seawall repairs and modifications will be constructed in compliance with all applicable rules and regulations to minimize the potential for significant adverse impacts to the natural environment.

II. Economic Activity

Objective B, Policy 8. Preserve the well-known and widely publicized beauty of Oahu for visitors as well as residents.

III. Natural Environment

Objective A. To protect and preserve the natural environment.

Policy 1. Protect Oahu's natural environment, especially the shoreline, valleys, and ridges from incompatible development.

Policy 4. Require development projects to give due consideration to natural features such as slope, flood and erosion hazards, water-recharge areas, distinctive land forms, and existing vegetation.

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

Policy 8. Protect plants, birds, and other animals that are unique to the State of Hawaii and the Island of Oahu.

Objective B. To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.

Policy 1. Protect the Island's well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands.

Policy 2. Protect Oahu's scenic views, especially those seen from highly developed and heavily traveled areas.

VII. Physical Development and Urban Design

Objective F. To promote and enhance the social and physical character of Oahu's older towns and neighborhoods.

Policy 2. Encourage, wherever desirable, the rehabilitation of existing substandard structures.

VIII. Public Safety

Objective B. To protect the people of Oahu and their property against natural disasters and other emergencies, traffic and fire hazards, and unsafe conditions.

Policy 2. Require all developments in areas subject to floods and tsunamis to be located and constructed in a manner that will not create any health or safety hazard.

V. Culture and Recreation

Objective B. To protect Oahu's cultural, historic, architectural, and archaeological resources.

Policy 2. Identify, and to the extent possible, preserve and restore buildings, sites, and areas of social, cultural, historic, architectural, and archaeological significance.

Policy 5. Seek public and private funds, and public participation and support, to protect social, cultural, historic, architectural, and archaeological resources.

Objective D, Policy 12. Provide for safe and secure use of public parks, beaches, and recreation facilities.

Objective D, Policy 13. Encourage the safe use of Oahu's ocean environments.

5.2.2 Koʻolau Poko Sustainable Communities Plan

The City and County of Honolulu's Development Plan (DP) program provides a conceptual framework for implementing the objectives and policies of the General Plan on a regional basis. Eight geographical DP and Sustainable Communities Plan (SCP) areas have been established on Oʻahu, including the Koʻolau Poko region where the project site is located. The eight community-oriented plans articulate the

long-range future vision and policies for regional land use, and establish policies and guidelines for land use, public facilities and infrastructure improvements over a 20-year period.

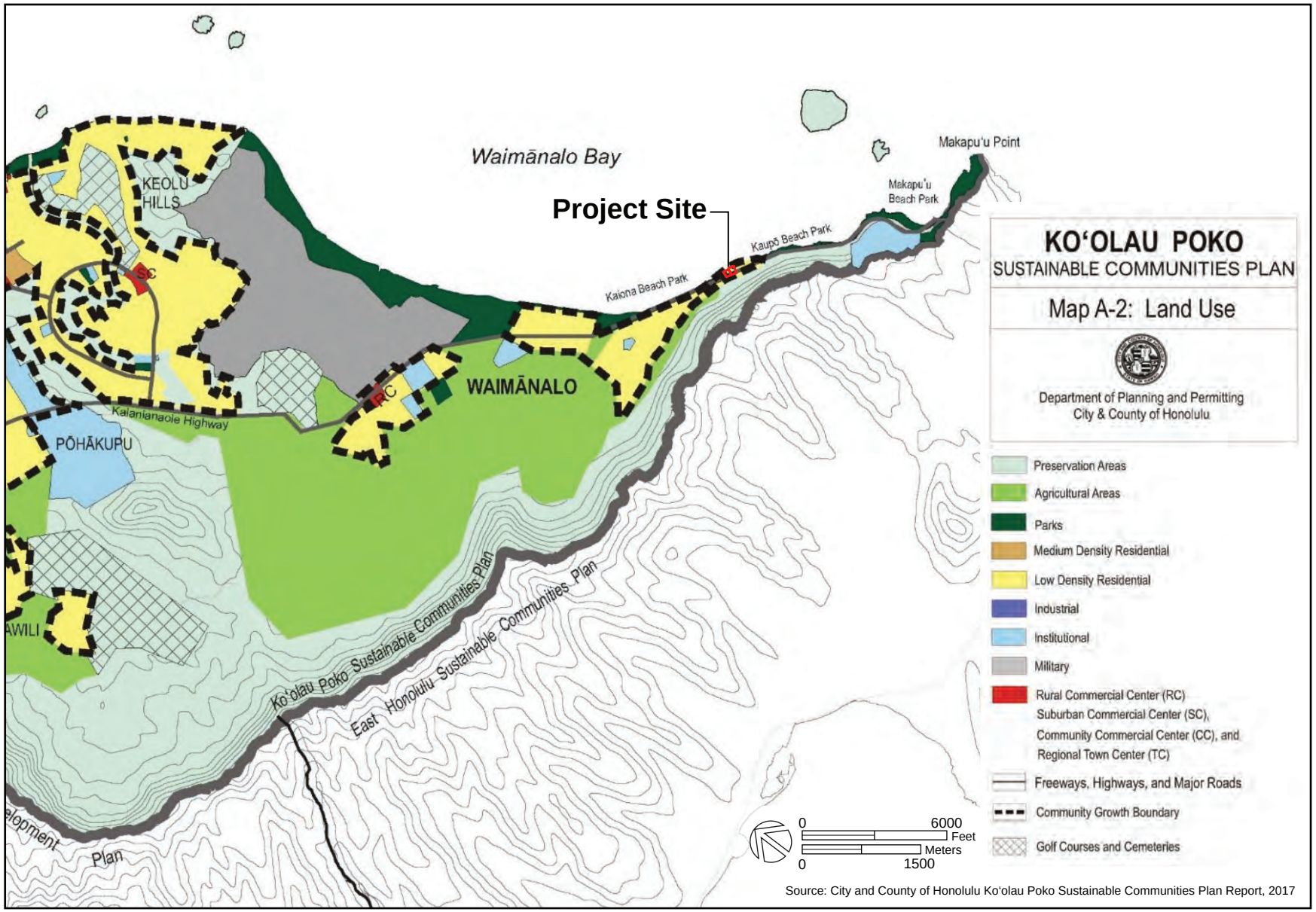
The Koʻolau Poko SCP was first adopted by Ordinance 97-49 in 1997, and most recently revised in 2017 with the adoption of Ordinance No. 17-42. The Koʻolau Poko SCP area encompasses Oʻahu's windward (northeastern) coastal and valley areas, extending from Makapuʻu Point at its eastern end to Kualoa at its western end. In carrying out the purposes of the General Plan, Koʻolau Poko is expected to experience essentially no growth over the 25-year planning horizon. Policies in support of this goal limit the potential for expansion of the region's housing stock, commercial centers and economic activity, and are focused on maintaining the patterns of development characteristics of its urban fringe and rural areas. The SCP's vision statement and implementing policies are shaped around two principal concepts, the first which calls for protection of the communities' natural, scenic, cultural, historic and agricultural resources, and the second which addresses the need to improve and replace, as necessary, the region's aging infrastructure systems. The Open Space Map, Urban Land Use Map, and Public Facilities Map appended to the Koʻolau Poko SCP graphically demonstrate the desired long-range pattern for land use, open space and public facilities.

Discussion*:* Figure 5-2 shows the SCP's Urban Land Use Map in relation to the project site. As shown on the SCP Land Use Map, the project site is within the community growth boundary in an area designated for low-density residential use.

The Proposed Action is consistent with the two concepts that form the basis of the SCP's vision and policies. The improvements address the deteriorating condition of the existing seawall and the need to repair and modify the existing structure, which was originally constructed in the early 1900s and is part of the island's aging coastal infrastructure. Secondly, implementation of the Proposed Action will promote efforts to protect natural, scenic, cultural or historic resources. No developed coral colonies or rare/unique marine communities were identified directly offshore from the seawall where repairs are proposed. Construction activities will employ best management practices to protect water quality, and also provide monitoring for marine species that could be disturbed by construction. Archaeological monitoring will also be conducted to mitigate effects on significant historic properties and any historic properties that may be identified during construction. The Proposed Action will not alter the existing visual character from the shoreline or obstruct existing coastal scenic views. The existing shoreline is being maintained, which complements efforts to protect and preserve the fishpond.

The Proposed Action complies with the following policies and guidelines in the Koʻolau Poko SCP.

- Protect endangered species and their habitats (Section 3.1.1 Open Space Preservation—Policies; Section 3.1.4.1 Protection of Other Natural Resources—Policies).
- Protect scenic beauty and scenic views and provide recreation (Section 3.1.1 Open Space Preservation—Policies).
- Promote access to shoreline and mountain areas (Section 3.1.1 Open Space Preservation—Policies).
- Locate and design exterior lighting to avoid disturbance to seabirds and marine mammals, using DLNR guidelines (Section 3.1.3.2 Shoreline Areas—Guidelines).
- Modify shoreline setbacks as needed to protect the natural shoreline, lessen the impact to coastal processes, and address sea level rise (Section 3.1.3.2 Shoreline Areas—Guidelines).



Ko'olau Poko Sustainable Communities Plan Urban Land Use Map **Figure 5-2**

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

- Analyze the possible impact of sea level rise for new public and private projects in shoreline areas and incorporate, where appropriate and feasible, measures to reduce risks and increase resiliency to impacts of sea level rise (Section 3.1.3.2 Shoreline Areas—Guidelines).
- Balance the need for public safety, the protection of property, and the desire for architectural embellishments with the need to conserve energy and the protection of wildlife and human health from adverse effects of outdoor night lighting (Section 3.1.4.1 Protection of Other Natural Resources—Policies).
- Require surveys to identify endangered species habitat, and require appropriate mitigation and protection measures to address impacts due to developments (Section 3.1.4.2 Protection of Other Natural Resources—Guidelines).
- Minimize glare and obtrusive light by limiting outdoor lighting that is misdirected, excessive, or unnecessary by fully shielding lighting (no light above the horizontal plane) fixtures and using lower wattage (Section 3.1.4.2 Protection of Other Natural Resources—Guidelines).
- Protect existing visual landmarks and support the creation of new, culturally appropriate landmarks. (Section 3.3.1 Historic and Cultural Resources—Policies).
- Preserve significant historic features from earlier periods (Section 3.1.1 Open Space Preservation—Policies).
- Implement in situ preservation and appropriate protection measures for sites that have high preservation value because of their good condition or unique features (Section 3.1.1 Open Space Preservation—Policies).
- Determine the appropriate treatment for a historic site by the particular qualities of the site and its relationship to its physical surroundings. Carefully plan and design adjacent uses to avoid conflicts or abrupt contrasts that detract from or destroy the physical integrity and historic or cultural value of the site since the context of a historic site is usually a significant part of its value (Section 3.1.1 Open Space Preservation—Policies).

Upon preliminary review, the Proposed Action does not appear to align with one of the guidelines for shoreline areas:

- Prohibit the use of shore armoring structures, considering alternative measures such as beach replenishment (Section 3.1.3.2 Shoreline Areas—Guidelines).

In actuality, selection of the Proposed Action as the preferred alternative was based on an evaluation that considered nine different alternatives ranging from No Action, managed retreat, removal of the existing seawall, construction of new shore protection structures, replacement of the existing seawall, and seawall repair (i.e. the Proposed Action). Given the presence of the existing seawall and the project objective to increase resilience to sea level rise, repairs and modifications to the existing seawall were determined to be the most cost-effective and least environmentally impactful approach to protect the shoreline. Natural measures such as beach nourishment are not appropriate for the project site because of the potential impacts to the historic fishpond. Furthermore, the natural shoreline was modified almost 100 years ago when the seawall was originally constructed; maintaining the current shoreline configuration along the existing seawall supports preservation of the fishpond.

5.2.3 City and County of Honolulu Zoning

The City and County of Honolulu Land Use Ordinance (LUO) regulates land use in accordance with adopted land use policies, including the General Plan and Development Plans. The LUO, which is also referred to as the Zoning Ordinance, describes the various zoning districts, the uses allowed within each zoning district, and the applicable development standards for each district. Zoning designations are shown on the zoning maps for the City.

Discussion*:* Under the current LUO zoning, the project site is zoned R-10 Residential (see Figure 5-3). According to Section 21-370(b) of the LUO, the intent of the R-10 Residential District is "to provide areas for large lot developments....located typically at the outskirts of urban development and…..applied as a transitional district between preservation, agricultural or country districts and urban districts. They would also be applied to lands where residential use is desirable, but some development constraints are present." While detached dwellings are the primary use within the R-10 District, nondwelling uses which support and complement residential neighborhood activities are also permitted. By protecting the adjacent property from coastal hazards and sea level rise, the Proposed Action supports the long-term use of the property for residential development and is consistent with the intent and use of the R-10 zoning designation. However, the proposed seawall repairs and modification are entirely within the shoreline setback area and are subject to approval of a shoreline setback variance.

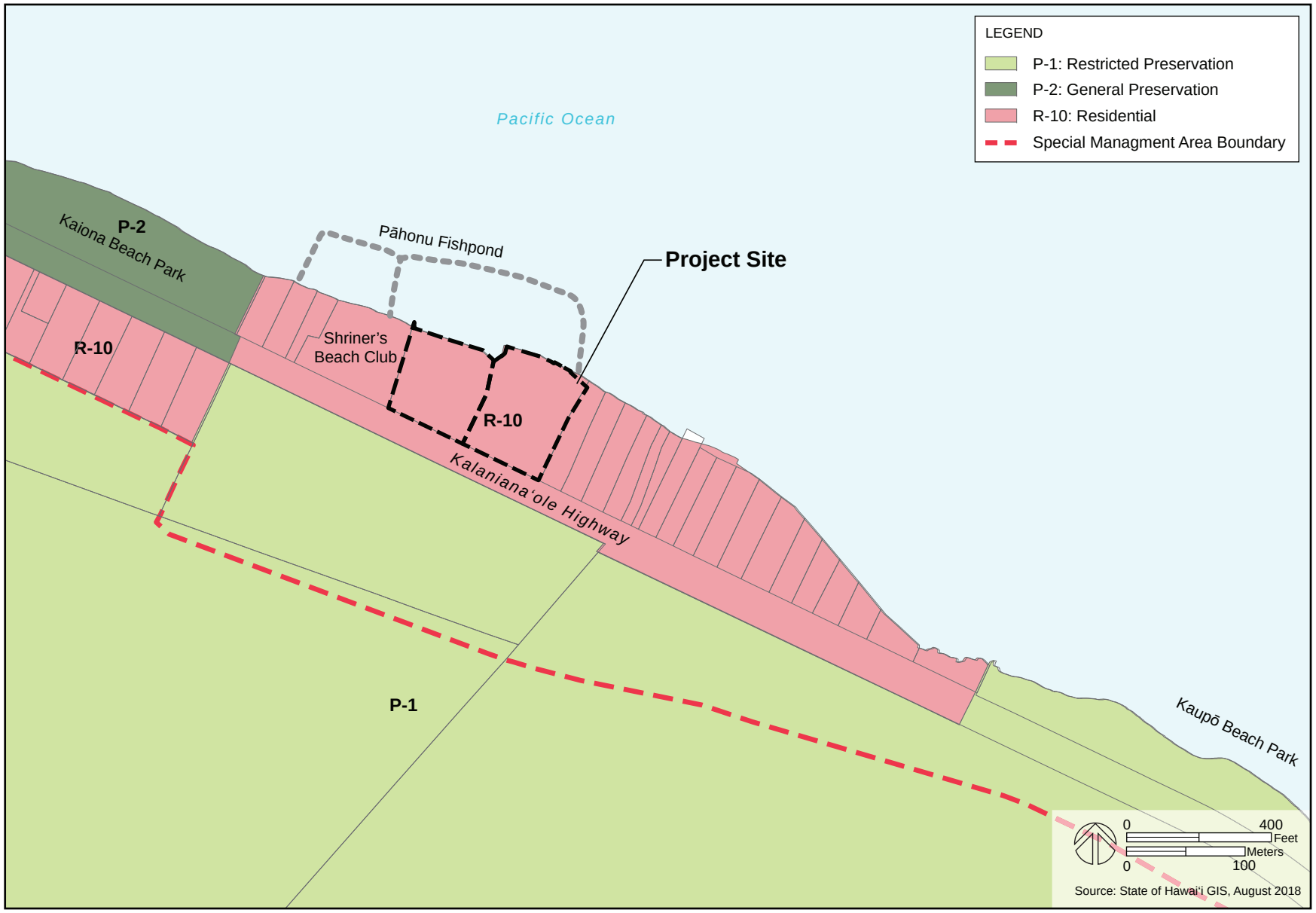
5.2.4 Special Management Area

The Hawaiʻi CZM Program embodied in HRS Chapter 205A contains the general objectives and policies upon which all counties within the state have structured specific legislation for the SMA. The intent of the SMA is to ensure adequate access to publicly owned areas; to mitigate adverse effects to water resources, and scenic and recreational amenities; to minimize vulnerability to coastal hazards; and to preserve historic and archaeological resources. The City and County of Honolulu, similar to other counties in Hawaiʻi, has adopted: (1) boundaries which identify the SMA; and (2) rules and regulations which are consistent with HRS Chapter 205A that control development within the SMA (ROH Chapter 25). Development within the SMA is subject to the regulations and procedures contained in ROH Chapter 25.

Discussion: Figure 5-3 shows the SMA boundary in relation to the project site. The project site is located entirely within the SMA. Consultation with DPP staff indicates that an SMA permit is not required for the Proposed Action because the proposed improvements are considered accessory to a single-family residence, and are exempt from the definition of development under ROH §25-1.3. "Development does not include:….(O) structural and nonstructural improvements to existing single family residences including additional dwelling units, where otherwise permissible."

5.2.5 Shoreline Setbacks

Pursuant to HRS Chapter 205A, the City and County of Honolulu has established standards and procedures that "generally prohibit within the shoreline area any construction or activity which may adversely affect beach processes, public access along the shoreline, or shoreline open space" (ROH Chapter 23). The shoreline area regulated by the City DPP encompasses the land between the certified shoreline and the shoreline setback line, which is typically 40 feet inland from the certified shoreline with exceptions that allow for adjustments. Structures and activities are expressly prohibited within the shoreline setback area, although allowances are permitted for specific circumstances and structures and activities approved via variance.



City and County of Honolulu Zoning and SMA

Figure 5-3

Waimānalo Paradise Seawall Repair

Draft Environmental Assessment

The Waimānalo Paradise property has a 60-foot shoreline setback which was established as part of the recently-approved subdivision approval). The certified shoreline, which was last approved on June 5, 2018, is located "along the seaward face of the seawall." The certified shoreline map is presented in Appendix E.

ROH §23-1.8 outlines the criteria for granting a shoreline setback variance, which includes structures and activities that: (1) are necessary for or ancillary to crop cultivation, aquaculture, landscaping, and moving sand that is seaward of the shoreline; or (2) are found to meet the shoreline-dependent facility standard, the public interest standard, or the hardship standard.

Discussion: The Proposed Action is located entirely within the shoreline setback area subject to the permitting requirements of ROH Chapter 23 and the *DPP Part 2 Rules Relating to Shoreline Setbacks and the Special Management Area*. The existing seawall is considered a nonconforming structure. The proposed seawall repairs and modifications will require approval of a SSV from the DPP. The SSV application to be submitted upon completion of the HRS 343 EA review process will describe how the Proposed Action meets the hardship standard for granting a variance. Following are the standards for determining hardship.

ROH §23-1.8(b)(3) Hardship Standard

(A) A variance may be granted for an activity or structure that is necessary or ancillary to the following private facilities or improvements, if hardship will result to the applicant if the facilities or improvements are not allowed within the shoreline area:
  (i) Private facilities or improvements which will neither adversely affect beach processes nor artificially fix the shoreline; and
  (ii) Private facilities or improvements that may artificially fix the shoreline, but only if hardship is likely to be caused by shoreline erosion and conditions are imposed prohibiting any such structure seaward of the existing shoreline unless it is clearly in the public interest.

(B) For the purposes of this subsection, hardship may be found only if:
  (i) The applicant would be deprived of reasonable use of the land if required to comply fully with the shoreline setback ordinance and the shoreline setback rules;
  (ii) The applicant's proposal is due to unique circumstances and does not draw into question the reasonableness of this chapter and the shoreline setback rules; and
  (iii) The proposal is the practicable alternative which best conforms to the purpose of this chapter and the shoreline setback rules.

(C) Before granting a hardship variance, the director must determine that the applicant's proposal is a reasonable use of the land. Because of the dynamic nature of the shoreline environment, inappropriate development may easily pose a risk to individuals or to the public health and safety. For this reason, the determination of the reasonableness of the use of land should properly consider factors such as shoreline conditions, erosion, surf and flood conditions and the geography of the lot.

(D) Hardship shall not be determined as a result of a zone change, plan review use approval, subdivision approval, cluster housing approval, planned development housing approval, conditional use permit, or any other discretionary land use permit granted after June 16, 1989.

The Proposed Action meets the prerequisite of a variance to be granted for private improvements that may artificially fix the shoreline, as hardship is likely to be caused by shoreline erosion if the proposed improvements are not constructed (ROH §23-1.8(b)(3)(A)(ii)). The three criteria for determining hardship under ROH §23-1.8(b)(3) are outlined in the following section. A fuller analysis of the hardship criteria will be included in the forthcoming SSV application.

- (B)(i): The landowner would be deprived of reasonable use of the land if required to comply fully with the shoreline setback ordinance and the shoreline setback rules. The repairs and modifications proposed to the existing sea wall are necessary to protect the residential property from erosion and ocean-related hazards. If not repaired or replaced, the existing seawall will continue to deteriorate, and large quantities of earth material will be released into nearshore waters.
- (B)(ii): The request to repair and modify the existing seawall is due to unique circumstances that date the existing structure back to the residential development of the former Anderson Estate-Pāhonu property (pre-1930s). The natural shoreline was modified approximately 100 years ago when the seawall was originally constructed. Although the original construction history of the seawall is unconfirmed, DLNR determined that the seawall is a legal, nonconforming structure based on a January 23, 1931 approval letter that authorized surface alterations to the existing seawall. Due to its age, the seawall is in deteriorating condition and in need of repair and rehabilitation.
- (B)(iii): The Proposed Action was determined to be the practicable alternative which best meets the purpose of the shoreline setback rules. A number of alternatives to the Proposed Action were evaluated in the Coastal Assessment (SEI, 2020) (see Section 2.4 and Appendix A), including the No Action alternative, managed retreat, beach nourishment, beach nourishment with stabilizing structures, revetment, hybrid seawall-revetment, seawall removal and seawall replacement.

5.2.6 O‘ahu Resilience Strategy

The *O‘ahu Resilience Strategy*, developed by the City’s Office of Climate Change, Sustainability and Resiliency, was formally adopted by the City Council in September 2019 (Resolution 19-233). The *Strategy* serves as a guiding policy document to improve O‘ahu’s resilience to social, economic and environmental stresses, with an emphasis on preparing for climate change impacts. To inform climate resilient planning while balancing economic and environmental goals for sustainability, the *Strategy* identifies 44 actions across four focal areas or resilience “pillars:” Pillar I: long-term affordability (local economy); Pillar II: disaster preparedness; Pillar III: climate security; and Pillar IV: community cohesion (Adaptation Clearinghouse, 2020).

Discussion: The Proposed Action is consistent with the following goals and action items of the *O‘ahu Resilient Strategy* (2019).

<u>PILLAR II. BOUNCING FORWARD</u>
Goal 1: Pre-Disaster Preparation
Action 12. Launch Hurricane Retrofit Program for Vulnerable Homes
Action 14. Establish Future Conditions Climate Resilience Design Guidelines

Goal 2: Effective Disaster Response
Action 18. Increase O‘ahu’s Preparedness Utilizing Scenario Modeling and Artificial Intelligence

<u>PILLAR III. CLIMATE SECURITY</u>
Goal 3: Climate Resilient Future
Action 28. Chart a Climate Resilient Future by Creating and Implementing a Climate Adaptation Strategy
Action 29. Protect Beaches and Public Safety with Revised Shoreline Management Rules
Action 30. Protect Coastal Property and Beaches Through Innovation and Partnerships

The project site is directly exposed to natural hazards such as tsunami, storm surge and hurricane approaching from the east. The Proposed Action aligns with the goals for pre-disaster preparation and disaster response: the proposed improvements protect against shoreline erosion associated with hurricane storm surges and will be designed to increase resilience to sea level rise based on the 3.2- foot sea level rise scenario modeled by the UH. Because the regulatory framework that supports climate security and a climate resilient future remains a work-in-progress, actions by individual landowners to invest in improvements that protect coastal property, beaches and public safety (such as the Proposed Action) should be encouraged.

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6. AGENCIES AND ORGANIZATIONS CONSULTED

An informational letter was sent on September 12, 2019 to 14 agencies, organizations and individuals to gather comments on the proposed project as part of the pre-assessment consultation process to prepare this Draft EA. A total of 9 agencies and organizations formally replied during the pre-assessment period. Agencies and organizations that were consulted during preparation of the Draft EA are listed as follows. The parties that provided formal response during the 30-day pre-assessment consultation period are identified with a check mark (✓). Written comments are presented in Appendix F.

CONSULTED AGENCY/ORGANIZATION	COMMENTS
Federal	
U.S. Army Corps of Engineers, Honolulu	✓
U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office	✓✓
National Marine Fisheries Service, Pacific Islands Regional Office	
State of Hawai‘i	
Office of Planning	✓
Department of Hawaiian Home Lands	
Department of Health, Environmental Health Administration	
Office of Conservation and Coastal Lands	✓
Department of Land and Natural Resources	✓
State Historic Preservation Division	
Office of Hawaiian Affairs	
City and County of Honolulu	
Department of Design and Construction	✓
Department of Planning and Permitting	✓
Department of Transportation Services	✓
Community Organizations and Others	
Waimānalo Neighborhood Board #32	

✓✓ Also includes separate comments from the Aquatic Ecosystems Conservation Program, U.S. Fish and Wildlife Service

In addition to the EA pre-assessment consultation, the following organizations and individuals were interviewed to support preparation of the CIA:

- Waimānalo Limu Hui, Community Group
- Kamuela Kala‘i
- Alu Like, Inc., Waimānalo Kūpuna Program
- Harold Ahuna Jr. and Cheryl Ahuna
- Kalani Kalima and his father

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7. ANTICIPATED DETERMINATION AND FINDINGS

To determine whether an action may have a significant impact on the environment, the agency needs to consider every phase of the proposed action, the expected impacts and the proposed mitigation measures. The agency's review and evaluation of the action would result in a determination that either: 1) the action may have a significant effect on the environment, and issuance of an Environmental Impact Statement Preparation Notice is required; or 2) the action is not likely to have a significant effect and notice of a FONSI should be issued.

In accordance with HRS Chapter 343 and HAR §11-200.1 , the Proposed Action is not likely to have a significant effect on the environment and a FONSI notice from DPP is anticipated. The anticipated FONSI determination is based on assessment of the significance criteria specified in HAR §11-200.1-13 as outlined below.

1. Irrevocably commit a natural, cultural, or historic resource

The Proposed Action is limited to repair and modification of an existing seawall. Construction activities, which are contained along the perimeter of the property, will not directly impact the oceanographic and coastal setting. No natural, cultural or historic resources will be irrevocably committed or lost. The residential portion of the project site has been previously disturbed and does not contain any biological species of concern or sensitive terrestrial habitats. Proper management and mitigation to protect water quality will ensure that the project does not affect existing marine resources, while visual observations will be conducted during construction to monitor for marine species. No nighttime construction or lighting sources that could impact migratory sea birds will be introduced. On-site archaeological monitoring of all ground-disturbing activities within the entire residential property will minimize potential loss or destruction of archaeological and historic resources. Native Hawaiian cultural practices involving use of the fishpond and adjacent shoreline area will not be impacted.

2. Curtail the range of beneficial uses of the environment

Proposed repairs and modifications to the existing seawall will maintain the current configuration and character of the shoreline and allow existing residential and coastal-dependent recreational uses to continue. Current uses and the intensity of use will not be altered, and no new uses are being introduced as a result of the proposed project. Construction will be performed in accordance with applicable State and County regulations to minimize potential impacts to the natural environment. By stabilizing the shoreline, the Proposed Action prevents soil and vegetation from polluting adjacent coastal waters, thereby positively enhancing the range of beneficial uses of the environment.

3. Conflict with the State's environmental policies or long-term environmental goals established by law

The Proposed Action does not conflict with the long-term environmental policies, goals and guidelines specified in HRS Chapter 344. The analysis of the individual resource areas presented in this EA demonstrates consistency with the State's policy to conserve natural resources and enhance residents' quality of life.

4. Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State

The Proposed Action does not include any new facilities or uses to increase resident or visitor populations, employment patterns, housing demand or community character. A beneficial short-term effect on the economy may result from the temporary increase in construction-related jobs. Proposed

repair and modification of the existing seawall will not affect public access to the shoreline or the use of the ocean for traditional cultural practices.

5. Have a substantial adverse effect on public health

The Proposed Action will not substantially affect public health. Typical short-term construction-related impacts (i.e. noise, air quality) may be experienced, but these are temporary and limited to the construction period. Standard best management practices will be used to minimize the temporary impacts. Compliance with applicable State and county regulations ensures that public health concerns are addressed.

6. Involve adverse secondary impacts, such as population changes or effects on public facilities

No adverse secondary impacts are associated with the Proposed Action. Improvements are limited in scope to repairing and modifying an existing seawall that has been in place since the early 1900s. Improvements do not involve development that generates population changes or demand for public facilities. No foreseeable changes in land use or intensity of existing use, population or employment levels, or demand for public facilities are anticipated.

7. Involve a substantial degradation of environmental quality

The environmental quality will not change as a result of the Proposed Action. Improvements will keep the existing shoreline intact and preserve the physical boundary between the terrestrial and marine environments, which will have an overall beneficial impact on the quality of the nearshore environment since marine and coastal ecosystems would not be exposed to deteriorated conditions associated with coastal erosion. The use of standard construction and erosion control best management practices are intended to minimize anticipated construction-related short-term impacts (i.e. noise, air quality, solid waste generation and traffic).

8. Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions

The Proposed Action involves repairs and modifications to reinforce an existing seawall that was originally constructed approximately 100 years. No cumulative impacts result from retaining the current shoreline configuration, particularly since no other foreseeable future actions or regional developments have been identified, and the proposed project is not a precursor for other future actions.

9. Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat

The project site does not contain any threatened, endangered or candidate listed animal or plant species or habitats that require protection under Federal or State regulations. No corals or other attached macrofauna were observed on the submerged seawall and its base. Visual surveys for sea turtles and monk seals will be conducted prior to construction; if either are present, work would be postponed until the animals leave the area. Nighttime construction and lighting that could impact migratory sea birds are not part of the Proposed Action.

10. Have a substantial adverse effect on air or water quality or ambient noise levels

The Proposed Action is not a major source of air, noise or water pollutants, and will not result in substantial adverse effects to air or water quality or ambient noise levels. Although temporary, short-term increases such as noise may occur, , best management practices will be used to prevent ambient dust and construction-related materials from being released into the nearshore waters during construction.

11. Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters

The Waimānalo Paradise property is in a special flood hazard area which is subject to inundation by the 1 percent annual chance flood. The shoreline, which faces towards the northeast, is exposed to a range of hazards including tsunami, hurricanes, erosion and sea level rise. The purpose of the Proposed Action is to protect the terrestrial area of the property from coastal hazards and to increase resilience to erosion and wave overtopping associated with sea level rise. The proposed seawall repairs and modifications will comply with all applicable design requirements. No impacts are anticipated.

12. Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies; or

The proposed improvements add additional height to portions of the seawall to create a uniform wall height (9-feet MSL). The additional height will not obstruct or alter views from the property or public views along the coast. No adverse impacts to the visual environment, scenic vistas and public viewplanes identified in County or State plans or studies are anticipated. No new lighting that could alter the nighttime environment is planned .

13. Require substantial energy consumption or emit substantial greenhouse gases.

Construction of the Proposed Action involves minimal energy consumption, and heavy equipment used during construction will generate minimal amounts of greenhouse gases. No new uses or activities that are major users of energy or major producers/sources of greenhouse gases will be introduced as a result of the project.

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APPENDIX A

Coastal Assessment for Waimānalo Paradise Seawall Repairs

Prepared by Sea Engineering, Inc.

Coastal Assessment for Waimanalo Paradise Seawall Repairs

Waimanalo, Oahu, Hawaii

January 2020

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1. EXECUTIVE SUMMARY

Waimanalo Paradise consists of two (2) adjoining residential parcels located seaward of Kalanianaole Highway in Waimanalo, Oahu, Hawaii identified by Tax Map Key Nos. (1) 4-1-002:021 and 022 (respectively, the "West Lot" and the "East Lot"). The project site has a total area of 130,788 square feet (3 acres) with about 585 feet of shoreline frontage.

The project site is located in Waimanalo Bay on the southeast coast of the island of Oahu. The oceanfront location of the property makes it vulnerable to coastal hazards and sea level rise. The property owners are investigating options to increase resilience of the properties to sea level rise. The planning horizon for the project is 50 years (2070). The planning scenario assumes 3.2 feet of sea level rise by 2070, which is consistent with Federal and State planning recommendations.

The project objectives are to:

- Ensure that the existing seawall can provide adequate resistance to design soil loads.
- Reduce wave overtopping under design wave conditions through 2070.
- Increase the resilience of the property to coastal hazards and sea level rise through 2070.

The project site is fronted by a seawall that was constructed between 1911 and 1928. The seawall is 585 feet long with crest elevations that range from + 5.0 feet to +11.0 feet mean sea level (msl). The crest elevation of the seawall becomes progressively lower in elevation and the condition of the seawall becomes progressively more deteriorated moving from east to west. The seawall protects the project site from erosion. The primary hazard is wave overtopping, which is projected to increase with sea level rise. The East Lot is less vulnerable to sea level rise because the terrestrial elevations are higher, the crest elevation of the seawall is higher, and the seawall is in better overall condition. The West Lot is more vulnerable to sea level rise because the terrestrial elevations are lower, the crest elevation of the seawall is lower, and the seawall is in a more deteriorated condition.

The seawall is over 100 years old and is in a deteriorated condition. If the seawall is not repaired or replaced, the condition of the structure can be expected to continue to deteriorate. The seawall is covered by a grant of non-exclusive easement from the State of Hawaii that requires the Grantee to maintain the seawall in a safe condition. The easement also confers unto the Grantee the "right, privilege, and authority to use, maintain, repair, replace and remove the existing seawall and steps over, under, and across State-owned land".

Maintaining the existing seawall would protect the project site and adjacent properties from erosion and wave overtopping. The repairs would be within the footprint and landward of the existing seawall and thus would have no impact on beach processes or lateral shoreline access. Increasing the crest elevation of portions of the seawall to +9.0 feet (msl) would be 2 feet above the existing grade in the terrestrial area and would not substantially change viewplanes to or along the shoreline. The project site is fronted by a historic *pāhonu* (fishpond). Repairing the seawall would prevent erosion of the terrestrial soils, which could negatively impact water quality and marine habitat.

The proposed seawall repairs are an appropriate engineering solution for the project site and would satisfy the project objectives. Repair is the most cost-effective and least environmentally impactful approach to maintain the existing seawall, mitigate potential for erosion, and reduce potential for wave overtopping with sea level rise.

2. INTRODUCTION

2.1 Purpose

This *Coastal Assessment* has been prepared in support of the *Waimanalo Paradise Seawall Repairs* project. The Waimanalo Paradise property (the "Project Site") is located seaward of Kalanianaole Highway in Waimanalo, Oahu, Hawaii identified by Tax Map Key Nos. (1) 4-1-002:021 and 022 (respectively, the "West Lot" and the "East Lot").

The project site is located in Waimanalo Bay on the southeast coast of Oahu. The oceanfront location of the project site makes it particularly vulnerable to coastal hazards and sea level rise. The property owners hired a team of local consultants to develop a strategic improvement plan to increase the resilience of the properties to coastal hazards and sea level rise through 2070.

Sea Engineering, Inc. (SEI) was retained to quantify the future effects of sea level rise, focusing on the adaptability and resilience of the properties. The sea level rise projections referenced throughout this report are based on global mean sea level (GMSL) scenarios that were published by the National Oceanic and Atmospheric Administration (NOAA) in January 2017. SEI adapted the projections to create local mean sea level (LMSL) scenarios for Hawaii.

The purpose of the *Coastal Assessment* is to collect the data and information necessary to assess the vulnerability of the project site to sea level rise and inform the development of conceptual engineering solutions that are appropriate for the existing site conditions. The objectives of the *Coastal Assessment* are to assess existing conditions, evaluate coastal engineering alternatives to increase resilience to sea level rise, and identify the recommended engineering solution.

The *Coastal Assessment* is an important component of the environmental review and regulatory permitting process. This *Coastal Assessment* complies with the Office of Environmental Quality Control (OEQC) guidelines for assessing shoreline alteration projects, including: a detailed description of the existing shoreline and coastal processes; historical shoreline erosion rates; site maps; oceanographic setting; coastal hazards; description of improvements; and review of alternatives. The *Coastal Assessment* is suitable for inclusion in an Environmental Assessment (EA) or Environmental Impact Statement (EIS).

2.2 Objectives

The property owners are developing a strategic improvement plan to increase the resilience of the properties to coastal hazards and sea level rise. The objectives of the project are to:

- Ensure that the existing seawall can provide adequate resistance to design soil loads.
- Reduce wave overtopping under design wave conditions through 2070.
- Increase the resilience of the property to coastal hazards and sea level rise through 2070.

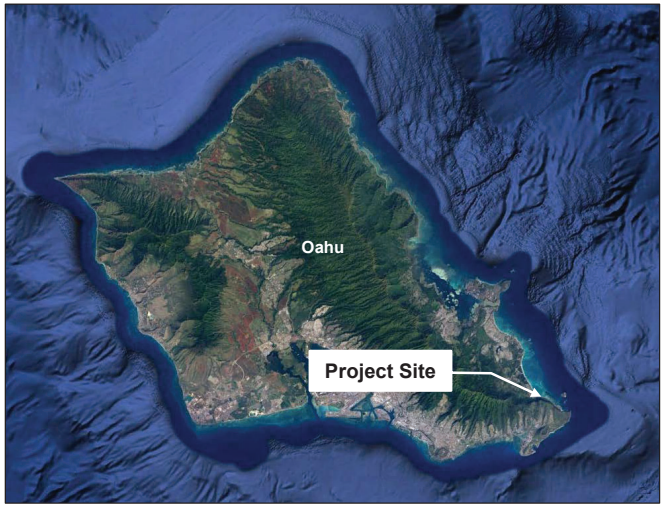


Figure 2-1 Project site location on the island of Oahu (Google Earth)

Figure 2-2 Oblique aerial photograph of the project site

3. PHYSICAL SETTING

3.1 Regional Conditions

The project site is situated at the southern end of Waimanalo Bay on the southeast coast of Oahu. The shoreline west of the project site is characterized by sandy beaches that extend north to Wailea Point. Notable features west of the project site include Kaiona Beach Park, Waimanalo Beach Park, Waimanalo Bay State Recreation Area, and Bellows Air Force Station. The shoreline east of the project site transitions to a rocky coastline with limestone outcrops, basalt boulder deposits, and small pocket beaches that extend south to Makapuu Point. Notable features east of the project site include Kaupo Beach Park, Manana (Rabbit Island), Makai Research Pier, Makapuu Beach Park, and Makapuu Lighthouse.

3.2 Geology & Soils

The surficial geology of the Waimanalo coastline is primarily unconsolidated Holocene carbonate beach and dune deposits and alluvium (Sherrod et al., 2007). The terrestrial soils are designated as Jaucas sand (Jac) with 0 to 15 percent slopes (Figure 3-1). This series consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean on all islands. These soils developed in wind- and water deposited sand from coral and seashells. On this soil, permeability is rapid. Runoff is very slow to slow, and the hazard of water erosion is slight, but wind erosion is a severe hazard where vegetation has been removed (USDA, 1972).

3.3 Bathymetry

The Waimanalo coast is dominated by a broad, shallow fringing reef that begins just south of the project site and becomes increasing wider toward Wailea Point. The broad reef is bordered by a wide nearshore lagoon. The combined reef and lagoon system give Waimanalo Bay its unique character. Figure 3-2 shows water depths (in fathoms) relative to mean sea level (msl) offshore of the project site. Nearshore water depths are generally one fathom (6 feet) or less in the inner lagoon and reef, which extends approximately 2,000 feet offshore. Water depths along the reef crest range from 1 to 3 fathoms (6 to 18 feet). Water depths on the outer reef range from 3 to 5 fathoms (18 to 30 feet) before dropping off into deeper waters offshore. A bathymetric survey of the nearshore waters within the fishpond was conducted by SEI on July 17, 2019. The minimum elevation within the fishpond was -5.4 feet msl at the tidal channel near the middle of the outer wall of the fishpond. The maximum elevation was +3.2 feet msl at the east end of the dry beach area where the fishpond abuts the seawall.

3.4 Topography

A topographic survey of the project site was conducted by KN Surveying, Inc. on October 19, 2017 (Figure 3-3). Terrestrial elevations on the West Lot ranged from +5 to +8 feet msl. Terrestrial elevations on the East Lot ranged from +5 to +11 feet msl. The East Lot is at a slightly higher elevation than the West Lot. A circular depression is located in the middle of the project site between the two lots. Elevations within the depression range from +3 to +5 feet msl.

Figure 3-1 Soil units within the project site (USDA)

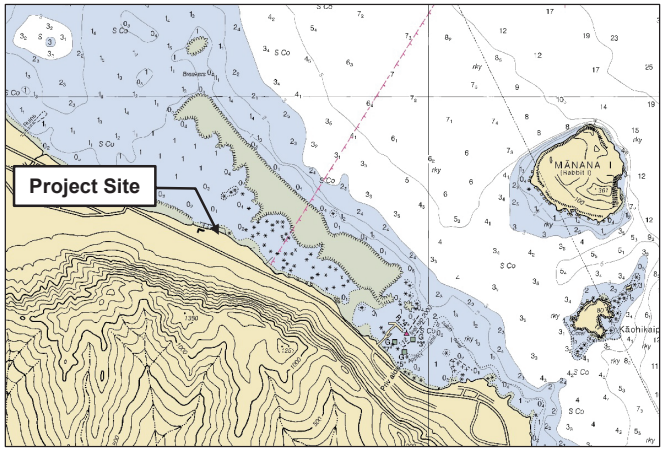


Figure 3-2 Bathymetry, in fathoms (NOAA)

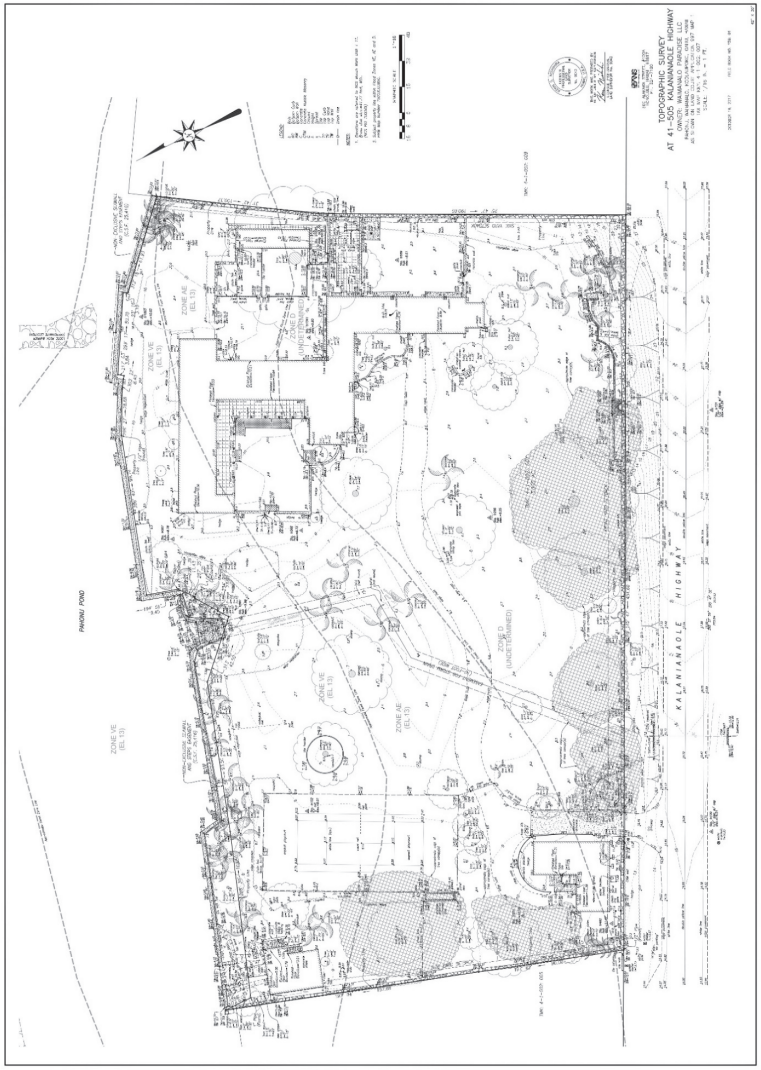


Figure 3-3 Topographic map of the project site (KN Surveying, Inc., Oct 2017)

3.5 Coastal Uses

The project site shoreline is primarily used for recreational purposes. The beach is a recreational destination for shoreline fisherman, *limu (*seaweed) collectors, snorkelers, swimmers, spear fishers, and tourists. Shoreline public access is available through Kaiona Beach Park, 400 feet west of the project site, and Kaupo Beach Park, 1,500 feet east of the project site. Although the project site is actively used by beach goers, there is limited parking and the beach is typically submerged at high tide. The project site was made famous by the 1980's television series "Magnum, P.I." and is thus a popular tourist attraction. The project site is fronted by a *pāhonu* (fishpond), a low rock-walled enclosure that is popular with swimmers and beachgoers. There are no notable surf breaks directly offshore of the project site.

3.6 Zoning & Land Uses

The project site is located in the State Urban District and the Special Management Area (SMA), which are regulated primarily by the City & County of Honolulu. The area between the record property boundary and the shoreline (along the seaward face of the seawall) is unencumbered State land. The area seaward of the shoreline is located in the Resource Subzone of the Conservation District. The Board of Land and Natural Resources (BLNR) has exclusive jurisdiction to govern land uses in the Conservation District. Table 3-1 summarizes the regulatory designations within the project site.

Table 3-1 Summary of regulatory designations

Category	Designation
District	Koolaupoko
Ahupuaa	Waimanalo
Zoning (State)	Urban
Zoning (County)	R-10 Residential
Community Development Plan	Koolaupoko Sustainable Communities Plan
Land Use Designation	Low Density Residential
Special Management Area	Yes
Conservation District	No
Water Quality Classification	Class AA
Waterbody Type	Marine, Open Coastal
Wetlands	No
FEMA Flood Zone	VE / AE / D (Base Flood Elevation = 13 feet)

4. OCEANOGRAPHIC SETTING

4.1 Winds

The prevailing winds throughout the year are the northeasterly tradewinds. Average tradewind frequency varies from more than 90% during the summer season to only 50% in January, with an overall annual frequency of 70%. Westerly or Kona winds occur primarily during the winter months and are generated by low pressure systems that typically move north of the islands from west to east. Figure 4-1 shows a wind rose diagram that is applicable to the project site. The diagram is based on wind data recorded daily at Marine Corps Base Hawaii (MCBH) in Kaneohe, Oahu.

Tradewinds are produced by the outflow of air from the Pacific Anticyclone high-pressure system, also known as the Pacific High. The center of this system is located well north and east of the Hawaiian Islands and moves to the north and south seasonally. In the summer months (May through September), the center moves to the north, causing the tradewinds to be at their strongest. In the winter months (October through April), the center moves to the south, resulting in decreasing tradewind frequency. During these months, the tradewinds continue to blow; however, their average monthly frequency decreases to 50%.

During the winter months, wind patterns of a more transient nature increase in prevalence. Winds from extra-tropical storms can be very strong from almost any direction, depending on the strength and position of the storm. The low-pressure systems associated with these storms typically track west to east across the North Pacific north of the Hawaiian Islands. At Honolulu International Airport, wind speeds resulting from these storms have exceeded 60 mph on several occasions. Kona winds are generally from a southerly to a southwesterly direction and are usually associated with slow-moving low-pressure systems known as Kona lows situated to the west of the Hawaiian Islands. These storms are often accompanied by heavy rains.

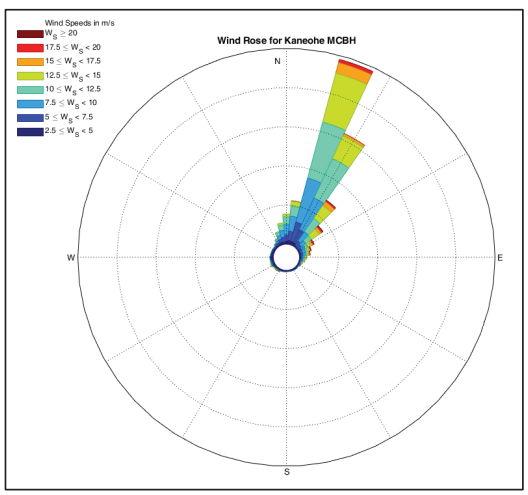


Figure 4-1 Wind rose, Kaneohe MCBH (Jul 2016 to Jul 2018)

4.2 Tides

Hawaii tides are semi-diurnal with pronounced diurnal inequalities (i.e. two high and low tides each 24-hour period with different elevations). A modulation of the tidal range results from the relative position of the moon and the sun. During full moon and new moon phases, the moon and sun act together to produce larger "spring" tides; when the moon is in its first or last quarter, smaller "neap" tides occur. The cycle of spring to neap tides and back is half the 27-day period of the moon's revolution around the earth and is known as the fortnightly cycle. The combination of diurnal, semi-diurnal and fortnightly cycles dominates variations in sea level throughout the Hawaiian Islands.

Tidal predictions and historical extreme water levels are provided by the NOAA NOS Center for Operational Oceanographic Products and Services. A tide station is located at Mokuoloe (Coconut Island) in Kaneohe Bay. Water level data based on the 1983 to 2001 tidal epoch is shown in Table 4-1.

Table 4-1 Water level data for Mokuoloe, Station 1612480 (NOAA)

Datum	Elevation (feet, mllw)	Elevation (feet, msl)
Mean Higher High Water	+2.1	+1.1
Mean High Water	+1.8	+0.8
Mean Sea Level	+1.1	0.0
Mean Low Water	+0.3	-0.7
Mean Lower Low Water	0.0	-1.1

Hawaii is also subject to periodic extreme tide levels due to large oceanic eddies and other oceanographic phenomena that have recently been recognized and that sometimes propagate through the islands. Mesoscale eddies produce tide levels that can be up to 0.5 foot higher than normal for periods up to several weeks (Firing and Merrifield, 2004). An additional temporary sea level rise of 0.5 feet has also been associated with phenomena related to the El Niño /Southern Oscillation (ENSO).

4.3 Waves

4.3.1 General Wave Climate

The wave climate in Hawaii is dominated by long period swell generated by distant storm systems, by relatively low-amplitude, short-period waves generated by local winds, and occasional bursts of energy associated with intense local storms. Typically, Hawaii receives five general surface gravity wave types: 1) northeast tradewind waves, 2) southeast tradewind waves 3) southern swell, 4) North Pacific swell, and 5) Kona wind waves. The dominant swell regimes for Hawaii are shown in Figure 4-2.

Tradewind waves occur throughout the year and are the most persistent April through September when they usually dominate the local wave climate. These winds result from the steady tradewinds blowing from the northeast quadrant over long fetches of open ocean. Tradewind deepwater waves are typically between 3 and 8 feet high with periods of 5 to 10 seconds, depending upon the strength of the tradewinds and how far the wind fetch extends east of the Hawaiian Islands. The direction of approach, like the tradewinds themselves, varies between north-northeast and east-southeast and is centered on the east-northeast direction. The project site is directly exposed to tradewind waves and these waves represent a significant source of wave energy reaching the project site.

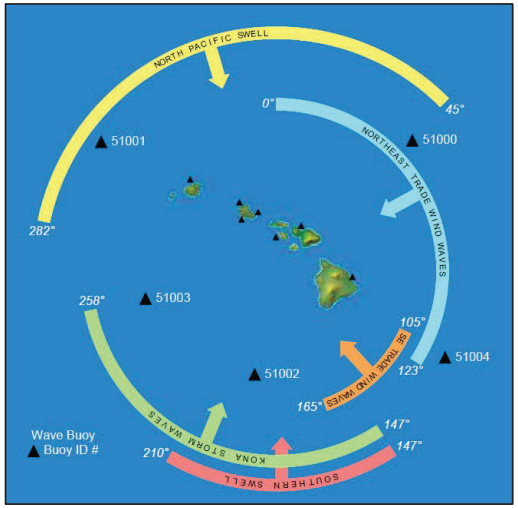


Figure 4-2 Hawaii dominant swell regimes

During the winter months in the northern hemisphere, strong storms are frequent in the North Pacific in the mid-latitudes and near the Aleutian Islands. These storms generate large North Pacific swells that range in direction from west-northwest to northeast and arrive at the northern Hawaiian shores with little attenuation of wave energy. These are the waves that have made surfing on the North Shore of Oahu famous. Deepwater wave heights often reach 15 feet and in extreme cases can reach up to 30 feet. Periods vary between 12 and 20 seconds, depending on the location of the storm. While sheltered from northwesterly wave approach, the project site is directly exposed to North Pacific swell approaching from the north and northeast directions and these waves represent a significant source of wave energy reaching the project site.

Southern swell is generated by storms in the southern hemisphere and is most prevalent during the summer months of April through September. Traveling distances of up to 5,000 miles, these waves arrive with relatively low deepwater wave heights of 1 to 4 feet and periods of 14 to 20 seconds. Depending on the positions and tracks of the southern hemisphere storms, southern swells approach between the southeasterly and southwesterly directions. The project site is well sheltered from the direct approach of southern swell by the island shadowing of Oahu, and only a portion of the wave energy refracting and diffracting around the southeast corner of the island reaches the project site.

Severe tropical storms and hurricanes have the potential to generate extremely large waves, which could potentially result in large waves at the project site. Recent hurricanes impacting the Hawaiian Islands include Hurricane Iwa in 1982 and Hurricane Iniki in 1992. Iniki directly hit the island of Kauai and resulted in large waves along the southern shores of all the Hawaiian Islands. Damage from these hurricanes was extensive. Although not a frequent or even likely event, they should be considered in the project design, particularly with regard to shoreline structures, both in the water and on land near the shoreline.

4.3.2 Prevailing Deepwater Waves

The deepwater wave conditions are well defined by the Coastal Data Information Program (CDIP) buoy station 098 (CDIP 098), which is located approximately 6.5 miles north of the project site. CDIP 098 is a Datawell directional buoy that measures wave height, wave direction, and peak period every hour. The buoy has recorded data continuously since it was installed in August 2000, with occasional data gaps due to maintenance.

The deepwater wave climate in the vicinity of CDIP 098 is dominated by the occurrence of tradewind waves with a peak direction (Dp) from northeast through east-northeast directions, clockwise. Buoy data shows that the area is also exposed to longer period North swell. The percent occurrences of wave height by direction and wave period by direction are presented below. Figure 4-3 and Table 4-2 show the wave height rose diagram and histogram, respectively. Figure 4-4 and Table 4-3 show the wave period rose diagram and histogram, respectively. The color scheme on the histograms provides a visual aid to illustrate the differences in percent occurrence over time.

The figures show that waves are predominantly from the east-northeast and have a significant wave height (Hs) between 4 and 8 feet occurring 50 percent of the time with peak periods typically between 6 to 10 seconds. The figures also show that the project site is exposed to longer period swells from the North with an average wave height of 6.3 feet.

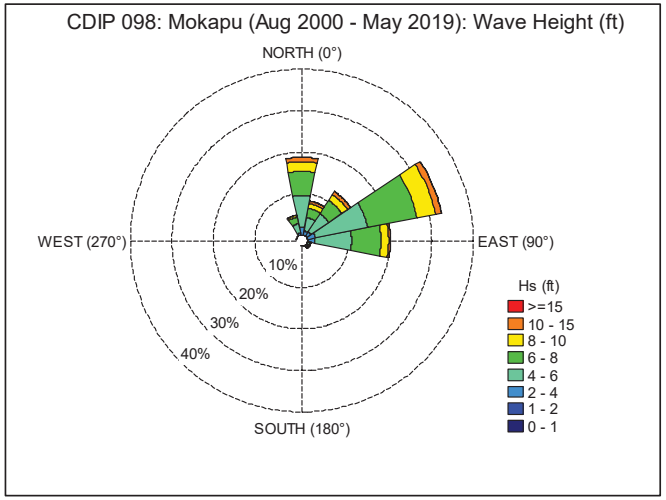


Figure 4 CDIP 098 wave height rose (Aug 2000 to Jan 2019)

Table 4-2 Wave height percent frequency of occurrence (Aug 2000 to Jan 2019)

Hs (ft)\Dir (deg)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total
0-1																	0.00
1-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0										0.01
2-3	0.3	0.2	0.2	0.3	0.2	0.1	0.2	0.0	0.0						0.0	0.1	1.44
3-4	1.8	0.9	1.1	1.7	1.6	0.2	0.3	0.0	0.0					0.0	0.0	0.5	8.14
4-6	7.5	3.3	5.2	12.8	8.9	0.4	0.4	0.0								2.3	40.81
6-8	5.9	2.3	3.8	12.1	7.1	0.1	0.1	0.0							0.0	1.6	32.99
8-10	2.4	1.1	1.7	4.5	1.9	0.0	0.0									0.5	12.08
10-12	0.8	0.5	0.6	1.2	0.4	0.0	0.0									0.1	3.53
12-14	0.2	0.1	0.2	0.2	0.0	0.0										0.0	0.80
14-16	0.0	0.0	0.0	0.0	0.0												0.14
16-20	0.0	0.0	0.0	0.0	0.0												0.05
20+			0.0		0.0												0.00
Total	18.75	8.43	12.88	33.00	20.08	0.89	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.01	100.000
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Overall
Mean	6.3	6.3	6.4	6.4	6.0	4.7	4.2	3.9	3.0	0.0	0.0	0.0	0.0	3.3	5.2	5.9	6.2
StDev	2.0	2.3	2.2	1.8	1.7	1.4	1.3	0.9	0.4	0.0	0.0	0.0	0.0	0.0	1.9	1.6	1.9
Min	1.8	1.7	1.8	1.9	1.9	1.8	1.8	2.1	2.7	0.0	0.0	0.0	0.0	3.3	2.9	2.1	1.7
Max	18.4	20.0	20.5	19.1	21.2	12.3	10.4	7.5	3.3	0.0	0.0	0.0	0.0	3.3	7.0	14.0	21.2

Note: The color scheme on the histogram is a visual aid to help view the differences in percent occurrence. Empty cells indicate where the value is precisely zero. Cells ranging from green to yellow to red indicate lower to intermediate to higher values, respectively.

Legend: Hs (ft) = wave height in feet; Dp = peak direction; deg = degree

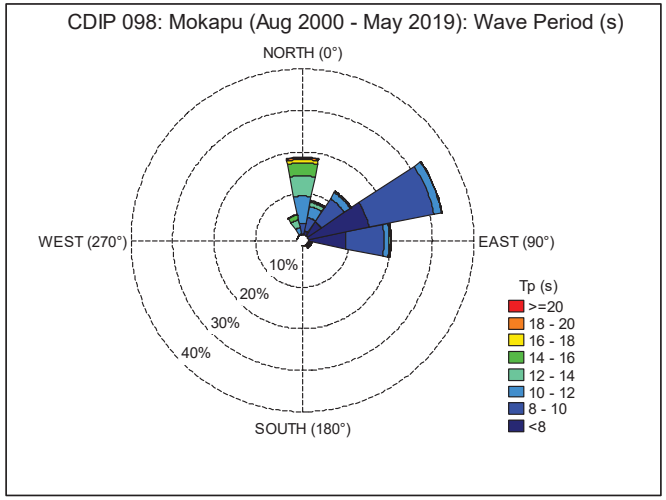


Figure 4-3 CDIP 098 wave period rose (Aug 2000 to Jan 2019)

Table 4-3 Wave period percent frequency of occurrence (Aug 2000 to Jan 2019)

Tp (s)\Dir (deg)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total
3-6	0.0	0.1	0.4	2.4	2.5	0.1	0.0	0.0								0.0	5.44
6-8	0.2	0.9	3.8	12.7	6.7	0.3	0.1	0.0								0.0	24.56
8-10	2.5	3.4	6.7	16.0	9.1	0.3	0.1	0.0								0.2	38.27
10-12	6.6	2.7	1.7	1.8	1.2	0.1	0.0	0.0								1.6	15.86
12-14	4.9	1.0	0.3	0.1	0.3	0.1	0.1	0.0	0.0					0.0	0.0	1.9	8.65
14-16	3.1	0.3	0.1	0.0	0.2	0.1	0.3	0.1	0.0						0.0	1.2	5.35
16-18	0.8	0.0	0.0	0.0	0.0	0.0	0.2	0.0								0.1	1.14
18-20	0.4	0.0	0.0			0.0	0.1	0.0								0.0	0.51
20+	0.2	0.0				0.0	0.0									0.0	0.21
Total	18.75	8.43	12.88	33.00	20.08	0.89	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.01	100.000
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Overall
Mean	12.4	10.3	8.8	8.1	8.1	9.0	14.3	13.6	14.4	0.0	0.0	0.0	0.0	13.3	14.1	12.8	9.5
StDev	2.3	2.0	1.6	1.4	1.7	2.7	3.2	2.3	1.4	0.0	0.0	0.0	0.0	0.0	0.4	1.6	2.6
Min	3.6	3.9	3.9	3.7	3.9	3.9	5.3	5.3	13.3	0.0	0.0	0.0	0.0	13.3	13.3	3.9	3.6
Max	25.0	25.0	18.2	16.7	16.7	20.0	20.0	18.2	15.4	0.0	0.0	0.0	0.0	13.3	14.3	20.0	25.0

Note: The color scheme on the histogram is a visual aid to help view the differences in percent occurrence. Empty cells indicate where the value is precisely zero. Cells ranging from green to yellow to red indicate lower to intermediate to higher values, respectively.

Legend: Hs (ft) = wave height in feet; Dp = peak direction; deg = degree

4.3.3 Extreme Deepwater Waves

Historical wave buoy data allows a statistical basis for the prediction of extreme wave events. These are infrequent, large, powerful, low probability wave events that are typically used for design purposes. For example, a 50-year return period wave event is an extreme event with a 1/50 (i.e. 2%) chance of occurring in any given year.

The extreme wave height data were used to generate a Weibull extreme value distribution for return period wave heights. The Weibull Distribution is a tool for looking at the relationship between the size of waves and how frequently they occur at a given location. Analysis requires a long-term data set with well-documented wave events. These events are sorted by size, and frequency of occurrence can be assessed by how often these events occur in the record. The relationship is logarithmic, and a linear fit can be established with a best fit linear regression of the data. Though not all wave events will be co-located on the line, its general trend represents the nature of the size and frequency relationship of wave events at a specific location.

Extreme wave height versus return period is shown in Figure 4-4 and Table 4-4. The ten largest wave events during the period of record are shown in Table 4-5.

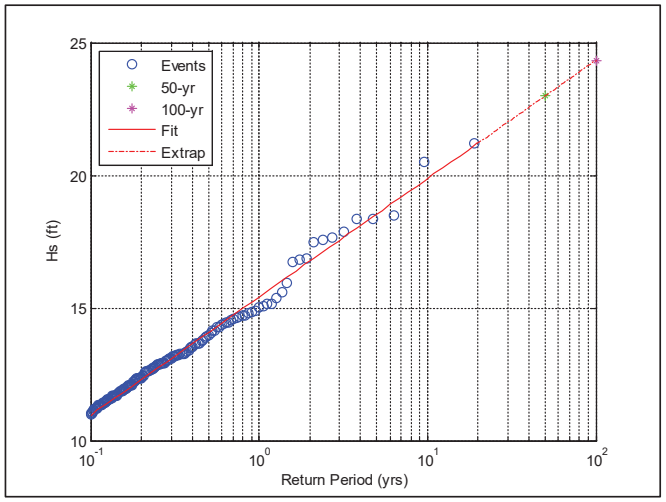


Figure 4-4 CDIP 098 return period 17-yr (Aug 2000 - Jan 2019)

Table 4-4 Return period significant wave heights at CDIP 098

Return Period (yrs)	Hs (ft)
1	15.4
2	16.8
5	18.5
10	19.9
25	21.7
50	23.0

Table 4-5 Ten largest wave events recorded at CDIP 098

Date	Hs (ft)	Tp (s)	Dp (deg)
Dec 14, 2001	21.2	12.5	87
Nov 21, 2003	20.5	16.7	37
Jan 19, 2002	18.5	11.8	62
Feb 22, 2016	18.4	18.2	1
Mar 14, 2009	18.3	14.3	10
Sep 12, 2018	17.9	11.1	85
Nov 12, 2009	17.6	13.3	28
Dec 04, 2007	17.6	16.7	355
Jan 22, 2017	17.5	10.5	15
Sep 03, 2016	16.9	14.3	81

4.3.4 Still Water Levels and Nearshore Wave Heights

During high wave conditions, the nearshore water level may be elevated above the tide level by the action of breaking waves. This water level rise, referred to as *wave setup*, could be as much as 1 to 2 feet during severe storm wave conditions. During hurricane conditions, an additional water level rise due to wind stress and reduced atmospheric pressure can occur. Collectively referred to as *storm surge*, this can potentially add another 1 to 2 feet to the still water level.

During storm or large wave conditions, there may be multiple zones of wave breaking. Wave heights are said to be *depth-limited* because once the water depth becomes shallow enough the wave breaks, losing size and energy. The wave, however, may reform before it reaches the shoreline and break again when the depth-limited ratio is again attained. The still water level rise during storm events is an important design consideration because it allows larger wave heights to reach the shoreline than during lower water levels. Estimation of still water level rise for a specific design wave event may be accomplished by traditional analytical methodology which uses bathymetry and wave heights as inputs. Still water level rise at the shoreline is a combination of astronomical tide, storm surge, and wave setup.

4.4 Marine Environment

4.4.1 Classifications

Hawaii Administrative Rules (HAR) §11-54 defines the State standards for particular parameters in Hawaii waters, and is defined by both narrative and numerical criteria. State waters are classified as either inland waters or marine waters. HAR §11-54-3 (c) defines classifications for marine waters. The water classifications within the project site are shown in Figure 4-5. The marine waters within the project site are defined as "Class AA". It is the objective of Class AA waters that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or altercation of water quality from any human-caused sources or actions. (HAR §11-54-3 (c)(1)). All marine waters are categorized as embayments, open coastal, or oceanic. The marine waters within the project site are defined as "open coastal".

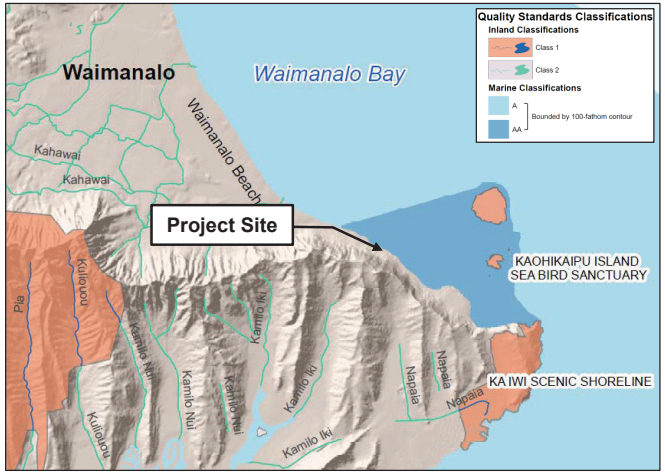


Figure 4-5 State water classifications (Hawaii Department of Health)

The National Oceanographic and Atmospheric Administration (NOAA) defines the benthic habitat offshore of the project site as a "reef flat" that is characterized by a combination of coralline algae, turf, and uncolonized reef (Figure 4-6).

The U.S. Fish and Wildlife Service classified the shoreline area as marine, intertidal, unconsolidated shore, and sand, that is regularly flooded. The nearshore waters within the fishpond are classified as marine, subtidal, unconsolidated bottom. The offshore waters are classified as marine, subtidal, coral reef (Figure 4-7).

Figure 4-6 Benthic habitat geography (PacIOOS)

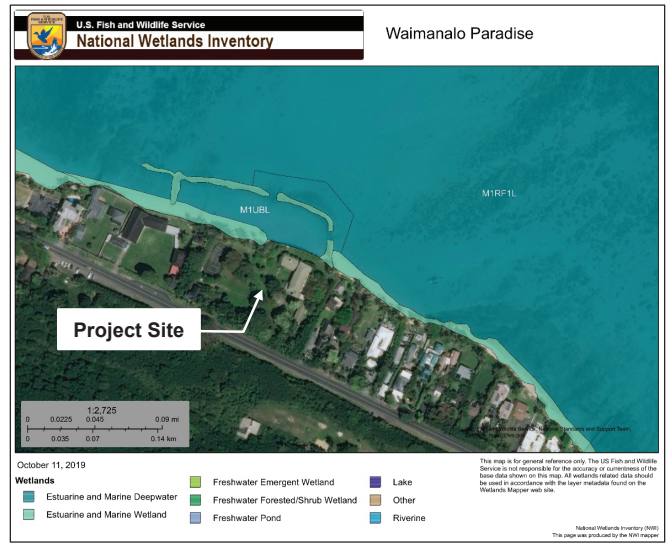


Figure 4-7 National Wetlands Inventory water classifications (USFWS)

4.4.2 Water Quality

Marine Research Consultants, Inc. (MRC) conducted field investigations to assess the physical, chemical, and biological composition of the marine environment in the vicinity of the project site. The purpose of the assessment was to provide a quantitative depiction of the existing condition of the seafloor, water chemistry, and biotic community structure of the marine environment.

In the nearshore area seaward of the seawall and within the fishpond walls, bottom composition consists of a shallow surface of coarse sand. The outer wall of the fishpond contains an opening (*makaha*) that provides a tidal channel that facilitates exchange of water between the fishpond and the open ocean. The partial isolation of the fishpond is reflected in the patterns of water chemistry distribution.

Water chemistry was assessed by collecting four linear sets of samples (i.e. transects) extending perpendicular to the shoreline, from the highest wash of waves to approximately 50 m offshore (Figure 4-8). Water quality parameters evaluated included all specific criteria designated for open coastal waters in HAR §11-54-6 (b) of the State of Hawaii Department of Health Water Quality Standards (HDOH-WQS). These criteria include: total nitrogen (TN), nitrate + nitrite nitrogen (NO3- + NO2-, hereafter referred to as NO3-), ammonium nitrogen (NH4+), total phosphorus (TP), Chlorophyll a (Chl a), turbidity, temperature, pH, and salinity. In addition, silica (Si) and orthophosphate phosphorus (PO4-3) were reported because these constituents are sensitive indicators of biological activity and the degree of groundwater mixing.

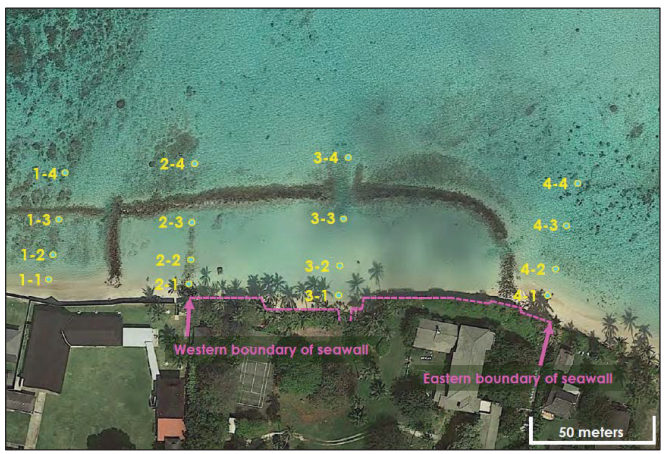


Figure 4-8 Water sampling stations and transects (MRC)

Several patterns of distribution were identified. On three of the four transects there were elevated values of several nutrient constituents at the shoreline that decreased with distance from the shoreline. The values of Si were most elevated at the shoreline of Transect 2, coupled with correspondingly low values of salinity. While less than on Transect 2, concentrations of Si near the shoreline are also elevated relative to offshore values on Transects 3 and 4, but not on Transect 1. The pattern of

elevated Si and lower salinity is indicative of freshwater entering the ocean at the shoreline. Such input of freshwater at the shoreline and retention within the fishpond is most pronounced at Transect 2 at the western boundary of the project site. At 50 meters from the shoreline, values of Si and salinity were nearly identical at all four transects, indicating that at this distance from the shoreline, all groundwater entering the ocean at the shoreline is mixed to background coastal ocean levels.

The concentrations of NO3-, NH4+, and TN on all transects showed a general trend of elevated values at the shoreline with decreasing concentrations moving seaward. This trend was most apparent at Transect 4, and least evident on Transect 1. As there is depressed salinity in the nearshore waters of all four transects, the source of these elevated nutrients is likely from groundwater input at the shoreline.

Considering physical properties of the water column, turbidity, Chl a, temperature, dissolved oxygen, and pH all display similar patterns, with peak values at the shoreline, and decreasing values with distance seaward. At the shoreline, the values of all of these physical properties were highest at Transect 2, located at the western boundary of the Property.

On all four transects, several measurements of ammonia nitrogen (NH4+) exceeded the 10% limits. As discussed above, the elevated concentrations of dissolved nutrients near the shoreline are likely a result of mixing of groundwater with ocean water. As the water quality standards do not take into account such natural mixing, and nutrient concentrations of all offshore samples are within the HDOH-WQS limits, it appears that the waters within the project site do not exceed water quality standards.

Values of turbidity at the shoreline of Transects 1, 2 and 4 exceeded HDOH limits. The elevated turbidity near the shoreline is likely a result of resuspension of the fine-grained sediment that comprises the floor of the fishpond. Concentrations of TP and Chlorophyll a did not exceed HDOH limits at any of the sampling sites.

Overall, with the exceptions described above, most of the waters within the project site are close to or below the specific criteria of the HDOH water quality standards. While these conclusions are based on a single sample set, water quality within the project site represents typical marine settings in Hawaii with no indication of any contamination from activities on land.

4.4.3 Biotic Community

The nearshore marine environment fronting the seawall is composed of several distinct habitats, defined by both physical and biotic composition. Biotic community structure of the marine environment was assessed by investigators swimming throughout the area from the shoreline to approximately 50 m offshore at each of the survey transects shown in Figure 4-8.

The most shoreward region of the marine habitat is bounded by a concrete seawall that extends the length of the project site. The base of the seawall and intertidal area consists of rocks and boulders that form a band extending 1 to 2 m offshore. No corals or other attached macrofauna were observed on the submerged seawall or boulder base. Schools of juvenile convict tangs (*Acanthurus triostegus*) were observed in the shallow rocky area along the base of the seawall.

Seaward of the shoreline, two structures occur on the sand floor of the fishpond. These consist of a square concrete block and a submerged boulder finger that extends perpendicular to the shoreline. No corals were observed on the submerged portions of the concrete block and no fish or other vertebrates were observed around the block. The boulders comprising the finger that extends off the seawall, as well as the boulders that form the inner margins of the fishpond are similar in biotic composition. The

most common corals colonizing the boulders are *Montipora capitata*, *Porites lobata*, *P. lutea*, *Pocillopora meandrina* and *P. damicornis*. None of these corals covered large expanses of the walls, and generally existed as isolated colonies. Other macroinvertebrates observed in this area were the sea urchins *Echinometra mathaei* and *Tripneustes gratilla*, the black-lipped pearl oyster *Pinctada margaritifera*, the sea cucumber *Holothuria atra*, and a single octopus (*Octopus sp.*). None of these invertebrates were abundant. The boulder walls provided sheltered habitat for a number of fish species. The most abundant species inside the fishpond were the convict tang (*Acanthurus triostegus*), goatfish (*Mulloidichthys flavolineatus*, *M. vanicolensis*) and the damselfish (*Dasyllus albisella*). Other genera of reef fish that were observed within the fishpond included several butterflyfish, wrasses, and triggerfish. The floor of the fishpond consisted of a white sand surface with areas of concentrated shell fragments and other debris. No seagrass was observed on the sand floor, although some green algae were noted, primarily of the genus *Caulerpa*.

The open ocean marine habitat outside the fishpond consisted of a shallow sand bottom interspersed with patches of coral rock. On the eastern side of the fishpond wall, large spherical colonies of *Montipora capitata* were interspersed over the bottom. Many of these colonies were up to two meters in diameter indicating they were decades old. The size of these colonies indicates that they have survived recent El Niño-induced bleaching events and other episodic instances of environmental stress. These large colonies were less common off the central part of the fishpond wall.

The marine community structure on the western side of the fishpond was substantially different than off the central region. Large coral colonies were very abundant, consisting primarily of spherical growth forms of *Porites* and *Montipora*. The difference in density of corals between the west and central areas outside of the fishpond was evident in the higher cover of dark areas. The probable reason for the higher cover to the west of the fishpond is increased protection from tradewind waves that arrive at the shoreline from the northeast. No seagrass was observed outside the fishpond, and benthic macroalgae was not present in significant amounts. Sea urchins and other motile macrobenthos were also scarce outside the fishpond. Species of fish that were noted only outside the fishpond included several surgeonfish (*Acanthurus xanthopterus*, *A. unicornis*, and *Naso unicornis*).

Several species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly throughout the Hawaiian Islands and is frequently observed in the nearshore areas of Oahu. The endangered hawksbill turtle (*Eretmochelys imbricata*) is not frequently observed in Hawaiian waters. No sea turtles were observed within the survey area, although they undoubtedly occur in the area. Populations of the endangered humpback whale (*Megaptera novaeangliae*) winter in the Hawaiian Islands from December to April. While the present survey was conducted in August when whales are absent from Hawaiian waters, the survey area is not conducive to whale habitation owing to shallow depth and lack of access across the outer reef. The Hawaiian monk seal (*Monachus schauinslandi*) is an endangered earless seal that is endemic to the waters off the Hawaiian Islands. Monk seals commonly haul out of the water onto sandy beaches to rest. No seals were observed during the survey.

In summary, the marine communities within the project site do not represent any rare or unique components. Within the inner boundaries of the fishpond, corals occur, although there are no expansive areas of colonization, nor are any of the species considered rare. Outside the fishpond, and particularly off the western boundary, coral communities are well developed, consisting of large colonies that are at least several decades old. No seagrass is present within, or outside, the fishpond.

5. COASTAL HAZARDS

The project site is located in Waimanalo Bay on the southeast coast of Oahu. The shoreline is northeast facing and exposed to a range of hazards including but not limited to tsunamis, hurricanes, erosion, and sea level rise. Figure 5-1 summarizes hazard exposure along the Waimanalo coastline. Table 5-1 summarizes hazard exposure at the project site. The Overall Hazard Assessment (OHA) within the vicinity of the project site is *high* (Fletcher et.al., 2004).

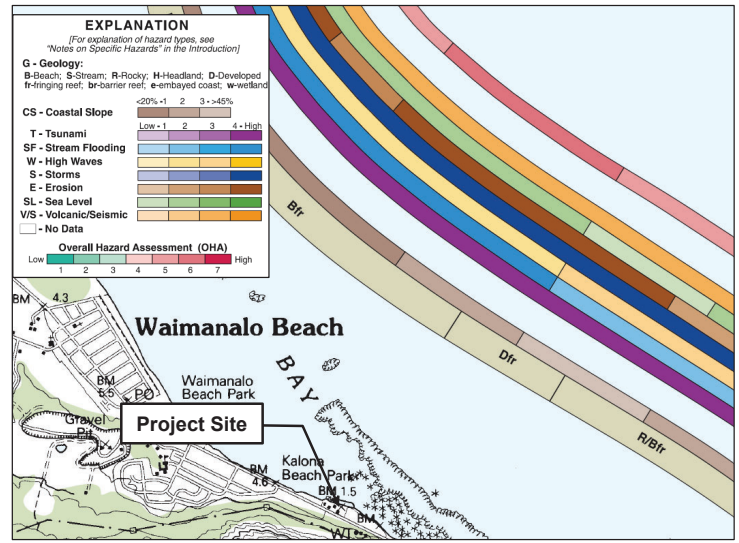


Figure 5-1 Overall Hazard Assessment for Waimanalo, Oahu, Hawaii

(adapted from Fletcher et.al., 2004)

Table 5-1 Overall Hazard Assessment for the project site

Category	Rating
Geology	Developed / Fringing Reef / Beach
Coastal Slope	(2) >20% and <45%
Tsunami	(4) High
Stream Flooding	(3) High
High Waves	(3) Moderate-High
Storms	(4) High
Erosion	(4) High
Sea Level	(2) Low
Volcanic / Seismic	(3) Moderate-High
Overall Hazard Assessment	(6) High

5.1 Coastal Flooding

FEMA administers the National Flood Insurance Program (NFIP) and maintains Flood Insurance Rate Maps (FIRM) for use in determining Base Flood Elevations (BFE). Local floodplain managers work with permitting agencies to incorporate BFE data into building codes, establishing guidelines for safe building in flood prone regions. The project site is identified on FIRM Panel 15003C0385G and is located in a Special Flood Hazard Area (SFHA), which is subject to inundation by the 1% annual chance flood. The seaward portion of the project site is located in Zone VE with a BFE of 13 feet. The landward portion of the project site is located in Zone AE with a BFE of 13 feet, and Zone D where flood hazards are undetermined, but flooding is possible.

5.2 Hurricane Waves

The Hawaiian Islands are annually exposed to severe storms and storm waves generated by passing low-pressure systems (Kona storms) and tropical cyclonic storms (hurricanes). Kona storms occur when the winter low pressure systems that travel across the North Pacific Ocean dip south and approach the islands. Strong southerly and southwesterly winds generated by these storms result in large waves on exposed shorelines, and often heavy rains. Hurricanes, the worst-case tropical cyclones, are caused by intense low-pressure vortices that are usually spawned in the eastern tropical Pacific Ocean and travel westward.

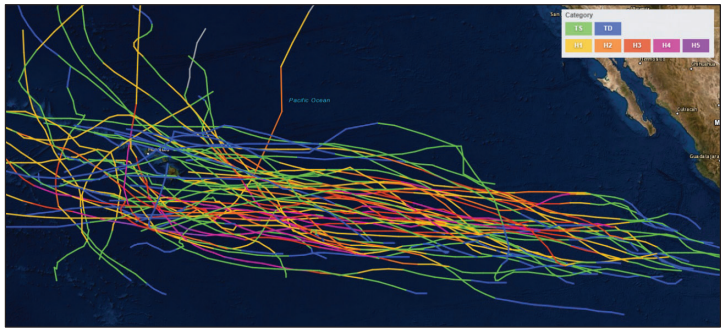


Figure 5-2 Central Pacific historical hurricane tracks (1949 to 2018)

While it is not uncommon for hurricanes to head towards Hawaii after generating in the east or central Pacific, they often change course or deteriorate by the time they reach Hawaiian waters. Figure 5-2 shows the historical tracks of hurricanes in the central Pacific from 1949 to 2018. While direct hits are rare, hurricane passage north or south of the Hawaiian Islands is not infrequent and can generate large, dangerous waves that can affect the coastlines of all islands. When hurricanes travel in a relatively straight path, the strong winds of the storm are continuously adding energy to waves traveling in the same direction as the storm in a phenomenon known a *capture fetch*. If the storm deteriorates or changes course, the waves generated continue to propagate in the direction they were generated. The historical tracks of hurricanes that have passed with in the vicinity of the Hawaiian Islands from 1948 to 2018 are shown in Figure 5-3, and the tracks of tropical storms and tropical depressions that have passed in the vicinity of Hawaii are shown in Figure 5-4.

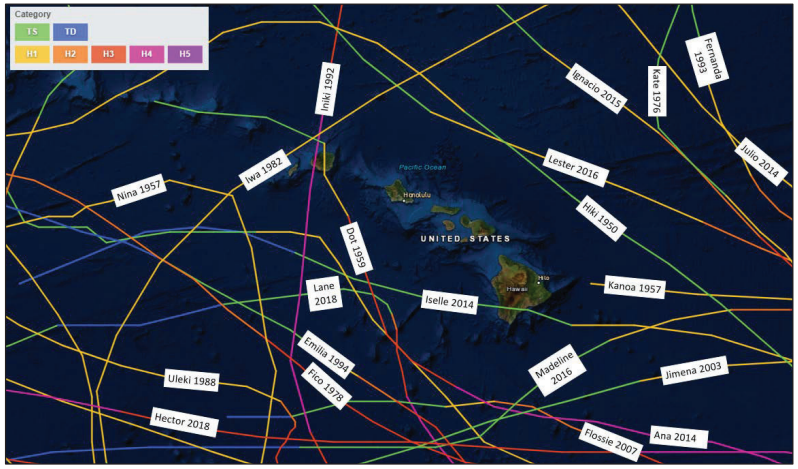


Figure 5-3 Hawaii historical hurricane tracks (1949 to 2018)

Figure 5-4 Hawaii historical tropical storms and depressions (1949 to 2018)

The most recent historical hurricanes that caused significant damage in Hawaii were Hurricane Iniki (1992) and Hurricane Iwa (1982). Hurricanes Iniki and Iwa have been well-studied, and the characteristics of these storms were significantly different. Hurricane Iwa was not as intense as Hurricane Iniki near the Hawaiian Islands, with less pressure differential and lower wind speeds, but it had a much larger horizontal dimension, with an estimated radius of maximum wind of 51 nautical miles (nm) compared to 13 nm for Hurricane Iniki.

Hurricane Iniki passed directly over and Hurricane Iwa passed within 30 miles of the island of Kauai. Hurricane Iniki approached Kauai from the south and was physically small but intense when it made landfall. Hurricane Iwa approached Kauai from the southwest and was a physically large Category 1 hurricane when it passed northwest of the island with maximum sustained wind speeds of 80 knots (92 mph). While Hurricane Iwa was a Category 1 event throughout its life near the Hawaiian Islands, Hurricane Iniki approached as a Category 4 and reverted to Category 3 just prior to making landfall on Kauai with maximum sustained wind speeds of 116 knots (113 mph). Wave heights, coastal inundation, and damage on Oahu's south shore were reported to be similar for both Hurricane Iwa and Hurricane Iniki, with waves on the order of 30 ft in height reported for both storms.

The 2014 hurricane season was notable for the passage of three hurricanes near the islands, with one (Hurricane Iselle) making landfall on August 7 on the east shore of Hawaii Island as a tropical storm with winds of 70 mph. A few days later, Hurricane Julio passed north of the Hawaiian Islands as a tropical storm, causing little damage. Hurricane Ana passed south of the Hawaiian Islands in October and caused little damage, although large waves were recorded on the south shore of Oahu.

The 2015 hurricane season was the second most active Pacific hurricane season on record behind the 1992 season (Hickey 2016). In August 2015, Hurricanes Kilo, Ignacio, and Jimena had sustained winds between 130 to 140 mph. This was the first time in history that there were three Category 4 hurricanes east of the International Date Line (National Hurricane Center 2015). Radar imagery from this event are show in Figure 5-5. Although these hurricanes resulted in little damage on Oahu, minor changes in the 2014-2015 storm tracks could have resulted in very different outcomes, and they serve as reminders of Hawaii's vulnerability. Hurricane Lane, in 2018, resulted in a hurricane warning forecasting potential landfall on Oahu's south shore. The stormed stalled west of Hawaii Island and rapidly dissipated but still caused damage across the eastern half of the state. Satellite imagery of Hurricane Lane's approach to Hawaii is shown in Figure 5-6.

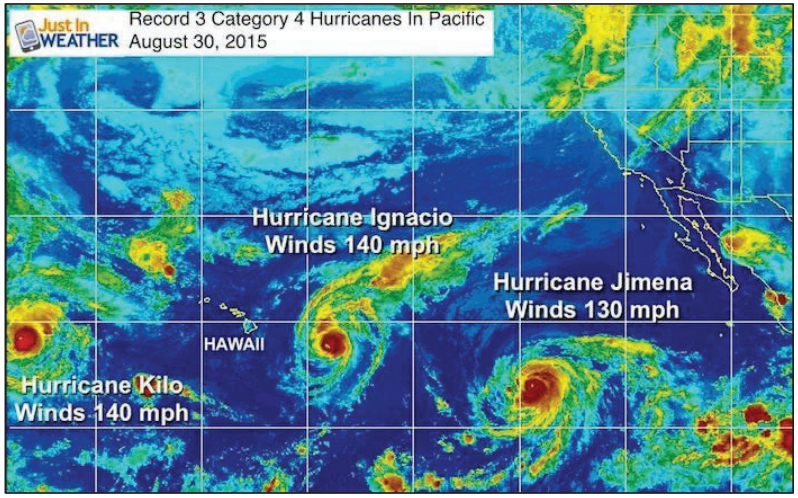


Figure 5-5 Radar image of three Category 4 hurricanes in the Pacific (August 2015).

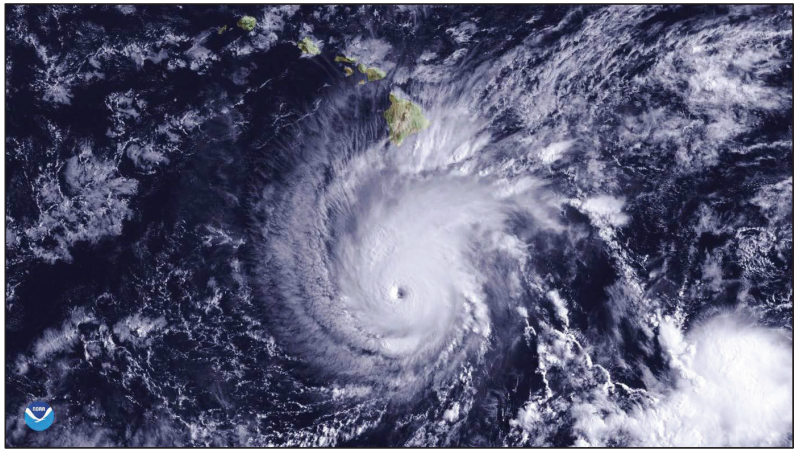
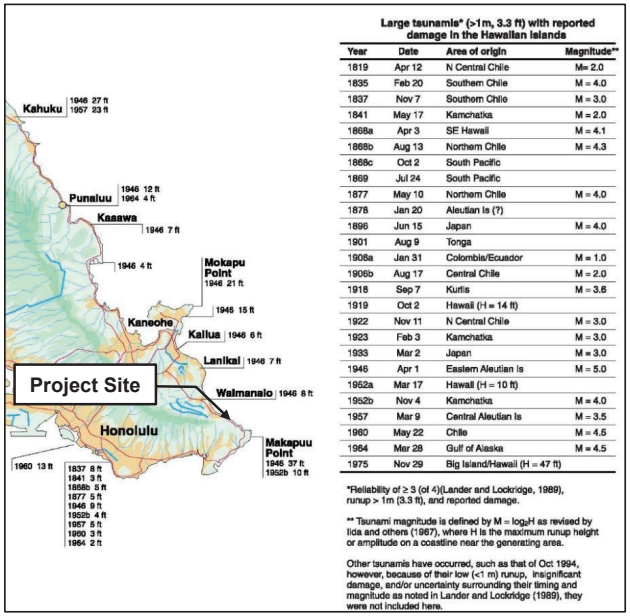


Figure 5-6 Satellite image of Hurricane Lane approaching Hawaii (August 2018).

5.3 Tsunami

Tsunami are sea waves that result from large-scale seafloor displacements. They are most commonly caused by an earthquake (magnitude 7.0 or greater) adjacent to or under the ocean. If the earthquake involves a large segment of land that displaces a large volume of water, the water will travel outwards in a series of waves, each of which extends from the ocean surface to the sea floor where the earthquake originated. In deep water, tsunami waves may only be a foot or so high, but they can have wave lengths of hundreds of miles and travel at 500 miles per hour. As they approach shore, the waves begin to shoal; slowing and increasing significantly in height. The water then recedes, also at considerable speed, and the recession often causes as much damage as the original wave front itself.

Most tsunamis in Hawaii originate from the tectonically active areas located around the Pacific Rim (e.g., Alaska and Chile). Waves originating with earthquakes in these areas take hours to reach Hawaii, and the network of sensors that is part of the Pacific tsunami warning system can give Hawaii several hours advance warning of tsunami from these locations. Less commonly, tsunamis originate from seismic activity in the Hawaiian Islands, and there is much less advance warning for these. The 1975 Halape earthquake (magnitude 7.2) produced a wave that reached Oahu in less than a half hour, for example. The history of tsunamis on the Island of Oahu is shown in Figure 5-7 (Fletcher, et. al., 2004).



Large tsunamis* (>1m, 3.3 ft) with reported damage in the Hawaiian Islands

Year	Date	Area of origin	Magnitude**
1819	Apr 12	N Central Chile	M= 2.0
1835	Feb 20	Southern Chile	M = 4.0
1837	Nov 7	Southern Chile	M = 3.0
1841	May 17	Kamchatka	M = 2.0
1868a	Apr 3	SE Hawaii	M = 4.1
1868b	Aug 13	Northern Chile	M = 4.3
1868c	Oct 2	South Pacific	
1869	Jul 24	South Pacific	
1877	May 10	Northern Chile	M = 4.0
1878	Jan 20	Aleutian Is (?)	
1896	Jun 15	Japan	M = 4.0
1901	Aug 9	Tonga	
1906a	Jan 31	Colombia/Ecuador	M = 1.0
1906b	Aug 17	Central Chile	M = 2.0
1918	Sep 7	Kurlis	M = 3.6
1919	Oct 2	Hawaii (H = 14 ft)	
1922	Nov 11	N Central Chile	M = 3.0
1923	Feb 3	Kamchatka	M = 3.0
1933	Mar 2	Japan	M = 3.0
1946	Apr 1	Eastern Aleutian Is	M = 5.0
1952a	Mar 17	Hawaii (H = 10 ft)	
1952b	Nov 4	Kamchatka	M = 4.0
1957	Mar 9	Central Aleutian Is	M = 3.5
1960	May 22	Chile	M = 4.5
1964	Mar 28	Gulf of Alaska	M = 4.5
1975	Nov 29	Big Island/Hawaii (H = 47 ft)	

*Reliability of ≥ 3 (of 4)(Lander and Lockridge, 1989), runup > 1m (3.3 ft), and reported damage.

** Tsunami magnitude is defined by $M = \log_2 H$ as revised by Iida and others (1967), where H is the maximum runup height or amplitude on a coastline near the generating area.

Other tsunamis have occurred, such as that of Oct 1994, however, because of their low (<1 m) runup, insignificant damage, and/or uncertainty surrounding their timing and magnitude as noted in Lander and Lockridge (1989), they were not included here.

Figure 5-7 History of tsunamis on the Island of Oahu

(*adapted from Fletcher et.al., 2004*)

Fletcher, et al. (2004) report that 10 of the 26 tsunamis with flood elevations greater than 3.3 feet (1 m) that have made landfall in the Hawaiian Islands during recorded history have had "significant damaging effects on Oahu". This means that, on average, one damaging tsunami reaches Oahu every 19 years. The recent record (1946 to the present) has seen four tsunami cause damage on Oahu, a rate that is very close to the longer-term average. In view of this, the U.S. Geological Survey (Fletcher, et al., 2004) has given the project coastal zone a high (4) tsunami hazard assessment. Waimanalo was inundated by the 1946 tsunami to an elevation of +8 feet mean sea level (msl) (Loomis, 1976), while inundating to elevation +37 feet msl at nearby Makapuu. This tsunami produced the only inundation data for the Waimanalo area.

The authority for the FIS is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The original FIS was completed by R.M. Towill Corporation in 1979 for tsunami flooding, and subsequently incorporated into the NFIP.

Tsunami flooding for the present project was calculated using *the Manual for Determining Tsunami Runup Profiles on Coastal Areas of Hawaii*, prepared for the Department of the Army by M&E Pacific, Inc. in August 1978. This methodology utilizes the recurrence intervals agreed upon at the Tsunami Conference held on February 23, 1977.

The project site is located near calculation point 51, which is located between Kaiona Beach Park and Kaupo Beach Park. The project site is located at the point where the coastal topography begins to change significantly, rising quickly in the Makapuu direction, and this can be seen in the calculation coefficients. Calculation point 51 gives a representative assessment of the project site.

The methodology calculates the inundation water level 200 feet inland of the shoreline. For initial planning purposes, the calculated inundation elevation can be considered to be the tsunami crest elevation within the project site. The calculated tsunami inundation elevations for a range of tsunamis are shown in Table 5-2.

Table 5-2 Tsunami return-period inundation elevations

Return period (years)	Inundation elevation above msl (feet)
10	1.0
25	5.4
50	8.7
75	10.6
100	12.0

The calculations produce estimated tsunami inundation elevations of 1.0 to 8.7 feet above msl during the 50-year planning horizon of this project. The *N*-year Return Period tsunami is defined as the tsunami that has a probability of 1/N of occurring in any given year. For example, the 10-year return period tsunami has a 1/10 chance (10%) and the 50-year return period tsunami has a 1/50 chance (2%) of occurrence in any given year. The inundation elevation for the 100-year tsunami is generally consistent with the 13-foot base flood elevation (BFE) determined by the FIS, should that tsunami occur this year. These calculations, however, were made using a methodology that does not account for sea level rise.

6. SHORELINE CHANGE

6.1 Historical Shoreline Change (1911 to 2005)

The University of Hawaii Coastal Geology Group (CGG) has undertaken historical analysis of Oahu's shoreline and produced a shoreline change map for the Waimanalo region based on historical surveys and aerial photographs from 1911 to 2005. The CGG analysis employed a weighted linear regression methodology to provide a best fit for a long-term shoreline change trend.

Figure 6-1 shows the regional analysis for Waimanalo Bay and indicates a general accretion trend in the middle sector of the bay, with an erosional trend in the eastern portion of the bay, which includes the project site. The analysis results for the project site shoreline is presented as Transects 357 through 363 on the CGG erosion map (Figure 6-2). The CGG analysis determined that the dominant historical shoreline change trend for the project site has been erosion at an average annual rate of 0.59 feet/year. While this rate is representative of the average, smoothed, long-term trend for the project site from 1911 to 2005, it does not account for fluctuations in beach width that may have occurred since 2005.

The CGG analysis was designed to measure changes in the active coastal profile, which is defined as the area that extends from the base of the foreshore to a fixed landward boundary. The CGG analysis used the beach toe, or base of the foreshore, as a geomorphic proxy for the low water mark, which is defined as the "shoreline" (Romine et.al., 2009). The CGG analysis measures changes in the position of the shoreline over time but those changes are not necessarily correlated with changes that have occurred or may occur landward of the active coastal profile. At the project site, the seawall represents a fixed landward boundary that separates the terrestrial area from the active coastal profile. Thus, the historical shoreline change trend may not be an accurate indicator of historical or future shoreline change at the project site. The seawall creates a physical boundary between the terrestrial and marine environments. The seawall protects the terrestrial area from erosion and there is no expectation of terrestrial erosion while the seawall is serviceable.

6.2 Modern Shoreline Change and Sediment Transport Rates (1996 to 2005)

To analyze the more recent historical shoreline change trends in the Waimanalo area, SEI used the CGG data to produce shoreline change maps for the more recent time period of 1996 to 2005 as part of the U.S. Army Corps of Engineer's Regional Sediment Management Plan for Southeast Oahu (2009). In addition to the updated shoreline change trends (1996 to 2005), the analysis included a sediment trend analysis and regional sediment budget calculations. Volumetric change for the active littoral region was coupled with long-term wave and wind climate and regional shoreline change analysis to develop sediment budgets for the region. The updated analysis did not revise the shoreline change trends for the project site but does provide insights into shoreline change and sediment transport dynamics in the vicinity of the project site.

Figure 6-3 shows the modern shoreline change trends (1996 to 2005) and sediment transport rates for the Kaiona Beach sector, which extends 1.6 miles northwest of the project site. Figure 6-4 shows the modern shoreline change trends (1996 to 2005) and sediment transport rates for the Kaupo Beach sector, which extends 1.2 miles south of the project site. The long-term shoreline change maps show that much of the Waimanalo shoreline has historically accreted, with the exception of Kaiona Beach Park, which shows erosion. However, the more recent trend indicates the opposite; erosion throughout most of Waimanalo Bay, with accretion at Kaiona Beach Park immediately north of the project site (Figure 6-3). The analysis also indicates that recent shoreline change east of the project site varies between accretion and erosion (Figure 6-4).

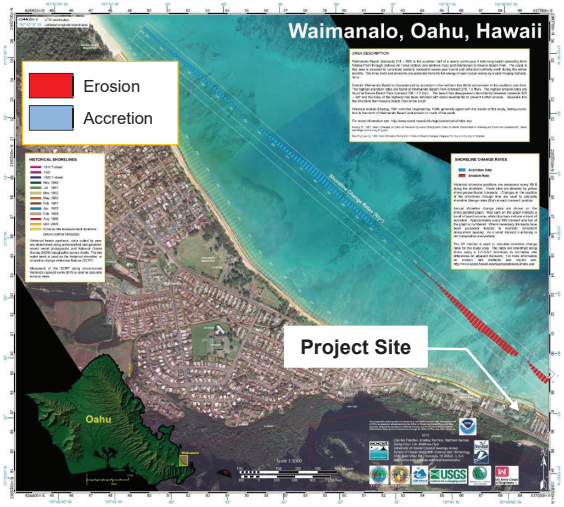


Figure 6-1 CGG historical shoreline change rates (1911 to 2005)

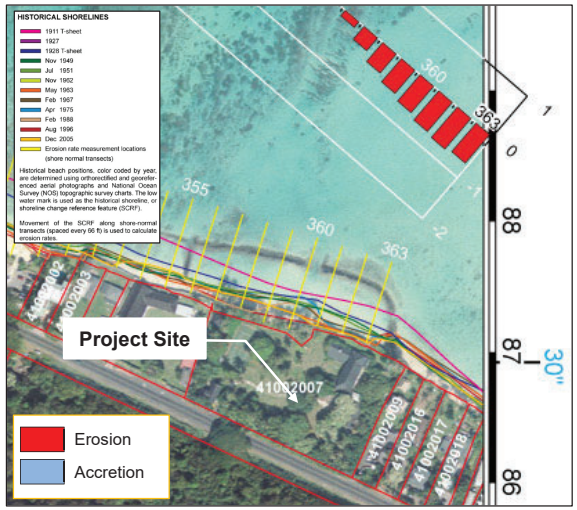


Figure 6-2 CGG historical shoreline change rates (1911 to 2005)

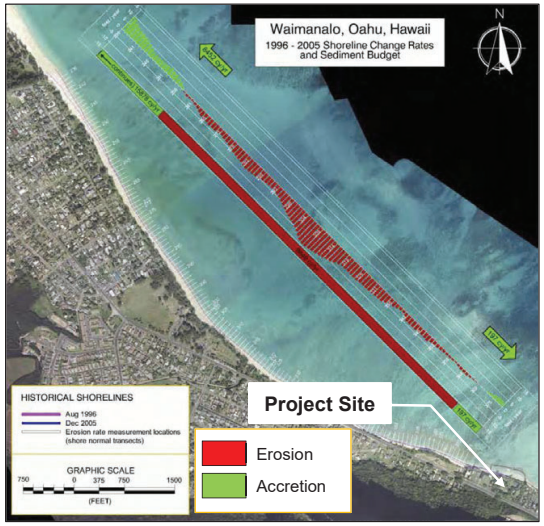


Figure 6-3 Kaiona Beach shoreline change and sediment budget (1996 to 2005)

(*U.S. Army Corps of Engineers, 2009*)

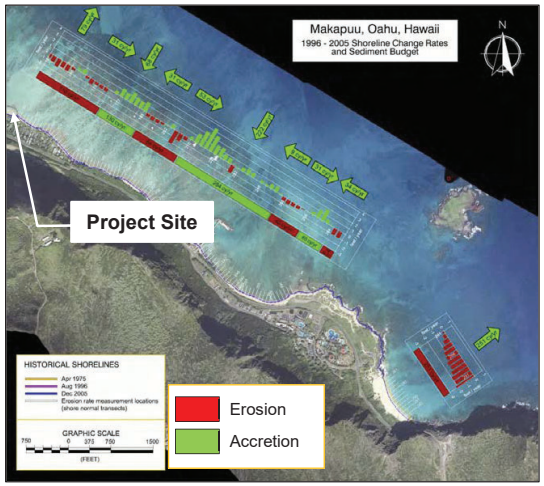


Figure 6-4 Kaupo Beach shoreline change and sediment budget (1996 to 2005)

(*U.S. Army Corps of Engineers, 2009*)

7. SEA LEVEL RISE

7.1 Projections

The present rate of global mean sea level change is +3.4 ± 0.4 mm/yr (NOAA, 2017), where a positive number represents a rising sea level. Sea level rise appears to be accelerating compared to the mean of the 20th Century. Factors contributing to the rise in sea level include decreased global ice volume and thermal expansion of the ocean. The relative sea level trend for Honolulu Harbor for the period of 1905 to present is shown in Figure 7-1 (NOAA, 2019). The rate of sea level change is shown in the figure as being +1.41 ± 0.21 mm/yr based on monthly data for the period 1905 to present. Figure 7-1 also shows interannual anomalies exceeding 0.5 feet (15 cm) in Honolulu Harbor.

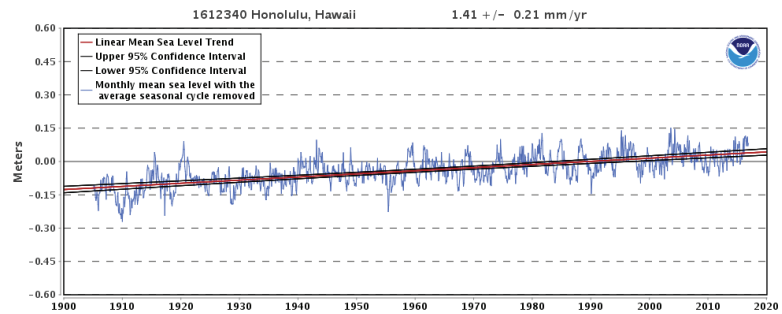


Figure 7-1 Mean sea level trend, Honolulu Harbor, 1905 to present (NOAA)

NOAA recently revised their sea level change projections through 2100, taking into account current scientific research and measurements. NOAA is projecting that global sea level rise as shown by their *Extreme* scenario could be as high as 8.2 feet by 2100. NOAA (2017) also identifies specific regions that are susceptible to a greater-than-average rise in sea level. Hawaii thus far has seen a rate of sea level rise less than the global average; however, this is expected to change. Hawaii is in the "far field" of the effects of melting land ice. This means that those effects have been significantly less in Hawaii compared to areas nearer to the ice melt. Over the next few decades, this effect will spread to Hawaii, which is projected to experience sea level rise greater than the global average.

Table 7-1 shows NOAA's most recent global mean sea level rise scenarios, while Table 7-2 and Figure 7-2 present estimates of Hawaii's mean sea level rise scenarios based on the revised NOAA projections, taking into account the far field effects. While the projections are based on the most current scientific models and measurements, discretion is necessary in selecting the appropriate scenario. Selecting the appropriate sea level rise projections is a function of many parameters, including but not limited to existing uses and site conditions, presence and type(s) of infrastructure, design life, potential for resilience, and socioeconomic value.

Table 7-1 Global mean sea level rise scenarios (NOAA, 2017)

Scenario (feet)	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
Low	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Intermediate-Low	0.1	0.3	0.4	0.6	0.8	1.0	1.1	1.3	1.5	1.6
Intermediate	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.3	2.8	3.3
Intermediate-High	0.2	0.3	0.6	1.0	1.4	2.0	2.6	3.3	3.9	4.9
High	0.2	0.4	0.7	1.2	1.8	2.5	3.3	4.3	5.6	6.6
Extreme	0.2	0.4	0.8	1.3	2.1	3.0	3.9	5.2	6.6	8.2

Table 7-2 Hawaii local mean sea level rise scenarios (adapted from NOAA, 2017)

Scenario (feet)	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
Low	0.1	0.2	0.3	0.5	0.6	0.7	0.9	1.0	1.2	1.3
Intermediate-Low	0.1	0.3	0.5	0.7	0.9	1.1	1.4	1.6	1.9	2.1
Intermediate	0.1	0.4	0.6	1.0	1.3	1.8	2.3	2.9	3.5	4.2
Intermediate-High	0.2	0.4	0.7	1.1	1.7	2.4	3.2	4.1	5.0	6.3
High	0.2	0.4	0.8	1.4	2.1	3.0	4.0	5.3	7.0	8.4
Extreme	0.2	0.4	0.9	1.6	2.4	3.5	4.8	6.5	8.3	10.5

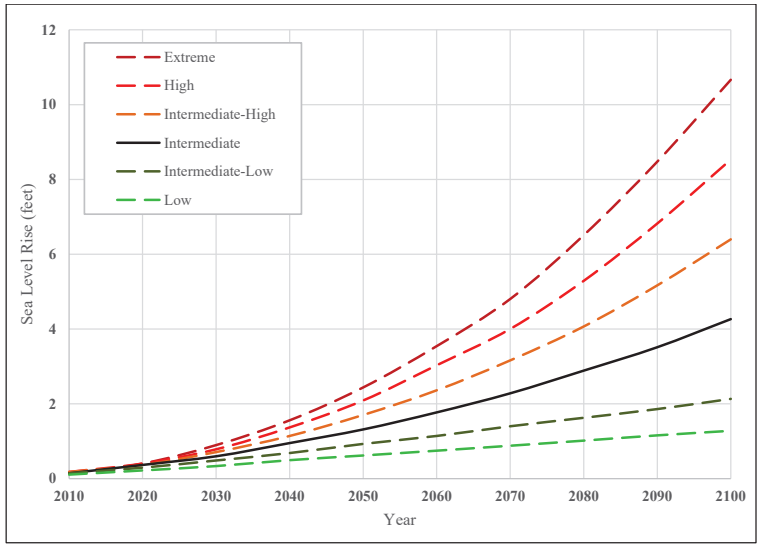


Figure 7-2 Hawaii local mean sea level rise projections (adapted from NOAA, 2017)

SEI participated in the Hawaiian Islands and Affiliated Pacific Islands regional climate assessment team, which contributed to the *4th National Climate Assessment (2018)*. The consensus from the regional team, which included representatives from NOAA, USGS, and UH, was that the NOAA *Intermediate-High* scenario projections are recommended for planning purposes in Hawaii. The *Intermediate-High* scenario projects that sea level in Hawaii will rise 1.7 feet by the year 2050, 3.2 feet by the year 2070, and 6.3 feet by the year 2100 (Table 7-2 and Figure 7-2).

The State of Hawaii recently published the *Sea Level Rise Vulnerability and Adaptation Report for Hawaii (2017)*, which discusses the anticipated impacts of projected future sea level rise on coastal hazards, and the potential physical, economic, social, environmental, and cultural impacts of sea level rise in Hawaii (State of Hawaii, 2017). A key recommendation of the report was that 3.2 feet of sea level rise should be adopted as a statewide vulnerability zone for planning purposes.

The planning horizon for the project site is 50 years, which corresponds with the NOAA *Intermediate-High* scenario projection of 3.2 feet of sea level rise by 2070. Planning for 3.2 feet of sea level is consistent with the recommendations from the *4th National Climate Assessment (2018)* and *Hawaii Sea Level Rise Vulnerability and Adaptation Report for Hawaii (2017).*

7.2 Inundation Scenarios

The previous sections discussed the potential effects of coastal hazards on the Property, which is primarily exposed to hurricane and tsunami inundation but is not currently vulnerable to erosion due to the presence of the seawall. The BFEs presented by FEMA include an additional 3 feet of freeboard to account for future sea level rise. In a similar manner, sea level rise can be included in the hurricane and tsunami inundation calculations for a chosen sea level rise scenario. While an in-depth study including numerical modeling would be required to produce more detailed inundation data, it is sufficient for this level of planning to treat the components as additive to estimate future inundation. For example, model hurricane runup elevation was presented in Table 7-3 to be 9.2 feet, with no consideration of sea level rise. With 2 feet of sea level rise, it is reasonable to expect runup elevation to exceed 11 feet based on current msl. The estimated inundation over the planning timeframe are presented Table 7-3.

Table 7-3 Inundation scenarios including sea level rise

	Planning horizons / inundation elevations (feet msl)			
Inundation Event	**Present** (+0.0)	**2030** (+0.6)	**2050** (+1.3)	**2070** (+2.3)
Model hurricane	9.2	9.8	10.5	11.5
Extreme hurricane	10.9	11.5	12.2	13.2
10-yr tsunami	1.0	1.6	2.3	3.3
25-yr tsunami	5.4	6.0	6.7	7.7
50-yr tsunami	8.7	9.3	10.0	11.0

7.3 Projected Impacts

Sea level rise has the potential to impact beaches and shorelines in Hawaii. Impacts may include beach narrowing and beach loss, loss of land due to erosion, and infrastructure damage due to inundation and flooding. Anderson et.al. (2015) found that, due to increasing sea level rise, average shoreline recession (erosion) in Hawaii is expected to be nearly twice the historical extrapolation by the year 2050, and nearly 2.5 times the historical extrapolation by the year 2100. The impacts from anomalous sea level events (e.g., king tides, mesoscale eddies, storm surge) are also likely to increase.

The State of Hawaii *Sea Level Rise Vulnerability and Adaptation Report for Hawaii (2017)* discusses the anticipated impacts of projected future sea level rise on coastal hazards, and the potential physical, economic, social, environmental, and cultural impacts of sea level rise in Hawaii (State of Hawaii, 2018). A key component of the report was a numerical modeling effort by the University of Hawaii (UH) to estimate the potential impacts of a 3.2-foot rise in sea level.

UH used the most current available information on climate change and sea level rise from the Intergovernmental Panel on Climate Change (IPCC) Assessment Report 5 (AR5). The UH numerical modeling is based on the upper end of the IPCC AR5 representative concentration pathway (RCP) 8.5 sea level rise scenario, which predicts up to 3.2 feet of global sea level rise by the year 2100. However, based on recent peer-reviewed publications, it is possible that sea level rise could be significantly greater than the RCP 8.5 sea level rise scenario by the end of this century. Sweet et al. (2017) suggest that global mean sea level rise in the range of 6.4 feet to 8.8 feet is physically plausible by the end of this century, which is significantly higher than the worst-case IPCC AR5 projections.

UH modeled the potential impacts that a 3.2-foot rise in sea level would have on coastal hazards including passive flooding, annual high wave flooding, and coastal erosion. The footprint of these three hazards were combined to define the projected extent of chronic flooding due to sea level rise, referred to as the *sea level rise exposure area (SLR-XA)*. Flooding in the SLR-XA is associated with long-term, chronic hazards punctuated by annual or more frequent flooding events. The UH model results are presented in Figure 7-3 through Figure 7-6.

Figure 7-3 depicts the potential for passive flooding with 3.2 feet of sea level rise. Passive flooding includes areas that are hydrologically connected to the ocean (marine flooding) and low-lying areas that are not hydrologically connected to the ocean (groundwater). The model projects no passive flooding on the project site with 3.2 feet of sea level rise.

Figure 7-4 depicts the potential for annual high wave flooding with 3.2 feet of sea level rise. The annual high wave flooding model propagates the maximum annually recurring wave, calculated from historical wave buoy data, over the reef and to the shore along 1-dimensional cross-shore profiles extracted from a 1-meter digital elevation model. The model depicts the spatial extent of inundation that is greater than 10cm in depth.

Figure 7-5 depicts the estimated area that could be exposed to erosion with 0.5 to 3.2 feet of sea level rise. The results of the erosion model represent the combined results of measured, historical erosion rates and the compounding impacts of projected higher water levels associated with projected sea level rise. The erosion model results are a useful tool for considering the potential impacts of erosion at the island or community level; however, there are certain assumptions, limitations, and uncertainties that must be understood when considering the results at the parcel level.

Figure 7-3 Passive flooding with 3.2 feet of sea level rise (PacIOOS)

Figure 7-4 Annual high wave flooding with 3.2 feet of sea level rise (PacIOOS)

Figure 7-5 Coastal erosion with 0.5 to 3.2 feet of sea level rise (PacIOOS)

Figure 7-6 Combined hazard exposure with 3.2 feet of sea level rise (PacIOOS)

The projected erosion hazard lines for the project site are shown in Figure 7-5 are derived from historical erosion rates that are based on shoreline location measurements collected at individual transects located 20 meters apart along the coastline. Each transect is characterized by a unique combination of physical and environmental factors that influence shoreline change at that specific transect. While erosion projections that are based on historical erosion rates may not be entirely accurate predictions of the future, they are often used for planning purposes.

The portion of the SLR-XA erosion model used to project coastal response to rising sea levels assumes that all coastal changes in the nearshore, shoreline, and terrestrial area (to the maximum extent of erosion) are occurring in mobile sandy substrate. The model implicitly assumes that sand moves freely along the affected dry and submerged coastal profile, allowing the entire system to respond to the effects of a rise in sea level. However, the assumption that the affected system is composed entirely of sand is not true for much of Oahu's coastline, including the project site, where shallow fringing reefs dominate the nearshore, and clay and rock are present along and within much of the terrestrial area.

Another notable assumption occurs where projected erosion impacts are presented along engineered shorelines, such as seawalls and revetments. The model uses the "all sand" substrate for predictive modeling but does not account for the presence of engineered shore protection structures, such as seawalls. Typically, these structures are utilized to abate the impacts of shoreline erosion and act counter to the natural pressure influencing shoreline retreat.

The coastline of Oahu is characterized by a broad spectrum of environments that include locations where sand is no longer present, the geology of the coastline has fundamentally changed, the coastline has areas of harder substrate, the shoreline is armored or otherwise engineered, and a myriad of others that are not an 'all sand' environment. A sea level rise influenced model that predicts coastal change in an all sand environment is not expected to accurately predict coastal change across the full spectrum of coastal environments present on Oahu. At the project site, the seawall creates a physical boundary between the terrestrial and marine environments. The seawall protects the terrestrial area from erosion and there is no expectation of terrestrial erosion while the seawall is serviceable

The project site is a location where, due to the presence of an engineered shoreline, the inherent environmental assumptions upon which the erosion model are based are not met. The erosion model does not include an evaluation of the efficacy or potential longevity of the seawall. Figure 7-6 depicts the projected extent of chronic flooding with 3.2 feet of sea level rise, referred to as the Sea Level Rise Exposure Area (SLR-XA). The SLR-XA represents the combined footprint of the three individual hazards that were modeled - passive flooding, annual high wave flooding, and coastal erosion. Similar to the erosion model, there are assumptions, limitations, and uncertainties that must be understood when considering the SLR-XA results at the project site. However, the clear potential inundation shown by the model indicates that engineered shore protection is necessary to prevent future property damage.

8. SHORELINE ASSESSMENT

8.1 Existing Conditions

The project site consists of two (2) adjoining residential properties that are located seaward of Kalanianaole Highway in Waimanalo, Oahu, Hawaii identified by Tax Map Key Nos. (1) 4-1-002:021 and 022 (respectively, the "West Lot" and the "East Lot") (Figure 8-1 and Figure 8-2). The project site has a total area of 130,788 square feet (3 acres) with approximately 585 feet of shoreline frontage.

The project site is situated at the southern end of Waimanalo Bay on the southeast coast of Oahu. The shoreline west of the project site is characterized by sandy beaches that extend north to Wailea Point. Notable features west of the project site include Kaiona Beach Park, Waimanalo Beach Park, the Waimanalo Bay State Recreation Area, and Bellows Air Force Station. The shoreline east of the project site transitions to a rocky coastline with limestone outcrops, basalt boulder deposits, and small pocket beaches that extend south to Makapuu Point. Notable features east of the project site include Kaupo Beach Park, Manana (Rabbit Island), Makai Research Pier, Makapuu Beach Park, and Makapuu Lighthouse.

The project site is fronted by a seawall constructed of stone and concrete grout that was constructed between 1911 and 1928. The seawall is 585 feet long with crest elevations that range from + 5.0 feet to +11.0 feet mean sea level (msl). The seawall has a nearly vertical face and recurved concrete cap that functions as a splashguard. The middle portion of the seawall has an opening in the wall with concrete steps that provide access to the shoreline. A boat ramp located near the western property boundary appears to have been constructed by removing a portion of the seawall. Return walls extend landward into the properties along the lateral property boundaries at each end of the seawall. The property east of the project site is armored by a wooden bulkhead seawall. The property west of the project site is armored by a seawall constructed of stone and concrete grout.

The shoreline fronting the seawall consists of a narrow sandy beach that is dynamic and ephemeral. When sand is present along the shoreline, the beach is generally exposed only during lower tides. At high tide, waves wash up to the seawall and the beach face is entirely submerged. The area seaward of the seawall is often completely devoid of sand and no beach is present.

The project site is fronted by a fishpond constructed of basalt boulders (Figure 8-2). The fishpond influences waves, currents, and sediment transport along the shoreline. The outer wall of the fishpond dissipates wave energy as it approaches the shoreline. A tidal channel (*makaha*) is located near the center of the outer fishpond wall. Wave energy is channeled through the tidal channel and diverges as it enters the fishpond. It is unclear if there is a dominant direction of sediment transport within the fishpond; however, sand impoundment at the east end of the fishpond suggests that sediment transport is predominantly easterly.

The nearshore waters are characterized by a shallow fringing reef that extends approximately 2,000 feet from the shoreline. Typical elevations on the reef range from -2 to -6 feet msl. The properties are north-facing and the predominate wave condition is generated by the northeast tradewinds that blow approximately 75% of the year. The project site is exposed to open ocean swell from the north and north northeast through east. The waves present under non-storm conditions are dissipated by the nearshore reef and the fishpond, resulting in a generally calm environment at the shoreline.

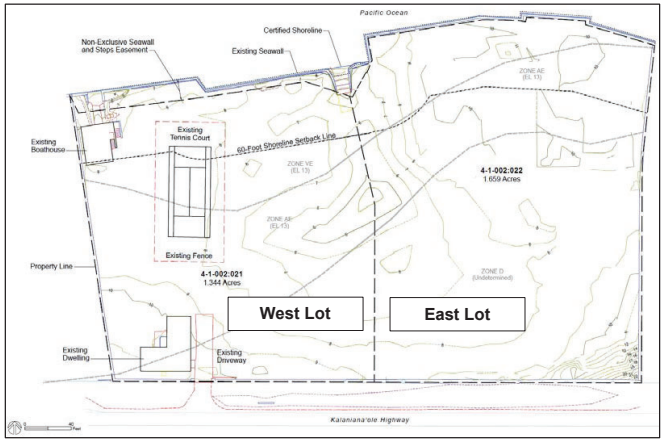


Figure 8-1 Site plan (KN Surveying, Inc., 2017)

Figure 8-2 Oblique aerial image of project site

The East Lot has a total area of 72,228 square feet (1.659 acres) with approximately 330 feet of shoreline frontage. The terrestrial area is relatively flat with elevations ranging from +5 feet to +10 feet msl. There are no existing structures on the property.

The seawall fronting the East Lot is categorized into five (5) sections (1, 2, 3A, 3B, 3C) based on observed differences in height and design profile along the wall length. The dimensions of each wall section are shown in Table 8-1.

Table 8-1 Wall section dimensions (East Lot)

Wall Section	Length (feet)	Crest Elevation (feet msl)
1	65	+11.0
2	65	+11.0
3A	95	+11.0
3B	30	+9.0
3C	75	+7.0

The seawall terminates at the northeast property corner. A return wall extends landward into the property and separates it from the adjacent property, which is fronted by a wooden bulkhead seawall.

Photographs showing existing conditions at the East Lot are shown in Figure 8-3 through Figure 8-8.

The West Lot has a total area of 58,560 square feet (1.344 acres) with approximately 255 feet of shoreline frontage. The terrestrial area is relatively flat with elevations ranging from +5 feet to +10 feet msl.

The seawall fronting the West Lot is categorized into two (2) sections (4, 5) based on observed differences in height and profile along the wall length. The dimensions of each wall section are shown in Table 8-2.

Table 8-2 Wall section dimensions (West Lot)

Wall Section	Length (feet)	Crest Elevation (feet msl)
4	135	+5.0
5	120	+5.0

The seawall terminates at the northwest property corner, where it abuts the neighboring Shriner's property, which is fronted by a seawall of similar construction. The Shiner's property seawall appears to have been heightened twice, approximately 30 and 32 inches, respectively. The top of the Shriner's seawall is at elevation +11 feet msl.

Photographs showing existing conditions at the West Lot are shown in Figure 8-9 through Figure 8-14.

Figure 8-3 East Lot – Walls 1, 2, 3A, 3B, and 3C (looking south)

Figure 8-4 East Lot – Walls 1 and 2 (looking north)

Figure 8-5 East Lot – Wall 1

Figure 8-6 East Lot – Wall 2

Figure 8-7 East Lot – Walls 3A and 3B

Figure 8-8 East Lot – Walls 3B and 3C

Figure 8-9 West Lot – Walls 4 and 5

Figure 8-10 West Lot – Wall 4

Figure 8-11 West Lot – Walls 4 and 5

Figure 8-12 West Lot – undermining and sinkhole at Wall 4

Figure 8-13 West Lot – damage area at Wall 5

Figure 8-14 West Lot – undermining and scour at Wall 5

8.2 Shoreline Boundary

There are two types of land registration in Hawaii; the Land Court system for recording registered land, and the Regular System for recording unregistered land. Title to the subject properties was conveyed through the Land Court system in 1932. The 1932 Land Court decree described the seaward boundary of the properties as "along high water mark" and "along outer face of seawall" (Figure 8-16).

The shoreline boundary of property (including both Land Court and Regular System properties) may be subject to change because of the action of the waves in adding to (accretion) or taking away (erosion) land along the shoreline and is subject to redetermination according to the laws of the State of Hawaii. Shoreline boundaries are typically determined or redetermined by a *certified shoreline*.

The "shoreline" in Hawaii is defined as:

> "*Shoreline*" means the upper reaches of the wash of the waves, other than storm or seismic waves, at high tide during the season of the year in which the highest wash of the waves occurs,, usually evidenced by the edge of vegetation growth, or the upper limit of debris left by the wash of the waves (Hawaii Administrative Rules §13-222)."

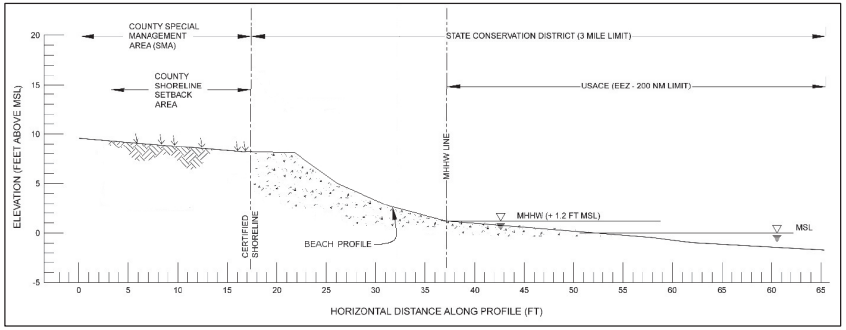


Figure 8-15 Jurisdictional boundaries for coastal land uses in Hawaii

The shoreline plays a key role in determining jurisdictional boundaries for coastal land uses in Hawaii (Figure 8-15). Lands seaward of the shoreline are deemed to be in the Conservation District and come under the administrative jurisdiction of the Hawaii Department of Land and Natural Resources (DLNR). Lands inland of the shoreline come under the administrative jurisdiction of the counties which implement zoning, Special Management Area permitting, and shoreline setback regulations (Fletcher and Hwang, 1994). The shoreline also establishes the landward limits of the *beach transit corridor*, which is intended to provide lateral shoreline public access seaward of the shoreline. A certified shoreline is typically a prerequisite for obtaining approvals for land uses in the Conservation District and Special Management Area.

The certified shoreline is located by a licensed land surveyor and certified by the State of Hawaii. The project site shoreline was certified by the State of Hawaii on June 5, 2018. The certified shoreline reconfirmed that the property boundary is located "along the seaward face of seawall" (Figure 8-17).

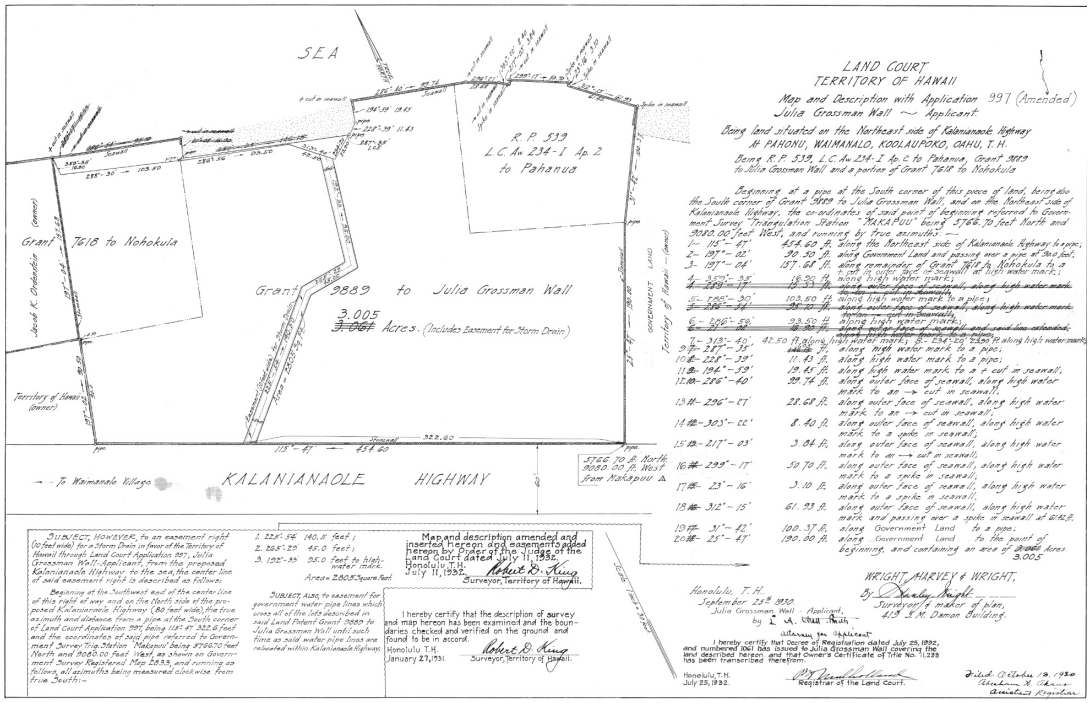


Figure 8-16 Land Court map and description (July 24, 1932)

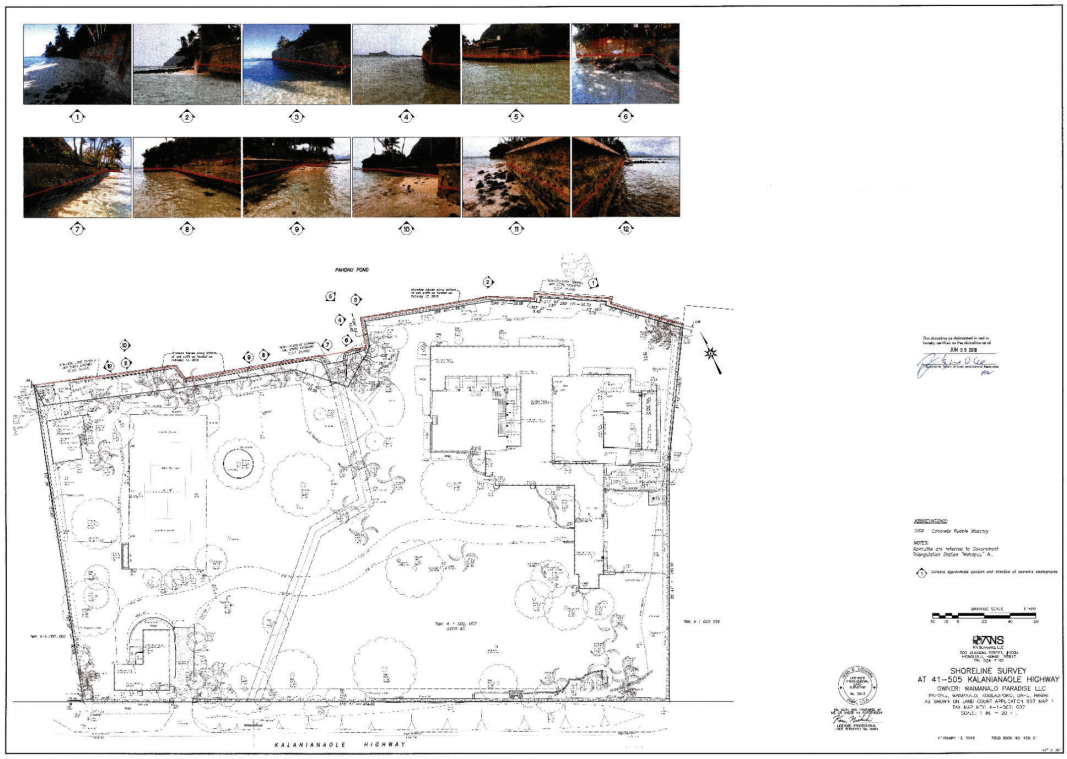


Figure 8-17 Shoreline as certified by the State of Hawaii (June 5, 2018)

8.3 Seawall

The project site and the adjacent property to the west are fronted by a seawall constructed of stone and concrete grout, with a thin exterior layer of concrete grout. The construction history of the seawall is unclear. The construction methodology and foundation conditions are unknown. While the exact date of construction is not known, the seawall appears to have been constructed sometime between 1911 and 1928. Table 8-3 provides a summary of the history of the seawall based on a review of historical records, maps, and aerial photographs.

Table 8-3 Seawall history

Year	Type	Description
1911	T-sheet	Property is undeveloped. No seawall or other structures are identified.
1928	T-sheet	Property is partially developed. Two wooden wharves are identified seaward of the subject property. Three additional structures are identified on the property. The seawall is identified for the first time by the label "wall ends" (Figure 8-18) and may have extended across the three neighboring properties to the northwest. Materials and dimensions of the seawall are unknown. The seawall may not have been continuous, and the crest elevation may have varied.
1930	Map	Land Court Application 997 Map 1 (1932) identifies the shoreline boundary as "high water mark" or "outer face of seawall" in (Figure 8-19). The shoreline boundary description suggests that the central portion of the seawall may have been added later. The portion of the seawall fronting the boathouse appears to have been continuous when it was originally constructed. That portion of the seawall was likely removed when the boat ramp was constructed.
1931	Letter	In a letter dated January 23, 1931, the Chairman of the Hawaii Board of Harbor Commissioners granted permission to put a concrete facing on the existing seawall. This government approval confirms the legality of the seawall.
1949	Aerial Photograph	Property is fully developed. Property tax records indicate that the existing single-family dwelling was constructed in 1933. The fishpond is visible for the first time. The wooden wharves are no longer visible. It is unclear if the central portion of the seawall has been constructed.
1980	Video	The seawall appears in the first episode of the television show Magnum P.I., which aired on December 11, 1980. The condition of the seawall appears similar to its current condition with visible spalling on the concrete face.

The Hawaii Department of Land and Natural Resources (DLNR) determined that the seawall is a legal, nonconforming structure. The legality of the structure was confirmed by a letter dated January 23, 1931, from the Chairman of the Hawaii Board of Harbor Commissioners granting permission to put a concrete facing on the existing seawall. The seawall is considered nonconforming because it was constructed on unencumbered State lands prior to the adoption of the Conservation District Rules in October 1964. There is no additional documentation or evidence of repair, maintenance, or alterations to the seawall since 1931.

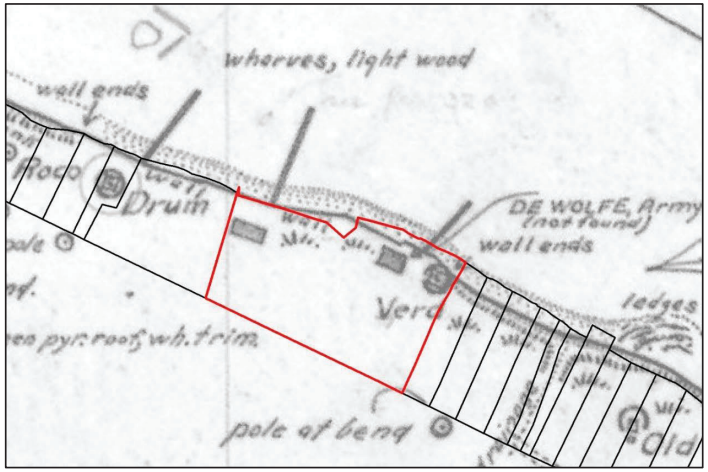


Figure 8-18 Seawall identified on NOAA historical T-sheet (1928)

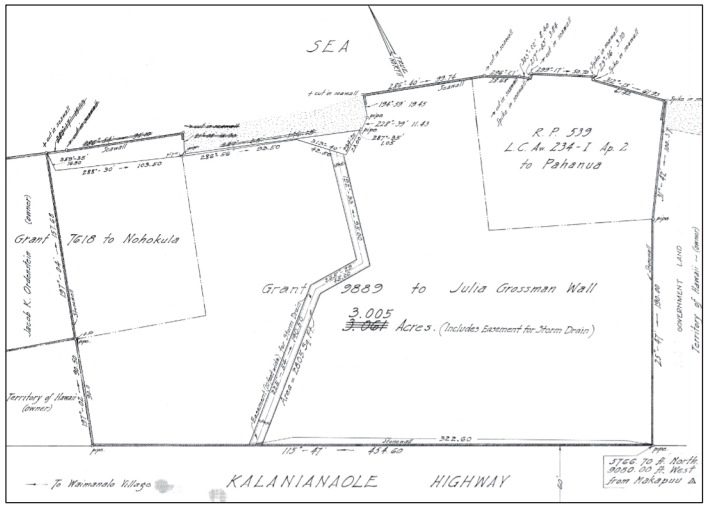


Figure 8-19 Seawall identified on Land Court map (1932)

The seawall is located seaward of the record property boundary and is, therefore, encroaching on unencumbered State land. A Grant of Non-exclusive Easement for the seawall and concrete steps was approved by the Deputy Attorney General on June 22, 2015. The easement contains an area of 4,539 square feet and includes the unencumbered land between the seawall and the record property boundary. The easement is non-exclusive and does not confer land ownership rights. Rather, the easement confers unto the Grantee the "right, privilege, and authority to use, maintain, repair, replace and remove the existing seawall and steps over, under, and across State-owned land". This language suggests that, in addition to the requirement to maintain the seawall, options may also be available for the Grantee to repair, remove, or replace the seawall; however, it does not specify the types of modifications that may be permissible, or what regulatory authorizations would be required. The easement is valid for fifty-five (55) years and will expire in October 28, 2070, which corresponds with the 50-year planning horizon for the project.

The existing seawall is 585 feet long and extends across both parcels. The seawall consists of multiple sections that vary in height and design cross section with a crest elevation that decreases from east to west. The wall has been divided into seven (7) sections based primarily on existing wall. The wall sections are labeled Wall 1, 2, 3A, 3B, 3C, 4, and 5. Figure 8-20 shows the location of the wall sections on an oblique aerial photograph. Figure 8-21 shows the dimensions of each wall section.

Figure 8-20 Oblique aerial photograph showing wall sections

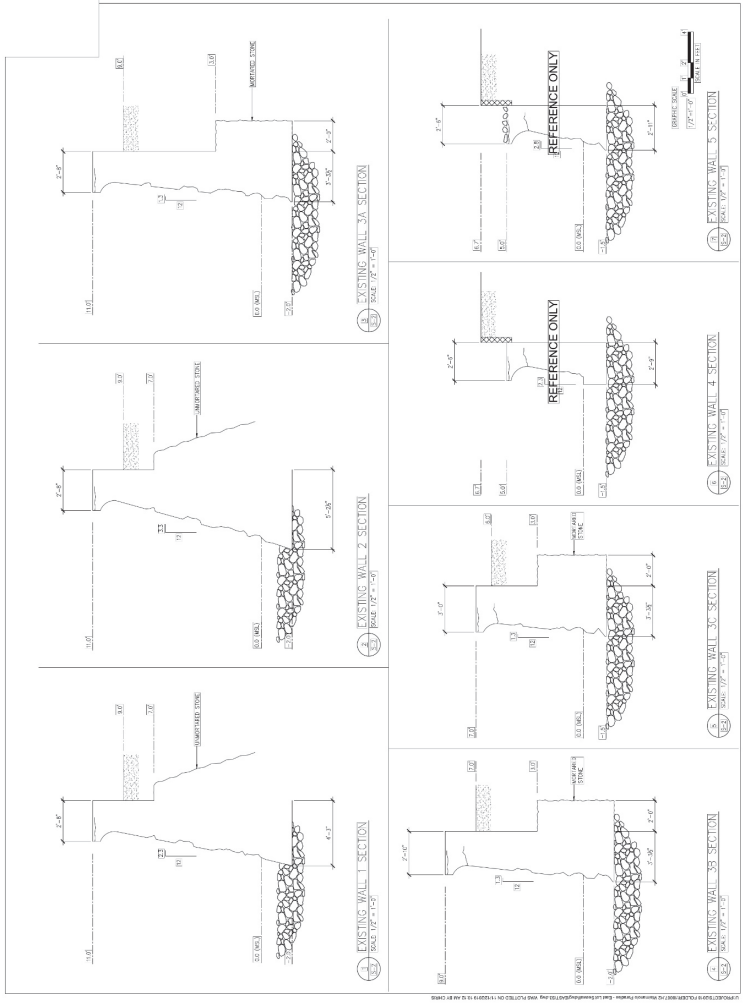


Figure 8-21 Existing wall sections and dimensions (GFDS)

8.4 Fishpond

The project site and adjacent property to the north are fronted by a low rock-walled enclosure referred to as a *pāhonu* (fishpond). The fishpond was traditionally used for the purpose of keeping *honu* (turtles) as food for the local chiefs. The fishpond is a recognized historical landmark, so much so that the subject property and surrounding area are locally referred to as "Pāhonu". While the original date of construction of the fishpond is unknown, oral histories indicate that it predates the unification of the islands under King Kamehameha I.

The fishpond is located on submerged lands and, as part of the Public Trust Lands Inventory, is recognized as held in trust by the State of Hawaii for its present and future generations. The fishpond is considered historically significant and was listed on the National and State Register of Historic Places (State Site No. 80-15-1037) on September 2, 1978.

The outer fishpond wall is approximately 780 feet long and extends between 80 and 110 feet from the shoreline. The fishpond is bifurcated by a middle wall, creating two sub-units of approximately 0.5 acres and 1.5 acres. The substrate inside the fishpond is predominately sand intermixed with cobble. A small beach runs along the shoreline at low tide, though it is typically submerged at high tide.

It is unclear when the fishpond went out of production. A regional map from 1916 shows fishpond walls extending offshore in a semi-circle, while a map from 1949 only shows the southeastern curve of the wall. The fishpond walls have been restored multiple times in the 1960's and 1980's. The fishpond is currently used by the public as a semi-protected swimming area.

Ke Kula Nui O Waimanalo, a 501(c)3 organization, in partnership with Kua'aina Uta 'Auama and the 'E Alu Pu network, is in the process of restoring the walls of the fishpond. The restoration work was authorized by the Hawaii Department of Land and Natural Resources in July 2018 (Loko I'a: OA-18-05). The purpose of the project is to re-stack the rocks using traditional dry-stack techniques to create a flat top extending 2 feet above the high tide line. Once the fishpond is restored, the Waimanalo Limu Hui plans to use the restored fishpond to replenish the native *limu* (seaweed) in the area. The Hui also intends to use the fishpond as an outdoor public classroom to educate its members on limu ecology and propagation.

The restoration work began in July 2019. Approximately two thirds of the fishpond walls have been restored as of December 2019. Photographs showing the results of the restoration work are shown in Figure 8-22 through Figure 8-25. The increased crest elevation of the outer wall, and closure of the tidal channel at the east end of the fishpond, appears to have resulted in impoundment of sand inside of the fishpond as shown in Figure 8-24 and Figure 8-25.

Figure 8-22 East fishpond wall, prior to restoration work (Aug 2019)

Figure 8-23 East fishpond wall, during restoration work (Sep 2019)

Figure 8-24 Sand impoundment inside fishpond, after restoration work (Sep 2019)

Figure 8-25 Sand impoundment inside fishpond, after restoration work (Sep 2019)

The existing fishpond is not an engineered structure and is not comparable to a conventional multi-layer rock rubblemound breakwater. A rock rubblemound breakwater is a porous, sloping, un-cemented structure composed of boulder-sized stone units that are layered to achieve a stable profile. The most common method of breakwater construction is to place a layer of armor stone, sized according to design wave height, over an underlayer and core layer designed to distribute the weight of the armor layer and prevent the loss of fine material through voids in the breakwater. The armor layer and underlayer are typically two stone diameters in thickness. Figure 8-26 through Figure 8-29 present a series of photographs illustrating the differences between the existing fishpond offshore of the project site and an engineered breakwater located at Makai Research Pier (Waimanalo, Hawaii).

The fishpond is constructed from stone sizes with nominal diameters that range from about 4 inches to 1.5 feet. The fishpond walls have a vertical profile and the base of the walls is about 10 to 12 feet (Figure 8-26). The stones are loosely placed and are not keyed and fitted to create a stable structure (Figure 8-28). The narrow base, vertical profile, and loose stones decrease the stability of the structure under design wave conditions. The crest elevations of the fishpond walls vary from between -0.1 to +0.7 feet msl at the north end to between +0.3 to +3.0 feet msl at the south end. The existing crest elevations are inadequate to prevent wave overtopping during high tides. In January 2020, restored portions of the fishpond walls were damaged by a combination of easterly swell and elevated water levels. The loose stones became dislodged and were redistributed along the seafloor inside the fishpond. From an engineering design perspective, the fishpond walls are not adequate to withstand a design wave event at the project site.

The breakwater at Makai Research Pier is an engineered structure composed of boulder-sized stone units with nominal diameters that range from about 3 to 6 feet (Figure 8-27). The breakwater has a sloping profile and the base of the structure is about 65 to 75 feet wide (Figure 8-29). The armor stones are keyed and fitted together to create a stable structure. The crest of the breakwater is about +6.0 feet msl. The breakwater is a stable structure that is designed to withstand a design wave event.

An appropriately sized breakwater for the project site would be designed to withstand a design wave height of 8.5 feet. This would require armor stones with a nominal diameter of 4.9 feet and a median weight of 9,700 pounds. An armor stone layer that is two stones thick would overlay a two-stone thick underlayer composed of smaller stones. The underlayer stones would have a nominal diameter of 1.8 feet and would weigh 970 pounds. Ideally, the large, heavy armor stones would be keyed and fitted to prevent movement and/or settlement of the stones. The crest elevation of the breakwater would need to be at least +9.5 feet msl to limit wave overtopping discharge into the fishpond.

Although it is not an engineered structure, the fishpond walls do dissipate wave energy and may reduce the intensity of wave action along the shoreline. The effectiveness of the fishpond in decreasing incident wave energy is primarily a function of the elevation of the structure in relation to sea level. The average crest elevation of the fishpond is +0.4 feet msl. As sea levels continue to rise, the fishpond will become less effective in protecting the subject properties from incident wave energy. Based on the existing crest elevation and projected sea level rise, the fishpond could be completely submerged by 2020 (*Extreme* scenario) or 2040 (*Low* scenario). The ability of the fishpond to dissipate incident wave energy will decrease as the structure becomes progressively more submerged. As sea level rises, the fishpond will eventually provide no added protection from wave energy. This could potentially be delayed or avoided if the fishpond is adapted as conditions change over time.

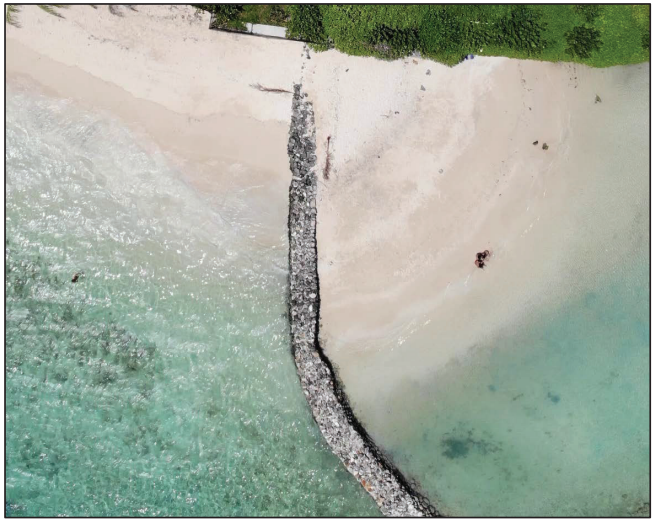


Figure 8-26 Aerial photograph of fishpond offshore of the project site

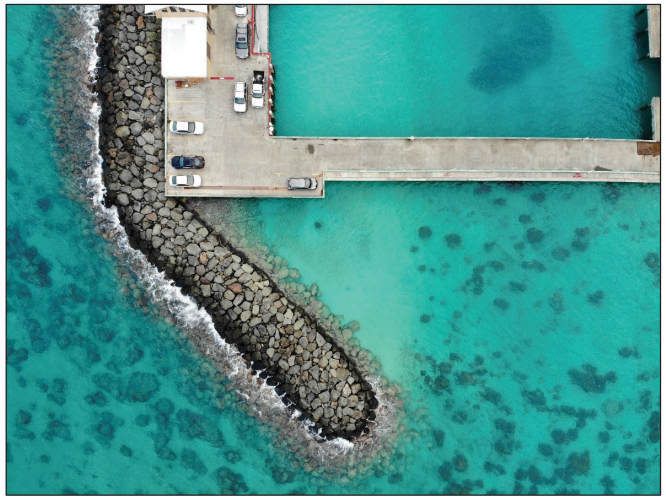


Figure 8-27 Aerial photograph of engineered breakwater at Makai Research Pier

Figure 8-28 Oblique photograph of fishpond offshore of the project site

Figure 8-29 Oblique photograph of engineered breakwater at Makai Research Pier

9. WAVE OVERTOPPING ANALYSIS

9.1 Introduction

The existing seawall is 585 feet long and extends across both properties. The seawall consists of multiple sections that vary in height and design cross section with a crest elevation that decreases from east to west. The wall has been divided into seven (7) sections based primarily on existing wall. The wall sections are labeled Wall 1, 2, 3A, 3B, 3C, 4, and 5. Figure 9-1 shows the location of the wall sections on an oblique aerial photograph.

Figure 9-1 Wall sections based on existing geometry

Although the seawall has been effective in preventing erosion of the terrestrial area, the properties remain vulnerable to wave overtopping. In order to quantify potential improvements to the wave overtopping problem under both existing and projected sea level rise conditions, SEI conducted an overtopping recurrence analysis for the project site. The objective of the analysis was to determine how increasing the crest elevation of the seawall would affect wave overtopping with sea level rise.

The following methodology was used for the analysis:

1. Wall reaches were defined to account for differences in wall geometry (primarily wall height);
2. A wave hindcast model was conducted to quantify the wave climate with specific application to nearshore wave heights that are active at the wall;
3. Wave parameters from the hindcast model were used as input for wave overtopping calculations using the empirical formulas from EurOtop (2018);
4. Overtopping rates were combined with the recurrence values from the hindcast wave model to show existing overtopping rates, overtopping rates with improvements to the wall, and overtopping rates under conditions of a 3.2-ft sea level rise scenario.

Three (3) wall improvement options were evaluated:

1) *Existing* – no improvements (maintain existing crest elevations for all wall sections)
2) *Repair* - increase crest elevation of Walls 3C, 4, and 5 to +9.0 feet msl.
3) *Replace* - increase crest elevation of Walls 3C, 4, and 5 to +11.0 feet msl.

Walls 1, 2, 3A and 3B are at +9 feet msl or higher and were therefore not included in the analysis.

9.2 Wave Hindcast Model

Deepwater wave conditions were collected from the Coastal Data Information Program (CDIP) buoy station 098, which is located approximately 6.2 miles north of the project site. CDIP 098 is a Datawell directional buoy that measures wave height, wave direction, and peak period every hour. The data set comprises a 17-year record of wave statistics. The wave climate and buoy data are described in Section 4, including rose diagrams for wave height (Figure 4-3) and wave period (Figure 4-4). Corresponding histograms of the data are shown in Table 4-2 for wave height and Table 4-3 for wave period.

In order to provide recurrence statistics for the wave overtopping analysis, the offshore annual wave statistics were discretized into 252 wave cases, each with a corresponding significant wave height, peak period, and direction. Ordering the buoy data in this manner allows a frequency of occurrence to be applied to each case.

9.3 Numerical Modeling of Wave Approach

As deepwater waves propagate toward shore, they begin to encounter and be transformed by the seafloor. In shallow water, wave speed becomes related to the water depth. As water depths decrease, waves slow down, and the process of wave shoaling steepens the wave and increases the wave height. Wave breaking occurs when the wave profile shape becomes too steep. This typically occurs when the ratio of wave height to water depth is about 0.78 and is a mechanism for dissipating the wave energy. Wave energy is also dissipated due to bottom friction. The phenomenon of wave refraction is caused by differential wave speed along a wave crest as the wave passes over varying bottom contours and can cause wave crests to converge or diverge and may locally increase or decrease wave heights. Not strictly a shallow water phenomenon, wave diffraction is the lateral transmission of wave energy along the wave crest and would cause the spreading of waves in a shadow zone, such as occurs behind a breakwater or other barrier. Because of the complexities of these transformations as waves move from offshore over the fringing reef to nearshore areas that front the seawall, the wave transformations are analyzed using computer models.

Simulating Waves Nearshore (SWAN) is a third-generation wave model developed by Delft University of Technology that computes random, short-crested wind-generated waves in coastal regions and inland waters (Booij, et al, 1999). The SWAN model can be applied as a steady state or non-steady state model and is fully spectral (over the total range of wave frequencies). Wave propagation is based on linear wave theory, including the effect of wave generated currents. SWAN provides many output quantities, including 2-dimensional spectra, significant wave height and mean wave period, and average wave direction and directional spreading. For this project, the SWAN model was used to transform waves from deep water to the project site for use in the wave overtopping equations. Water levels used for the modeling were 1) constant existing mean sea level, and 2) +3.2 feet msl, the design sea level in 2070, which is the NOAA *Intermediate-High* projection.

Each of the 252 wave cases was propagated from offshore to a location immediately fronting the existing seawall at the project site. Based on visual inspection of the spatial output of wave height inside the pāhonu, the variability of wave along the seawall was minimal and therefore only one representative output location was chosen fronting the portion of the seawall being assessed. The model output provides significant wave height, peak period, and water depth fronting the seawall for both simulations.

A key observation from the model is that for the same offshore wave height an increase in sea level depth will allow larger wave heights to pass over the reef flat/inner reef and into the nearshore area fronting the project site. This is because wave breaking is a function of the water depth (breaking wave height is about 0.78*depth), and the depth of the reef flat will thus dictate the size of waves which are able to pass over the reef flat unbroken. In fact, a simple model for the effects of sea level rise on shorelines is that it will lead to an increase in wave heights and incident wave energy, with consequent impacts on coastal processes.

9.4 Wave Overtopping Analysis

The wave overtopping analysis of the seawall at the project site was performed using the methodology presented in the EurOtop 2018 Manual (EurOtop, 2018). EurOtop provides techniques for calculating mean overtopping discharges, overtopping wave volumes and the proportion of waves overtopping seawalls, flood embankments, breakwaters and other shoreline structures. The manual defines types of structure, provides definitions for parameters, and gives guidance on how results should be interpreted. The EurOtop Manual is the accepted industry standard for the assessment of wave overtopping of coastal structures and the methods outlined in the manual are based on the most recent research and development in wave overtopping (EurOtop, 2018). A schematic representation of the parameters used in the overtopping analysis is shown in Figure 9-2.

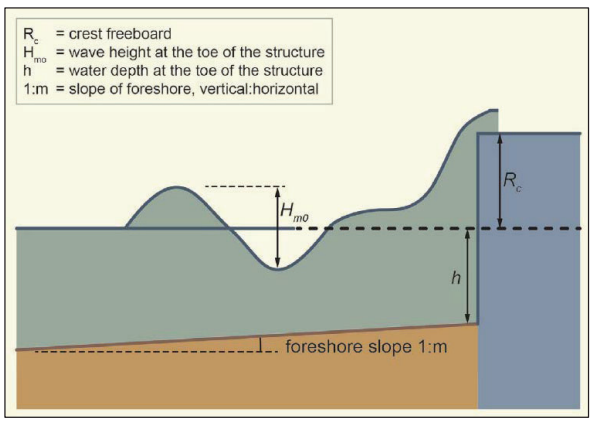


Figure 9-2 Assessment of overtopping at vertical walls (EurOtop 2018)

The EurOtop manual provides a set of semi-empirical equations to calculate the overtopping rate as a function of typical wave parameters (H_s, T_p, R_c, etc.) and seawall dimensions. For this study, the empirical formulas provided for very steep to vertical walls were used to assess wave overtopping at the project site. Figure 9-2 shows the basic key parameters used as inputs into the empirical formulas for overtopping at plain vertical walls. Multiple empirical formulas are available to account for wall geometry (wall batter, return wall, etc.) and wave forms (breaking waves, non-breaking waves). These empirical formulas are derived from measured data in the field and laboratory.

Wave parameters from the SWAN numerical model were used as input into the overtopping equations for each of the wall sections. Overtopping calculations were also made for the three seawall modification configurations: *existing*, *repair*, and *replace*, with their respective height adjustments. One output location was chosen for each of the three seawall sections since it was observed that there was no significant lateral variation in the modeled wave heights long each portion of the wall.

The EurOtop formulas provide overtopping rates (Q) in terms of liters per second per meter of wall length (l/s/m). Table 9-1 shows the relative hazards associated with overtopping rate ranges. Overtopping rates greater than 10.0 l/s/m are considered potentially hazardous to persons in an exposed location.

Table 9-1 EurOtop overtopping rate relative hazards

Tolerable Overtopping Rates (EurOtop 2018)	
Upper Limit, Q (l/s per m)	Hazard Type
<0.1	Insignificant overtopping
0.1-5	Erosion of backfill soil (non-vegetated)
5-10	Erosion of backfill soil (vegetated)
>10	Significant overtopping

9.5 Overtopping Rate

The offshore wave conditions are represented by a 252 wave cases, each with a unique combination of wave heights, periods, directions, and a percent occurrence based on 19 years of historical buoy data (see Section 3.3). For each wave case, the offshore wave condition was transformed to shore using the SWAN wave model to provide wave parameters fronting the seawall. The nearshore wave conditions were then used as input to the empirical EurOtop equations to calculate the overtopping volume rate at each wall site for both existing and projected higher sea levels.

The average overtopping percent occurrence for Walls 3C, 4, and 5 for existing sea level conditions and with +3.2 feet of sea level rise are summarized in Table 9-2 and Table 9-3. Overtopping rates less than 0.1 l/s/m were considered insignificant as per Table 9-1.

Table 9-2 Overtopping occurrence, Wall 3C

Wall Section 3C - Overtopping Percent Occurrence (No SLR)			
Wall Configuration	> 0.1 l/s per m	> 5 l/s per m	> 10 l/s per m
Existing (+7')	23.7	0.0	0.0
Repair (+9')	3.0	0.0	0.0
Replace (+11')	0.3	0.0	0.0

Wall Section 3C - Overtopping Percent Occurrence (SLR +3.2')			
Wall Configuration	> 0.1 l/s per m	> 5 l/s per m	> 10 l/s per m
Existing (+7')	92.3	85.6	80.6
Repair (+9')	90.0	43.1	13.7
Replace (+11')	87.3	1.7	0.0

Table 9-3 Overtopping occurrence, Walls 4 and 5

Wall Sections 4/5 - Overtopping Percent Occurrence (No SLR)			
Wall Configuration	> 0.1 l/s per m	> 5 l/s per m	> 10 l/s per m
Existing (+5')	55.9	0.3	0.0
Repair (+9')	3.0	0.0	0.0
Replace (+11')	0.3	0.0	0.0

Wall Sections 4/5 - Overtopping Percent Occurrence (SLR +3.2')			
Wall Configuration	> 0.1 l/s per m	> 5 l/s per m	> 10 l/s per m
Existing (+5')	92.4	92.3	92.2
Repair (+9')	90.0	43.1	13.7
Replace (+11')	87.3	1.7	0.0

The results presented in Table 9-2 and Table 9-3 indicate moderate overtopping of Walls 3C, 4 and 5 under existing sea level conditions. Wall 3C is overtopped by 23.6 percent of the 252 wave cases, and Walls 4 and 5 are overtopped by 55.9 percent of the wave cases. Overtopping is greatly reduced by both the *repair* and *replace* options. Higher overtopping rates that might cause erosion of vegetated backfill or be of greater concern are virtually non-existent under existing sea level and wall configuration conditions, however they become common for all walls with +3.2 feet of sea level rise.

The analysis also shows that the *repair* option effectively eliminates virtually all overtopping for existing sea level conditions but is less effective after +3.2 feet of sea level rise. The higher wall height of the *replace* option is effective at reducing or eliminating wave overtopping over moderate levels (i.e. erosion of non-vegetated back fill) for all walls after +3.2 feet of sea level rise.

10. ENGINEERING ANALYSIS

10.1 Geotechnical Assessment

The subsurface conditions at the project site were investigated by excavation of four (4) test pits along the inshore side of the seawall. Two (2) test pits were excavated on the West Lot (Walls 4 and 5) and two (2) test pits were excavated on the East Lot (Walls 1, 2, and 3). The test pits were excavated to depths of 6.0 to 13.0 feet below grade. An air jet probe was used to measure sand thickness and estimate the depth to hard substrate along the seaward base of the seawall. The test pit and jet probe locations are shown in Figure 10-1.

The subsurface investigations were performed in collaboration with Cultural Surveys Hawaii, Inc. (CSH), to assist in the completion of an Archaeological Inventory Survey (AIS) for future permitting purposes. CSH completed the seawall AIS under state archaeological fieldwork permit number 19-07, which was issued by the State Historic Preservation Division (SHPD), pursuant to Hawaii Revised Statutes (HRS) §13-282. SEI performed the excavation in accordance with the approved AIS research design with direction from CSH. No historical, cultural, or archaeological resources or remains were encountered during the investigations.

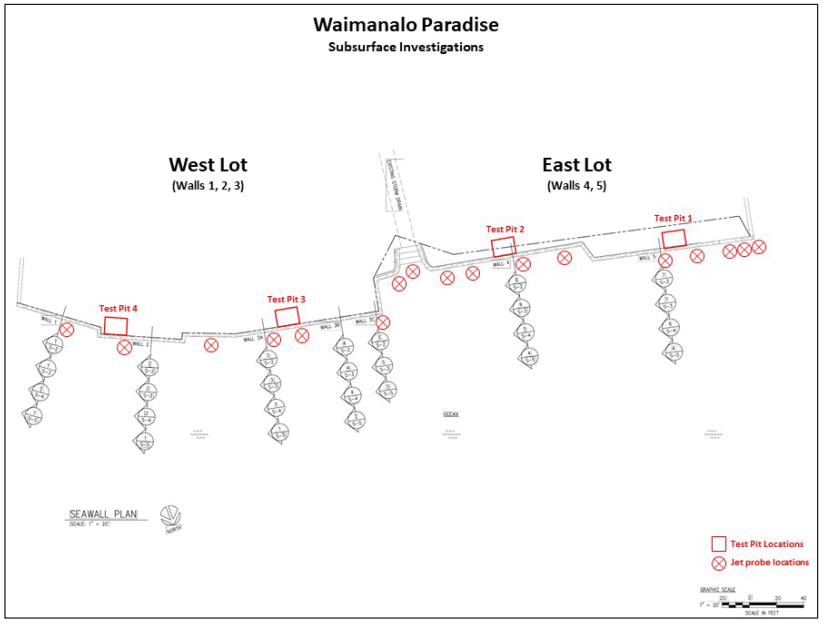


Figure 10-1 Test pit and jet probe locations

10.1.1 Test Pits

Test Pit 1 was located at Wall 5 approximately 85 feet from the west boundary of the West Lot. Substrate consisted primarily of tan, fine grain, loose to medium dense, calcareous sand to the final depths of the pits at 6.0 to 8.0 feet below grade (Figure 10-2 and Figure 10-3). Some cobbles and boulders were also encountered during the excavation of the test pit. No hard or non-erodible substrate was encountered.

The rear profile of Wall 5 was observed to be vertical to the base of the wall. MKE determined that Wall 5 is inadequate for supporting the design retained soil load. However, Wall 5 appears to be performing satisfactorily, with the exception of the CMU extension above the wall. Due to the lack of a landward extension, Wall 5 remains inadequate with respect to supporting the design retained soil and with respect to extreme event loads, such as flood loads.

Due to the presence of sand, cobbles and boulders, a definitive depth to the hard substrate could not be ascertained. Based on the jet probing, an average depth of 3 to 4 feet below the bottom of wall is assumed; however, the hard substrate is assumed to be irregular, therefore the depth to hard substrate could be considerably deeper in some areas.

Test Pit 2 was located at Wall 4 approximately 30 feet west of the concrete steps at the boundary between the West Lot and the East Lot. Substrate consisted primarily of tan, fine grain, loose to medium dense, calcareous sand to the final depths of the pits at 6 to 8 feet below grade (Figure 10-4 and Figure 10-5). Some cobbles and boulders were also encountered during the excavation of the test pit. No hard or non-erodible substrate was encountered.

The rear profile of Wall 4 is vertical with no batter or cantilever. MKE determined that Wall 4 is inadequate for supporting the design retained soil load. However, Wall 4 appears to be performing satisfactorily, with the exception of the CMU extension above the wall. Due to the lack of a landward extension, Wall 4 remains inadequate with respect to supporting the design retained soil and with respect to extreme event loads such as flood loads.

Due to the presence of cobbles and boulders, a definitive depth to the hard substrate could not be ascertained. Based on the jet probing, an average depth of 3 to 4 feet below the bottom of wall is assumed; however, the hard substrate is assumed to be irregular, therefore the depth to hard substrate could be deeper in some areas.

Figure 10-2 Test Pit 1 (West Lot, Wall 5)

Figure 10-3 Test Pit 1 (West Lot, Wall 5)

Figure 10-4 Test Pit 2 (West Lot, Wall 4)

Figure 10-5 Test Pit 2 (West Lot, Wall 4)

Test Pit 3 was located at Wall 3A approximately 175 feet from the east boundary of the East Lot. Substrate consisted primarily of tan, fine grain, loose to medium dense, calcareous sand to about 2 feet below grade, followed by brown, medium stiff, silty clay with sand to about 6 feet, followed by tan, fine grain, loose to medium dense, calcareous sand to the final depths of the test pit at approximately 13 feet below grade (Figure 10-6 and Figure 10-7. A moderate to high volume of cobbles and boulders were encountered during the excavation and a definitive depth to hard substrate could not be ascertained. Based on the jet probing, an average depth of 3 to 4 feet below the bottom of wall is assumed; however, the hard substrate is assumed to be irregular, therefore the depth to hard substrate could be considerably deeper in some areas.

The additional mass and width of the wall base contributes to wall stability, and Wall 3A is considered to be adequately designed to resist sliding and overturning. However, it is likely not capable of resisting design soil loads or extreme wave events.

Test Pit 4 was located at Wall 2 approximately 60 feet from the east boundary of the East Lot. Substrate consisted primarily of tan, fine grain, loose to medium dense, calcareous sand to about 2 feet below grade, followed by basaltic cobbles and boulders (Figure 10-8 and Figure 10-9). The excavation was terminated at approximately 6 feet below grade due to suspicion that the basaltic cobbles and boulders were part of a buried, original unmortared rock wall. No hard or non-erodible substrate was encountered.

The rear profile of Wall 2 was observed to be vertical down to a depth of about 2 feet below grade. At 2 feet below grade, the wall extended landward about 6 to 12 inches and then diagonally downward. As this landward extension was constructed of unmortared stone, the exact profile of the wall could not be discerned. From removal of some of the unmortared stone, it was observed that the unmortared stone extended beyond the vertical rear profile of the wall above. Therefore, the bottom portion of the wall appears to be largely constructed of unmortared or lightly mortared stone, which was covered with mortar and concrete on the front face of the wall. For the purposes of this assessment, the rear batter of this portion of the wall is assumed to be similar to the front face batter. Due to the proximity and similarity in the front batter of Wall 1 to Wall 2, a similar rear profile is assumed for Wall 1. Wall 2 is still inadequate with respect to extreme event loads such as flood loads.

Figure 10-6 Test Pit 3 (East Lot, Wall 3A)

Figure 10-7 Test Pit 3 (East Lot, Wall 3A)

Figure 10-8 Test Pit 4 (East Lot, Wall 2)

Figure 10-9 Test Pit 4 (East Lot, Wall 2)

10.1.2 Jet Probes

An air jet probe was used to measure sand thickness and estimate the depth to hard substrate to inform the structural engineering analysis. Air jet probing provides a rapid means for determining the nature of unconsolidated sedimentary deposits. Air jet probing can also help to differentiate layers of materials that are present below the surface. The air jet probe consists of an eight-foot length of pipe connected to compressed air in a scuba tank by a flexible hose. The pipe is jetted vertically into the sand until "refusal" is encountered or the end of the probe is reached.

Jet probe measurements were collected at fifteen (15) locations seaward of and adjacent to the seawall (Figure 10-10 and Figure 10-11). Jet probing was performed at approximately 10 to 20-foot intervals. Sand thickness ranged from 0 feet to 8 feet, with an average probe depth of 4 feet. The estimated sand thickness and depth to hard substrate at each probe location is shown in Table 10-1.

Table 10-1 Jet probe measurements at base of seawall

Wall	Probe	Sand Thickness	Hard Refusal
5	P1	8.0 feet	No
5	P2	3.0 feet	No
5	P3	2.5 feet	No
5	P4	6.0 feet	Friction
5	P5	7.0 feet	Yes
4	P6	7.5 feet	Friction
4	P7	1.0 feet	No
4	P8	0.0 feet	No
4	P9	6.0 feet	Friction
3C	P10	6.0 feet	Friction
3C	P11	3.0 feet	Yes
3C	P12	4.0 feet	Yes
3A	P13	3.0 feet	Yes
3A	P14	2.0 feet	No
2	P15	2.5 feet	No

The presence of basalt boulders and cobble encountered at most probe locations made it difficult to confirm if refusal was caused by hard substrate or loose material. The bottom of the seawall was identified at some locations. The jet probe results suggest that the depth to hard substrate is relatively deep. The seawall appears to have a shallow foundation that is constructed on loose boulders and cobble. The lack of a deep foundation makes the seawall vulnerable to scour.

Figure 10-10 Jet probing

Figure 10-11 Jet probing

10.1.3 Design Parameters

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii," the site is located in an area designated as Jaucas sand (Jac) with 0 to 15 percent slopes. This series consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean on all islands. These soils developed in wind- and water deposited sand from coral and seashells. On this soil, permeability is rapid. Runoff is very slow to slow, and the hazard of water erosion is slight, but wind erosion is a severe hazard where vegetation has been removed (USDA, 1972, pg. 48, Plate 67).

Based on the findings and observations of the subsurface investigations, the following geotechnical parameters are provided for the analysis of existing and/or the design of new seawall foundations:

a) For the analysis of existing seawall sections:
Ultimate soil bearing value (for submerged conditions):
Footings bearing on cobbles and boulders (Lot 2): 14,000 psf
Footings bearing on sand (Lot 1): 6,500 psf (for footings in positive contact with subgrade soils (excluding undermined areas) and with a minimum embedment depth of 12 inches below the anticipated scour depth).

Material Type	Passive Earth Coefficient (Kp)	Active Earth Coefficient (Ka)	At-Rest Earth Coefficient (Ko)	Frictional Coefficient (x D.L.)	Unit Weight (pcf)	
					moist	submerged
On-Site SAND	3.0	0.30	0.45	0.5	110	60
On-Site silty CLAY	2.5	0.40	0.60	0.4	100	50
Imported Structural Fill and underlying COBBLES	3.5	0.27	0.42	0.7	140	90

b) For the design of new seawall sections:
Allowable soil bearing value (for submerged conditions):
Footings bearing on cobbles and boulders (Lot 2): 4,500 psf
Footings bearing on sand (Lot 1): 2,500 psf (for footings in positive contact with subgrade soils (excluding undermined areas) and with a minimum embedment depth of 12 inches below the anticipated scour depth).

c) Scour protection for the seawall foundations:
It is recommended that new foundations and existing foundations that are to remain be protected from scour and undermining.

10.2 Structural Assessment

A structural engineering analysis was conducted by MKE Associates LLC (MKE) to assess the condition of the wall and the effectiveness of the wall in resisting design forces.

The structural assessment consisted of the following:

- A field survey to visually observe the condition of the seawall, document wall dimensions, sound portions of the seawall to obtain information on the extent and location of spalling and perform a nondestructive rebar scan to identify the approximate location and spacing of existing reinforcing. Light excavation of the substrate adjacent to the wall was also performed using hand tools.
- A limited destructive field investigation to remove small portions of mortar, concrete and/or stone at the wall surface to obtain an indication of the wall construction and reinforcing size and embedment. This work took place at five (5) locations along the front face of the wall, one (1) location at the rear face, and six (6) locations at the top of wall with the surface of the removal area averaging 0.5 to 1 square foot at each location.
- Observe jet probing and minor excavation of the substrate at the seaward face of the wall to determine the condition and type of substrate and footing at the toe of the wall and whether undermining may be taking place under the wall.
- Based on field observations, design soil parameters, and a rough order of magnitude indication of wave forces, perform a preliminary structural analysis of the existing wall to obtain an indication of its adequacy to support design loads.
- Structural analysis to evaluate options to repair, modify, or replace the existing seawall.

The seawall is 585 feet long with a crest elevation that ranges from +11.0 feet mean sea level (msl) to +5.0 feet (msl). The seawall can be categorized into seven (7) sections (1, 2, 3A, 3B, 3C, 4, and 5) based on observed differences in height and profile along the wall length. The dimensions for each wall section are shown in Table 10-2.

Table 10-2 Wall dimensions

Wall	Lot	Length	Crest Elevation
1	East	65 feet	+11.0 feet (msl)
2	East	65 feet	+11.0 feet (msl)
3A	East	95 feet	+11.0 feet (msl)
3B	East	30 feet	+9.0 feet (msl)
3C	East	75 feet	+7.0 feet (msl)
4	West	135 feet	+5.0 feet (msl)
5	West	120 feet	+5.0 feet (msl)

The wall sections referred to in the following discussion are shown in Figure 10-12 and Figure 10-13.

Representative photographs of each wall section are shown in Figure 10-14 through Figure 10-21.

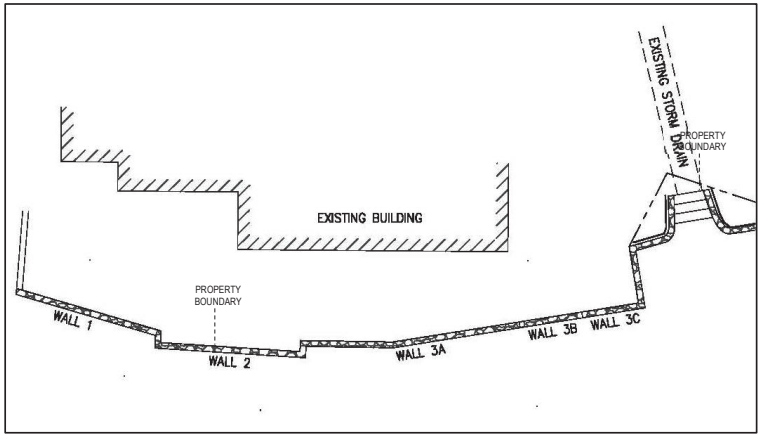


Figure 10-12 Walls 1, 2, 3A, 3B, 3C – East Lot

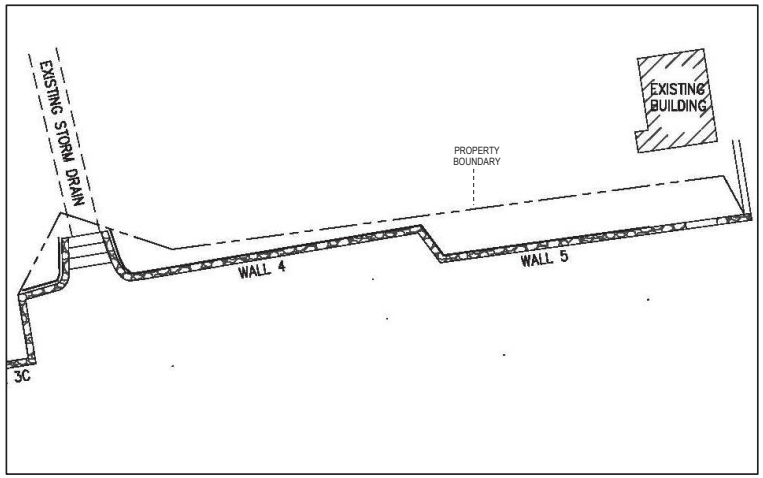


Figure 10-13 Walls 4, 5 – West Lot

Figure 10-14 Aerial photograph of Walls 1 and 2 (East Lot)

Figure 10-15 Ground photograph of Walls 1 and 2 (East Lot)

Figure 10-16 Aerial photograph of Walls 3A, 3B, and 3C (East Lot)

Figure 10-17 Ground photograph of Walls 3A, 3B, and 3C (East Lot)

Figure 10-18 Aerial photograph of Wall 4 (West Lot)

Figure 10-19 Ground photograph of Wall 4 (West Lot)

Figure 10-20 Aerial photograph of Wall 5 (West Lot)

Figure 10-21 Ground photograph of Wall 5 (West Lot)

10.2.1 Findings

The following findings are summarized from the structural engineering report dated April 18, 2017.

- All wall sections except Wall 4 appear to have been originally constructed in the early 1900's and appear to largely be variations of CRM construction.
- The front batters of the seven wall sections vary between approximately 1h:12v to 3h:12v. The rear faces of the walls appear plumb ("vertical").
- The cantilevered curved splashguard at the top of the walls also appears to be constructed of mortar with some stones. The splashguard appears to be reinforced with I-beam shaped iron or steel rail sections. Portions of the splashguard appear to have been plastered over and/or reinforced with wire mesh and remortared, possibly to repair previously spalled areas. Rust stains, cracks, and associated delaminations and spalls as well as corroded rails were observed over the majority of the splashguard length.
- From scanning portions of the wall and observations at the chipped-out areas, there does not appear to be any significant reinforcing in the walls, although a few stray pieces of rail steel appear to be randomly embedded in some areas.
- A few sporadic vertical and diagonally oriented cracks were observed in the wall below the splashguard.
- The surface mortar at the bottom several feet of portions of the wall front faces appears to be significantly abraded from wave action.
- The walls appear to extend about 1 foot below mean sea level where they largely bear on a layer of boulders and cobbles.
- Intermittent undermining extending between 6 to 18 inches was observed where cobbles and the bottom front face of the wall were not covered with sand. Water jet probing also identified some soft or potentially undermined areas of wall.
- A sinkhole appears to have formed in the retained substrate behind Wall 4, due to undermining of the wall.
- There is a 4-inch wide by 16 to 20-inch high CMU wall extension about 2 to 3 feet behind the front face of Walls 4 and 5. From scanning a 15-foot section, this extension appears to be unreinforced.

Structural analysis of the existing wall as well as preliminary structural design of the modified and new wall options were performed following provisions in the current City & County of Honolulu Building Code. Results of the structural analysis and field investigations indicate the following:

- The walls were determined to be adequate against overturning and sliding with acceptable design bearing pressures, except for Walls 3A, 4, and 5. Wall 3A, which has the least front batter and retains the most soil, exceeds the design bearing capacity of the cobble foundation. Walls 4 and 5 were calculated to have inadequate design stability to support the additional surcharge loads from the CMU wall extensions immediately adjacent to and behind the walls, although it was found that maintaining the overall heights of Walls 4 and 5 by removing and replacing the CMU wall with new reinforced concrete extensions located directly over the walls improves the wall design stability.
- Preliminary assessment found all existing walls to be inadequate with respect to resisting the approximated design flood forces produced by a model hurricane. Therefore, construction of new walls designed to meet current structural code requirements may be considered. All existing walls were however found to be adequate for design flood forces produced by the less-

intense 50-year wave scenario. The 50-year wave is a north swell event with a 1/50, or 2%, annual chance of occurrence.

- All wall sections including Walls 3A, 4, and 5 generally appear to be performing satisfactorily.
- Sporadic vertical and diagonal cracks may be due to shrinkage/temperature movement or minor settlement of the wall and largely appear stable at this time. Therefore, the walls largely appear sound and do not appear to have any distress or displacement associated with overturning, sliding or major settlement of the wall.
- Due to the isolated nature of the deep pitting, the surface abrasion and loss of surface mortar does not yet appear to adversely affect the structural integrity of the wall. However, continuing abrasion of the mortar may eventually result in loosening of some of the embedded rocks in the wall.
- Undermining of the wall appears to be isolated. This condition does not yet appear to adversely affect the bearing support of the wall; however, continuing undermining may eventually affect the wall bearing support and/or result in more sinkholes behind the wall.
- The 4-inch wide unreinforced CMU wall extension is inadequate with regard to resisting retained soil loads.
- Rust stains, cracks, delaminations, and spalling in the majority of the splashguard appear to be caused by expansive corrosion of the embedded rails, compromising the structural integrity of the splashguard.
- To restore the integrity of the existing wall and to help maintain the performance of the wall in the short (10 year) term, the observed cracks, delaminations, spalling and abrasion/undermining should be repaired. Replacement of the inadequate CMU wall extension should also be considered.

10.3 Design Wave Conditions

The project site is directly exposed to oceanographic hazards. Hurricane and tsunami inundation elevations, along with sea level rise scenarios, were presented in Section 4. The cumulative effects of sea level rise and coastal hazards were presented in Section 6. The findings show that a storm like Hurricane Iniki could be expected to inundate the project site to elevation +13.2 feet msl in 2070, the end of the 50-year planning horizon. Given the interest in a 50-year planning horizon and the likelihood of occurrence, these hazards will need to be addressed in any shoreline structural improvement plan. In addition, the calculation of wave forces on a shore protection structure is necessary for proper design. Preliminary design wave conditions for a model hurricane and a 50-year wave event were provided to the structural engineers for their assessment of the existing seawall and guidance for option development (Table 10-3). The structural engineering evaluation of the design wave and geotechnical conditions indicates that saturated soils are the controlling factors for design.

Table 10-3 Design wave conditions (relative to mllw)

	50-year wave	Model Hurricane
Still Water Level (SWL) Rise		
Astronomical Tide (feet)	1.9	1.9
Wave Setup (feet)	1.0	5.0*
Mesoscale Eddy (feet)	0.5	0.5
Sea Level Rise (feet)	3.2	3.2
Total SWL Rise (feet)	6.6	10.6
Nominal Water Depth (feet	3.0	3.0
Design Water Depth (feet)	9.6	13.6
Design Wave Height (feet)	6.7	9.5

** Combined wave setup and storm surge*

11. ALTERNATIVES ANALYSIS

11.1 Introduction

The objectives of the *Waimanalo Seawall Repairs* project are to:

- Ensure that the existing seawall can provide adequate resistance to design soil loads.
- Reduce wave overtopping under design wave conditions through 2070.
- Increase the resilience of the property to coastal hazards and sea level rise through 2070.

SEI evaluated nine (9) alternatives to determine if they are suitable for the project site conditions and capable of achieving the project objectives:

- No Action
- Managed Retreat
- Beach Restoration
- Beach Restoration with Stabilizing Structures
- Revetment
- Hybrid Seawall-Revetment
- Seawall Removal
- Seawall Replacement
- Seawall Repair

Alternatives were evaluated based on the following criteria:

- Effectiveness (i.e. capable of achieving the project objectives)
- Design Considerations (i.e. suitability, durability, design life)
- Costs (i.e. initial costs, recurring costs, cost-benefit ratio)
- Feasibility (i.e. constructability, regulatory requirements, community support/opposition)
- Potential Impacts (i.e. coastal processes, marine habitat, shoreline access, adjacent properties)

Ideally, the recommended engineering alternative would satisfy the project objectives, while minimizing potential negative impacts to the environment and adjacent shorelines.

11.2 No Action

The *No Action* alternative would involve leaving the seawall in its existing location and condition with no repairs or modifications. This approach would do nothing to improve the condition or functionality of the seawall. The seawall is over 100 years old and is in a deteriorated condition. If the seawall is not repaired, the structure can be expected to continue to deteriorate. If the seawall deteriorates to a point that it is no longer serviceable, the structure may fail, or removal may be required.

The seawall protects the project site and the adjacent properties from erosion and wave overtopping. If the seawall were to fail or be removed, the terrestrial area would be unprotected. Flooding would occur more frequently, and property damage would be expected. Failure or removal of the seawall would not improve the condition of the beach or improve lateral shoreline access and would expose the adjacent properties to increased hazard risk.

The seawall also retains the terrestrial soils, which consist of a mixture of sand and clayey fill material. If the seawall failed or was removed, erosion of the terrestrial area would result in the release of terrigenous sediment into the nearshore waters and potential entrapment within the fishpond.

Advantages

- No cost.

Disadvantages

- Increases vulnerability of the project site to coastal hazards and sea level rise.
- Reduces wave overtopping under design wave conditions.
- Seawall would continue to provide inadequate resistance to design soil loads.

No Action would have no immediate impacts to the project site, the nearshore waters, marine habitat, or adjacent properties. However, the likelihood of seawall failure or removal would increase significantly over the long-term. If no mitigative action is taken to repair the seawall, damage will continue and the level of deterioration of the seawall could eventually result in significant negative impacts to the project site, the nearshore waters, marine habitat, and adjacent properties. *No Action* would not increase the resilience of the project site to sea level rise and is therefore not a preferred alternative.

11.3 Managed Retreat

Managed Retreat (also referred to as *managed realignment*) is a coastal management strategy that is intended to allow the shoreline to naturally move inland, rather than fixing the shoreline with engineered shore protection structures. *Managed Retreat* typically involves modification, relocation, or removal of existing structures to reduce hazard exposure and maintain a natural shoreline. *Managed Retreat* strategies can be horizontal or vertical in nature. Horizontal retreat strategies seek to reduce hazard exposure by moving structures further inland. Vertical retreat strategies seek to reduce hazard exposure by elevating structures above the hazard.

Shoreline setbacks are a "horizontal retreat strategy" that require development to be set back a minimum distance from the shoreline. The City & County of Honolulu requires shoreline setbacks for new construction along the shoreline. The purpose of the shoreline setback is to protect and preserve the natural shoreline, lateral shoreline access, and open space along the shoreline. Shoreline setbacks are also intended to reduce risks to property from coastal hazards. The proposed development for the project site includes construction of two (2) single-family homes. The City & County of Honolulu determined that the shoreline setback for the project site is 60 feet. The shoreline setback is a "horizontal retreat strategy" in that it creates a buffer zone that reduces the potential for the homes to be exposed to erosion and flooding.

Freeboard is a "vertical retreat strategy" that involves elevating structures above the Base Flood Elevation (BFE). The project site is located in a Special Flood Hazard Area (SFHA), which is subject to inundation by the 1% annual chance flood. The seaward portion of the subject property is located in Zone VE with a BFE of 13 feet. The landward portion of the property is located in Zone AE with a BFE of 13 feet, and Zone D where flood hazards are undetermined, but flooding is possible. The new homes will be constructed above the BFE. Elevating the structures above the BFE is a "vertical retreat strategy" in that it elevates the structures above the anticipated flood hazard.

The project site could be modified in the future to reduce risk to coastal hazards and sea level rise. For example, the ground floors of the homes could eventually be converted to non-habitable space and used for other purposes (e.g., parking or patio). This approach could be considered a "vertical retreat strategy" in that the at-risk infrastructure would be modified to accommodate flooding.

Another option for *managed retreat* could be a "phased reconfiguration" of the properties, which would involve gradually modifying or removing the structures closest to the shoreline and expanding and/or elevating the structures furthest from the shoreline. Modifying the infrastructure and development footprint in an incremental manner over time would provide the flexibility to adapt to changing conditions while maintaining the economic and recreational value of the property.

Advantages

- Reduces vulnerability of infrastructure to coastal hazards and sea level rise.
- Avoids costs and requirements associated with shore protection or beach restoration.
- Allows the shoreline to migrate naturally.

Disadvantages

- Does not address the damages and structural deficiencies of the existing seawall.
- Does not reduce wave overtopping under design wave conditions.
- No existing rules, programs or policies to manage or facilitate the retreat process.

Managed Retreat is a relatively new concept that is being evaluated for applicability in Hawaii. The Hawaii Office of Planning (OP) recently published a report entitled, *Assessing the Feasibility and Implications of Managed Retreat Strategies for Vulnerable Coastal Areas in Hawaii (2018)*. The study evaluated options to establish policies, regulations, tools, and programs to support a managed retreat strategy in response to sea level rise. The study found that retreat is one of three primary adaptation strategies, along with accommodation (e.g., freeboard) and protection (e.g., hybrid-seawall revetment), and that, prior to deciding upon retreat, accommodation and protection must be examined to determine which strategy is the best for the area dealing with coastal hazards, climate change and sea level rise. The study also found that retreat is only effective when done voluntarily and that economic incentive programs to fund retreat (e.g., buyouts, transferrable development rights, rolling easements) are unlikely to be effective due to the high cost of real estate in Hawaii. Finally, the report noted that retreat from chronic coastal hazards (e.g., erosion and sea level rise) is incremental and typically takes decades to complete.

Managed Retreat at the project site could potentially involve removal of the seawall, which would allow the terrestrial area to erode and sand to migrate naturally along the beach. *Managed Retreat* would avoid the costs associated with design, permitting, and construction of shore protection measures or beach restoration; however, costs associated with modifying, relocating, or removing the existing structures would be substantial. In the absence of the seawall, the terrestrial area would be exposed to erosion and flooding, and the planned single-family homes would be more vulnerable to coastal hazards and sea level rise.

Managed Retreat may be considered as a long-term option but is not necessary at this time. The existing seawall is in a serviceable condition. Repair and modification of the seawall would extend the life of the structure and increase the resilience of the property to sea level rise. Until retreat is determined to be feasible desirable or necessary, and rules, programs and policies are in place to facilitate the retreat process, other appropriate solutions should be considered. Managed retreat would not achieve the project objective of increasing resilience to sea level rise and is therefore not the preferred alternative.

11.4 Beach Nourishment

Beach nourishment typically involves placement of beach fill to specified profiles that are designed to augment the natural morphology of the beach to offset the effects of chronic, seasonal, or episodic erosion. Regulatory agencies and the public are generally supportive of beach nourishment because it has minimal environmental impacts and is consistent with State and County policies that seek to preserve and enhance beach resources.

The Hawaii Department of Land and Natural Resources, Office of Conservation and Coastal Lands (DLNR-OCCL) authorizes beach nourishment through the Small-scale Beach Nourishment (SSBN) program, which allows placement of compatible beach quality sand seaward of the shoreline in the Conservation District. There are two categories of SSBN authorizations: Category I (up to 500 cubic yards of sand), and Category II (up to 10,000 cubic yards of sand).

Beach nourishment projects are regulated by Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, which regulate discharges of fill material into waters of the United States. Placement of fill material seaward of the mean higher high water line (mhhw) is generally prohibited. In general, placement of fill material is limited to areas where a stable beach is typically present and additional fill is required to maintain a stable beach profile.

Based on a review of historical aerial photographs, when a beach is present along the shoreline, average beach width is 10 to 15 feet. In order to achieve a stable beach profile, the beach would need to be approximately 120 feet wide and the beach crest elevation would need to be approximately +8.0 feet msl. Beach nourishment at the project site would require placement of a large volume of sand fill inside the fishpond, which would cover a significant portion of the interior of the fishpond. Due to existing Federal and State regulations, discharge of such a large volume of fill material into waters of the United States may not be permissible. A conceptual plan for beach nourishment at the project site is shown in Figure 11-1 and Figure 11-2.

Advantages

- Provides a temporary increase in beach volume and width.
- Provides additional protection against wave overtopping.
- May provide some additional protection against wave overtopping.
- SSBN authorizations may allow for periodic renourishment.
- Agencies and the public are generally supportive of beach restoration projects.

Disadvantages

- Does not address the structural deficiencies of the existing seawall.
- Requires an adequate quantity of compatible beach quality sand.
- Requires discharge of fill material in waters of the United States.
- Sand is unlikely to remain stable without engineered stabilizing structures.
- Recurring costs for periodic renourishment could be high.

Beach nourishment would provide a short-term increase in beach volume and width at the project site. The existing fishpond walls would help to stabilize the sand fill. However, without stabilizing structures (e.g., groins), the beach profile would be unstable, and the sand would eventually be redistributed along the shoreline.

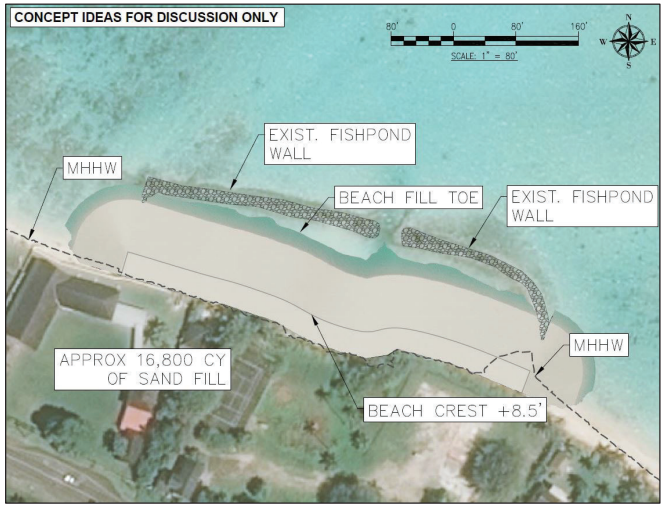


Figure 11-1 Conceptual plan view for small-scale beach nourishment

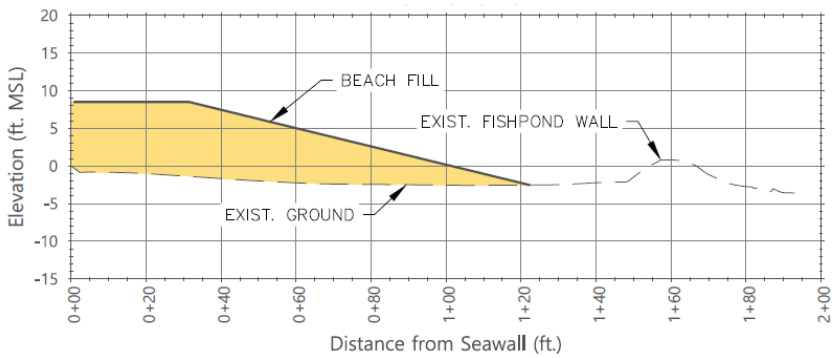


Figure 11-2 Conceptual section view for small-scale beach nourishment

11.5 Beach Restoration with Stabilizing Structures

One of the factors that can limit the effectiveness of beach nourishment projects is the loss of sand due to natural processes, such as longshore and cross-shore sediment transport. Some areas have natural features such as headlands, harbors, or reefs that disrupt sediment transport and naturally stabilize the sand. In some cases, it may be necessary to design engineered containment structures, such as groins, to maintain a stable beach. T-head groins decrease and reorient the amount of wave energy reaching the beach and create artificial littoral cells to stabilize the sand. An example of beach nourishment with stabilizing T-head groin structures is shown in Figure 11-3.

Beach nourishment accompanied by the construction of sand stabilization structures, such as groins, to minimize sand movement would be the most effective means for restoring and maintaining the beach resource, while providing long-term protection for the terrestrial area and infrastructure. A series of groin structures accompanied by beach fill would create stable, wide beach cells within the groins, stable fillets on the outside of each groin, and would reduce the loss of sand to the north and south.

A conceptual plan for beach nourishment with stabilizing structures at the project site is shown in Figure 11-4. The plan would consist of a single T-head groin aligned with the boundary between the properties, bounded by two (2) L-head groins aligned with the east and west lateral boundaries of the properties. The plan would require demolition and removal of the existing fishpond walls and placement of a large volume of sand fill seaward of mhhw. Due to existing Federal and State regulations, demolition of the fishpond and discharge of such a large volume of fill material into waters of the United States may not be permissible.

Beach nourishment with stabilizing structures would disrupt longshore sediment transport in the project area which could potentially result in beach narrowing to the east of the project site. The groins would be located seaward of the shoreline, so an easement would likely be required for the structures.

<u>Advantages</u>

- Provides a permanent increase in beach volume and width.
- Provides some additional protection against wave overtopping.
- Low maintenance.
- Agencies and the public are generally supportive of beach nourishment projects.

<u>Disadvantages</u>

- Does not address the structural deficiencies of the existing seawall.
- Requires removal of the existing fishpond walls.
- Requires an adequate quantity of compatible beach quality sand.
- Requires discharge of fill material (sand) in waters of the United States.
- Groins and beach fill would have a very large structural footprint.
- Very high costs for design, permitting, construction, and easements.

Beach nourishment with stabilizing structures would create a stable beach, improve lateral shoreline access, and provide long-term protection for the terrestrial area and infrastructure. However, the project would have a very large structural footprint and would require removal of the historic fishpond. This option would not address the structural deficiencies of the existing seawall and is therefore not the preferred alternative.

Figure 11-3 Beach nourishment with T-head groins at Iroquois Point, Oahu, Hawaii

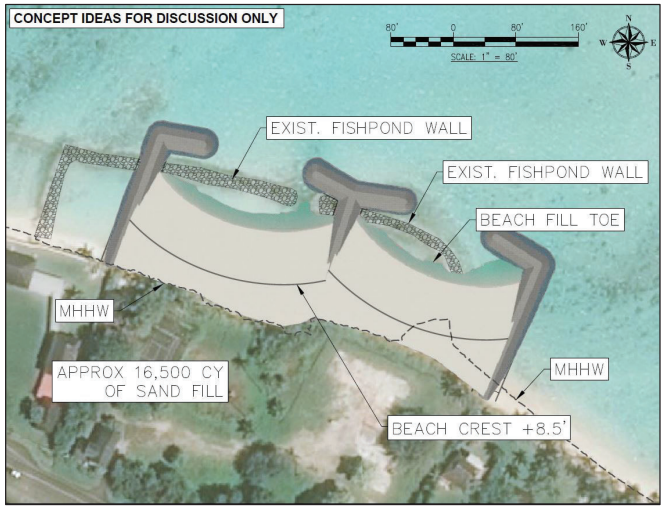


Figure 11-4 Conceptual plan view for beach nourishment with T-head groins

11.6 Revetment

A revetment is a sloping, un-cemented structure constructed of wave-resistant material. The most common method of revetment construction is to place a layer of armor stone, sized according to the design wave height, over an underlayer of smaller rock that sits atop filter fabric. The underlayer is designed to distribute the weight of the armor layer and to prevent loss of fine material through voids in the revetment. An example of a rock revetment at Kahului Harbor (Kahului, Maui) is shown in Figure 11-5.

Revetments in Hawaii are typically built on a slope of 1.5 to 2 horizontal to 1 vertical to ensure stability. Toe scour protection can be provided by excavating to place the toe on solid substrate, constructing the foundation below the maximum depth of anticipated scour, or extending the toe to provide a scour apron of excess stone. For large wave heights, a revetment may be constructed with a two-stone thick armor layer that uses a uniform stone size designed to be stable under the design wave conditions. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage. Should toe scour occur, the structure can settle and readjust without major failure. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs.

An advantage of a revetment is that the rough porous rock surface and sloping face of the structure will tend to absorb wave energy, reduce wave reflection, and may help to promote accretion of sand on a sandy beach when sufficient sand volume is available in the littoral environment. Additional advantages of revetments are that materials are readily available and localized damage can be easily repaired by placement of additional armor stone. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage.

A disadvantage of a revetment is that it would have a large structural footprint, which can be problematic in a coastal setting. The location of the revetment would affect the overall cost and permitting requirements. Revetments are typically constructed in areas where the terrestrial area is already threatened by erosion, such as along roadways. In these locations, the erosion threat is typically so severe that there is little terrestrial area to accommodate a revetment so the structure can only be constructed seaward of the shoreline. Hawaii Revised Statutes discourages construction of shore protection structures seaward of the shoreline in the Conservation District. Construction of a revetment landward of the shoreline would require extensive excavation of the terrestrial area. It is important to note that, even if the revetment were constructed landward of the shoreline, the future certified shoreline would likely be located at or near the crest of the structure, in which case an easement for the use of State submerged land may be required.

The rough and porous surface and flatter slope of revetments absorb and dissipate more wave energy than the smooth vertical surfaces of seawall structures. Revetments are more effective in reducing wave reflection, runup, and overtopping, which increases the potential for sand accumulation seaward of the structure. Because of its durability, flexibility, and reduced wave reflection, a revetment is often considered the best erosion control/shore protection measure for sites where shoreline hardening is considered appropriate.

Figure 11-5 Typical rock revetment (Kahului, Maui)

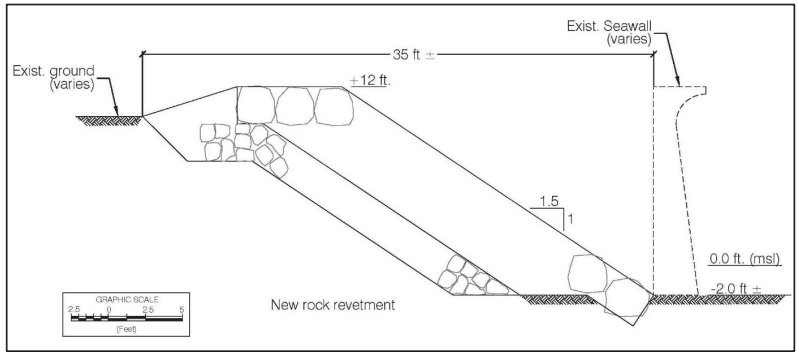


Figure 11-6 Conceptual section view for a rock revetment

Construction of a rock revetment at the project site would not necessarily require removal of the existing seawall. Given the location of the seawall and the open space inshore of the seawall, it is possible to leave the existing seawall in place and construct a new revetment entirely inshore of the seawall (Figure 11-6). The area over the revetment could be backfilled and landscaped to create usable open space. The existing seawall would remain the primary shore protection structure; however, if the seawall were to become critically damaged or fail, it could be removed, exposing the revetment. A revetment designed for the existing project site conditions would likely have a cross-shore footprint of more than 35 feet.

Advantages

+ Increases resilience to coastal hazards and sea level rise.
+ Provides additional protection against wave overtopping.
+ Construction landward of the shoreline would minimize potential environmental impacts.
+ Better wave energy dissipation characteristics than a seawall.
+ Less reflective than a seawall and may facilitate sand accretion seaward of the structure.
+ Does not negatively impact lateral shoreline access.
+ May not require removal of the existing seawall.

Disadvantages

– Largest structural footprint of the options considered.
– Very large structural footprint within the property.
– Very high costs for design, permitting, and construction.
– Existing boathouse would need to be removed or relocated.
– Existing seawall could be damaged during construction.
– Public could traverse the revetment creating potential privacy, security, and liability issues.
– Uncertainty regarding entitlement implications and regulatory requirements.
– Agency and public opposition to construction of new shore protection structures.

A *revetment* is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the property to sea level rise. However, the seawall is in a serviceable condition, so replacement of the structure is not necessary at this time. Furthermore, due to the large structural footprint within the property, and high costs for design, permitting, construction, a revetment is not the preferred alternative.

11.7 Hybrid Seawall-Revetment

Another potential long-term engineering solution for the project site is a *hybrid seawall-revetment*, which is a shore protection structure that combines a vertical seawall with a sloping rock revetment. A *hybrid seawall-revetment* would be composed of two primary elements: a seawall (i.e. sheet pile, reinforced concrete, or cemented rock masonry) and a uniform armor rock rubblemound revetment. An example of a hybrid seawall-revetment is shown in Figure 11-7.

Figure 11-7 Hybrid seawall-revetment (Kapaa, Kauai, Hawaii)

An advantage of a *hybrid seawall-revetment* is that the structure can be designed to be modified to withstand changing design wave conditions as sea level rises. Additional advantages of a *hybrid seawall-revetment* are that materials are readily available and localized damage can be easily repaired by placement of additional armor stone. Properly designed and constructed hybrid seawall-revetments are durable, flexible, and highly resistant to wave damage.

A disadvantage of a *hybrid seawall-revetment* is that it would have a relatively large structural footprint. The location of the structure would affect the overall cost and permitting requirements. Hawaii Revised Statutes discourages construction of shore protection structures seaward of the shoreline in the Conservation District. Construction of a *hybrid seawall-revetment* landward of the shoreline would require extensive excavation of the terrestrial area. It is important to note that, even if a *hybrid seawall-revetment* were constructed landward of the shoreline, the future certified shoreline would likely be located at or near the crest of the structure, in which case an easement for the use of State submerged land may be required.

Design heights for shore protection structures typically account for the effects of tides, surges, waves, and relative sea-level rise. Accounting for projected sea level rise in the design of shore protection structures often requires increasing the design height of the structure. Sea-level driven changes in wave characteristics, and to a lesser extent, tides, amplify the resulting design heights by an average of 48–56%, relative to design changes caused by sea level rise alone. (Arns et.al., 2017).

A *hybrid seawall-revetment* that is designed to account for sea level rise 50 years in the future would have a larger structural footprint than is required for current conditions. A larger structure would impact viewplanes along the shoreline and from within the property. An alternative approach is to design a structure that can be modified as sea level rises. A *hybrid seawall-revetment* would provide the flexibility to modify the structure as conditions change over time. A conceptual design for a *hybrid seawall-revetment* at the project site is shown in Figure 11-8.

The structure would initially consist of a revetment and retaining wall designed for 1 foot of sea level rise. Coupling the revetment with a retaining wall reduces the overall footprint of the structure while maintaining adaptability. The revetment crest consists of a three-stone crest. Stone size would be based on design wave calculations taking into account sea level rise projections through 2070. The structure is be consistent with standard revetment design. The retaining wall would only extend about 6 feet below existing grade, which reduces the size and construction impact.

The structure would eventually be modified when sea level is 1.5 feet higher, at which time the crest stones would be removed and reset to make the revetment crest 1.5 feet higher. The revetment would still have a three-stone crest. When sea level rises another 1.5 feet, the retaining wall crest elevation would be raised. The revetment crest could be raised one additional time to produce a two-stone crest at elevation +12 feet (msl), making the structure adequate for 2070 design wave conditions.

<u>Advantages</u>

- + Increases resilience to coastal hazards and sea level rise.
- + Provides additional protection against wave overtopping.
- + Structure could be adapted to withstand future design wave forces (i.e. sea level rise).
- + Construction landward of the shoreline would minimize environmental impacts.
- + Better wave energy dissipation characteristics than a seawall.
- + Less reflective than a seawall.
- + May facilitate sand accretion seaward of the revetment.
- + No negative impacts on lateral shoreline access.

<u>Disadvantages</u>

- – Large structural footprint.
- – High costs for design, permitting, construction, and future modifications.
- – Existing seawall could be damaged during construction.
- – Potential exposure to personal injury liability.
- – Agency and public opposition to construction of new shore protection structures.

A *hybrid seawall-revetment* is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the property to sea level rise. However, the seawall is in a serviceable condition, so replacement of the structure is not necessary at this time. Furthermore, due to the large structural footprint within the property, and high costs for design, permitting,

construction, and potential future modifications, a hybrid seawall-revetment is not the preferred alternative.

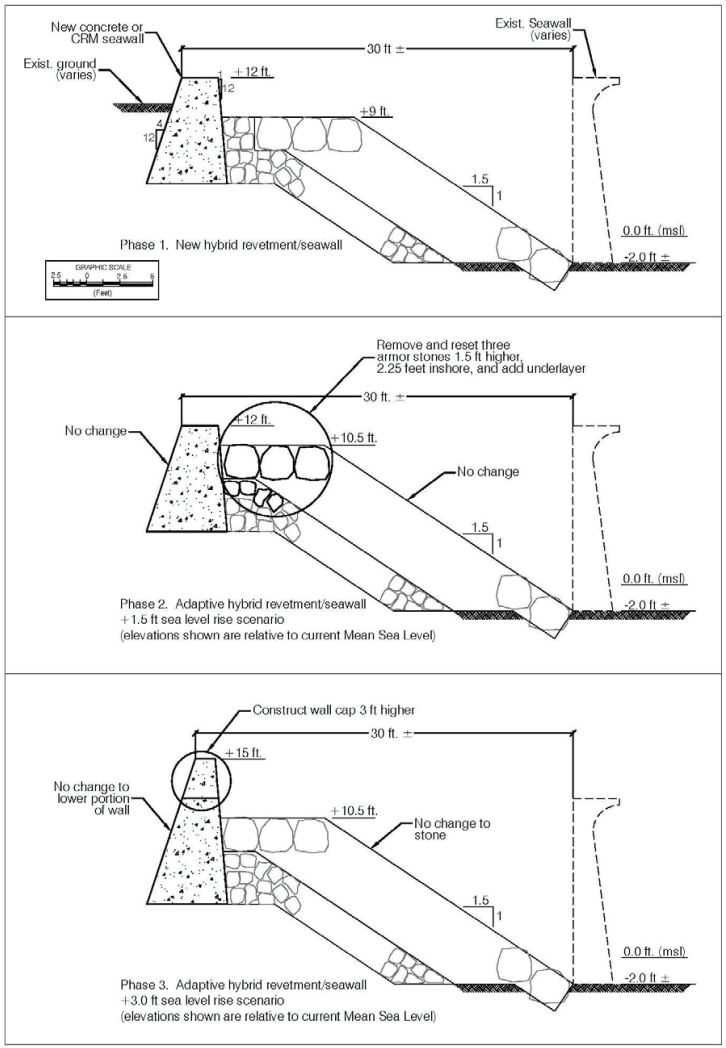


Figure 11-8 Conceptual section view for a hybrid seawall-revetment

11.8 Seawall Removal

The *Seawall Removal* alternative would involve removing the existing seawall and allowing the shoreline to migrate naturally. As sea levels continue to rise, this would likely result in significant erosion, flooding, and permanent loss of land. The seawall is covered by an easement that confers unto the Grantee the "right, privilege, and authority to use, maintain, repair, replace and remove the existing seawall". The easement also requires that the Grantee "shall keep the easement area and the improvements thereon in a safe condition". If the existing seawall is substantially (greater than fifty percent) or completely destroyed, the easement shall cease and terminate automatically.

The seawall is over 100 years old and is in a deteriorated condition. Repairs are necessary in order to maintain the seawall in a safe condition and prevent it from being "substantially or completed destroyed", which would result in termination of the easement. If the seawall is not repaired and continues to deteriorate to a point that it is no longer serviceable, removal may be required.

The seawall protects the project site and the adjacent properties from erosion and wave overtopping. If the seawall were to be removed, the terrestrial area would be exposed to erosion and wave overtopping would also occur more frequently, and property damage would be expected. Removal of the seawall would not improve the condition of the beach or improve lateral shoreline access and would expose the adjacent properties to increased hazard risk.

The seawall also retains the terrestrial soils, which consist of a mixture of sand and clayey fill material. If the seawall was removed, erosion of the terrestrial area would result in the release of terrigenous sediment into the nearshore waters. The fishpond is a semi-enclosed structure and has the potential to impound eroded sediment. There does not appear to be a natural mechanism to transport sediment out of the fishpond. If the seawall failed or was removed, the terrestrial area would erode, and the influx of terrigenous material could result in sedimentation that could negatively impact water quality and habitat within the fishpond.

Removal of the seawall would require extensive excavation. The excavation would disturb a large volume of the existing soil in the terrestrial area making it more unconsolidated and prone to erosion. Removal of return walls would expose adjacent properties to increased hazard risk.

<u>Advantages</u>

+ None.

<u>Disadvantages</u>

- High costs for demolition and removal.
- Increases vulnerability to erosion and wave overtopping.
- Decreases resilience to coastal hazards and sea level rise.
- Potential negative impacts on water quality and habitat within the fishpond.
- Potential environmental impacts during the demolition and removal process.

Seawall Removal would increase vulnerability to coastal hazards and sea level rise and is therefore not the preferred alternative.

11.9 Seawall Replacement

The purpose of the *seawall replacement* option is to increase the durability and performance characteristics of the wall over the long term and to correct inherent structural deficiencies in the existing wall designs. Replacement would consist of construction of a new reinforced concrete wall landward and independent of the existing walls. A new seawall would meet or exceed modern structural code requirements and be designed to increase the crest height of the structure to increase resilience to future sea level rise. Replacing the existing walls would provide greater flexibility for integrating shoreline access into the wall design. A conceptual drawing showing the *seawall replacement* option is shown in Figure 11-9.

Advantages

- + Increases resilience to coastal hazards and sea level rise.
- + Provides adequate protection against wave overtopping.
- + Effective for the project planning horizon of 50 years.
- + Designed to meet current structural code requirements.
- + Provides long term resilience against spalling and abrasion.
- + Founded on hard substrate to mitigate long term undermining concerns.
- + Provides more options to improve the seawall (appearance, size, specs, ocean access).

Disadvantages

- – Construction costs would be significantly higher than the repair option.
- – Construction duration would be significantly longer than the repair option.
- – Excavation to the depth required for scour resistance would be difficult and costly.
- – May require demolition and removal of the existing walls.
- – Requires adequate equipment access and clearance landward of the wall.
- – Agency and public opposition to construction of new shore protection structures.

If a new seawall was constructed at the location of the existing wall, the existing seawall would need to be demolished and a temporary barrier constructed. Construction would be time and labor-intensive and additional care would need to be taken to mitigate potential adverse impacts to the fishpond with this more extensive construction. Due to the battered profile identified behind Walls 1, 2 and 3, and the lower allowable bearing pressure values for Walls 4 and 5, constructing a new seawall against the rear face of the existing walls does not appear to be feasible.

A new seawall would require a deep foundation, which would require extensive excavation to uncertain depths. Construction of a new seawall would likely require demolition and removal of the existing walls. The cost of demolition and removal would be significant.

Seawall Replacement is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the project site to sea level rise. However, due to the high costs for demolition and removal of the existing seawall, and regulatory restrictions on construction of new shore protection structures, *Seawall Replacement* is not the preferred alternative.

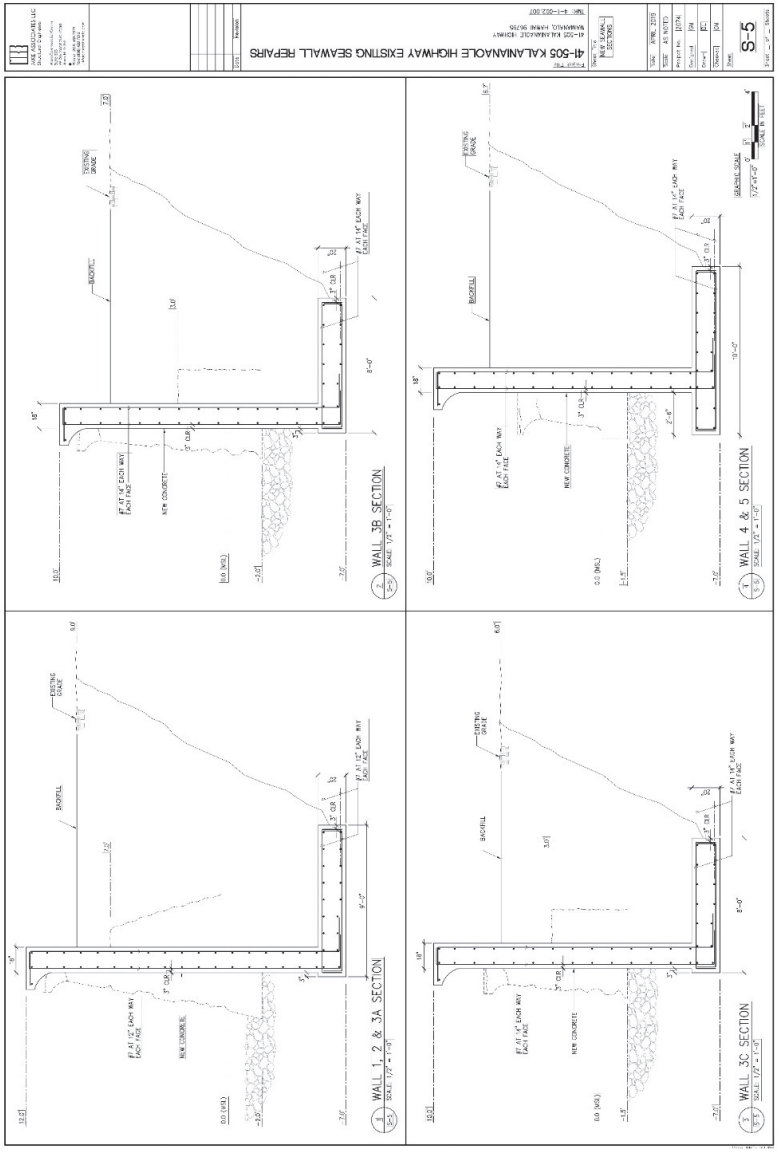


Figure 11-9 Conceptual design for seawall replacement (MKE)

11.10 Seawall Repair

The *Seawall Repair* alternative includes a combination of repairs and modifications designed to achieve adequate resistance to design soil loads, reduce wave overtopping under design wave conditions, and increase the resilience of the property to sea level rise. The seawall is covered by an easement that confers unto the Grantee the "right, privilege, and authority to use, maintain, repair, replace and remove the existing seawall". The easement also requires that the Grantee "shall keep the easement area and the improvements thereon in a safe condition". The seawall is over 100 years old and is in a deteriorated condition. Repairs are necessary in order to maintain the seawall in a safe condition. Modifications are necessary to reduce potential for wave overtopping with sea level rise.

Conceptual plans for the *Seawall Repair* option were prepared by GFDS Engineers (GFDS). The scope of work and conceptual plan for the West Lot is shown in Figure 11-10 and Figure 11-11. The scope of work and conceptual plan for the East Lot is shown in Figure 11-12 and Figure 11-13. A key component of the design is increasing the crest elevation of walls 3C, 4, and 5 to +9.0 feet (msl) to create a uniform wall height.

The following repairs would be performed for all wall sections:

- Repair delaminations and spalls from isolated small steel connections and random embedded steel at the front surface of the wall.
- Patch vertical and diagonal cracks to mitigate potential loss of fines through cracks.
- Repoint and parge shallow and more deeply abraded and missing front surface mortar.
- Fill undermined areas at the toe of the wall with tremie concrete, remove material susceptible to scour at the toe of the wall as is feasible and fill the void with tremie concrete to increase scour resistance at the wall base.
- Replace missing, settled and spalled concrete masonry unit (CMU) wall extensions with new reinforced concrete wall extensions.

In addition to the repairs, the following modifications would be performed by individual wall section:

Wall 1 Remove and replace delaminated areas of the top cap of the splashguard. Construct a concrete rubble masonry (CRM) return wall.

Wall 2 Remove and replace delaminated areas of the top cap of the splashguard

Wall 3A Remove and replace delaminated areas of the top cap of the splashguard. Install concrete width extension to provide adequate resistance to design overturning forces.

Wall 3B Remove and replace delaminated areas of the top cap of the splashguard. Install concrete width extension to provide adequate resistance to design overturning forces.

Wall 3C Remove and replace delaminated areas of the top cap of the splashguard. Increase wall crest elevation from +7.0 feet (msl) to +9.0 feet (msl).

Wall 4 Remove delaminated and spalled splashguard and replace with a new reinforced concrete splashguard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide adequate resistance to design

overturning forces. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet msl.

Wall 5 Remove delaminated and spalled splashguard and replace with a new reinforced concrete splashguard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide adequate resistance to design overturning forces. Reconstruct 15-foot section of wall that was previously removed. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet msl.

In addition to the proposed repairs and modifications, a new buttress wall would be constructed at the southeast end of the property and a new ocean access would be constructed at the boundary between the two properties.

Buttress Wall

The new buttress wall would be an 18-inch wide buttress wall founded on a new 5.0-foot-wide by 1.5-foot-deep footing (Figure 11-14). The design intent is to provide storm surge and scour protection at the Southeast corner of the East Lot where the existing seawall stops at the property line. The new buttress wall would be behind the existing seawall, running parallel 10 feet to the Southeast property line. The top of wall would be +8.0 feet MSL or 1.0 feet below the existing grade. The bottom of the wall would be +2.5 feet MSL. The total length of the new buttress wall would be approximately 20 linear feet. The buttress wall and all associated construction work would occur landward of the existing seawall. No in-water work is proposed.

Ocean Access Wall

The new ocean access wall would be an approximately 24" wide concrete site wall founded on a new 12" concrete mat slab (Figure 11-14). The design intent is to provide storm surge protection at stair access while maintaining the existing seawall opening. The new ocean access wall would be located approximately 15' behind the existing ocean stair access and is partially on the West Lot and East Lot. The top of wall would be +8.0 feet mean sea level (MSL). The bottom of wall would be +4.0 feet MSL. The total length of new ocean access wall would be approximately 50 linear feet. The ocean access wall and all associated construction work would occur landward of the existing seawall. No in-water work is proposed.

The proposed repairs would be conducted landward of the existing seawall and would have no impact on natural beach processes, shoreline access, or existing viewplanes. Maintaining the existing seawall would protect the project site and the adjacent properties from erosion and wave overtopping. Maintaining the existing seawall would also prevent erosion of the terrestrial soils, which could negatively impact water quality and habitat within the fishpond. The proposed increase in the crest elevation of Walls 3C, 4, and 5 to +9 feet (msl) would be 2 feet above the existing grade in the terrestrial area and would not substantially alter existing viewplanes to or along the shoreline.

Advantages

+ Provides adequate resistance to design soil loads for all wall sections.
+ Increases resilience to coastal hazards and sea level rise.
+ Reduces potential for wave overtopping for Walls 3C, 4, and 5.
+ Construction costs would be significantly lower than the seawall replacement option.
+ Construction would be significantly faster than the seawall replacement option.

+ Does not require demolition and removal of the existing walls.
+ No negative impacts on lateral shoreline access or coastal processes.
+ No negative impacts on viewplanes to or along the shoreline.

Disadvantages

– Repairs are labor intensive and require specialized materials.
– Does not improve potential for sand accumulation seaward of the seawall.

Seawall Repair is an appropriate engineering solution for the project site and would satisfy the project objective to increase the resilience of the project site to sea level rise. The proposed repairs and modifications are the most cost-effective and least environmentally impactful approach to maintain the existing seawall and reduce potential for wave overtopping with sea level rise. *Seawall Repair* is therefore the preferred alternative.

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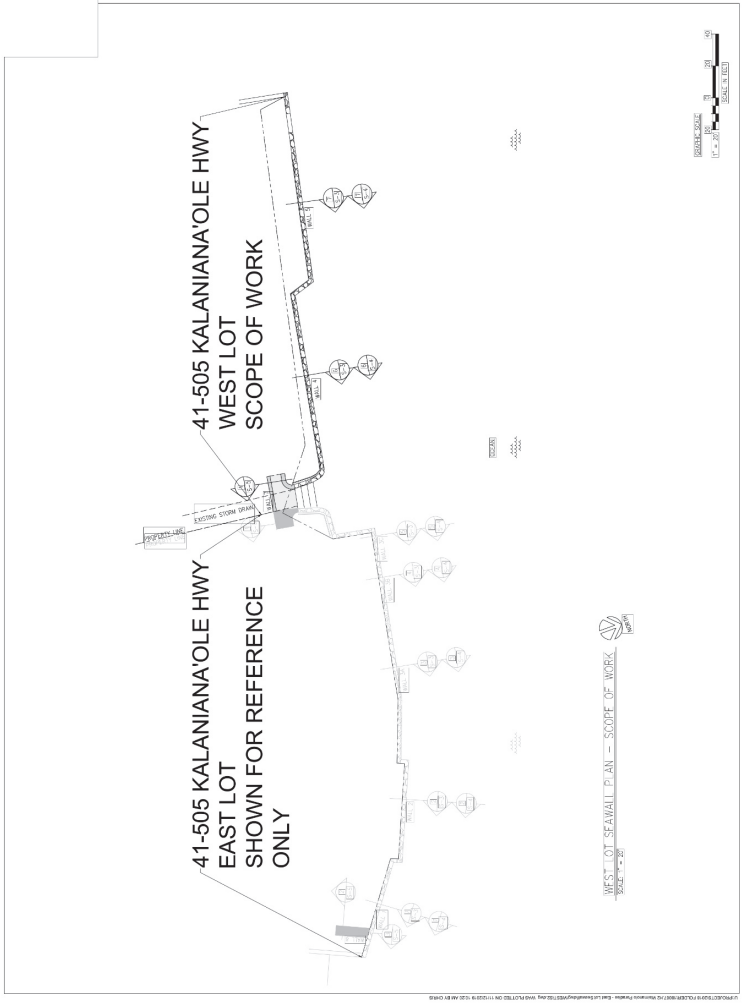

Figure 11-10 West Lot scope of work for seawall repairs (GFDS)

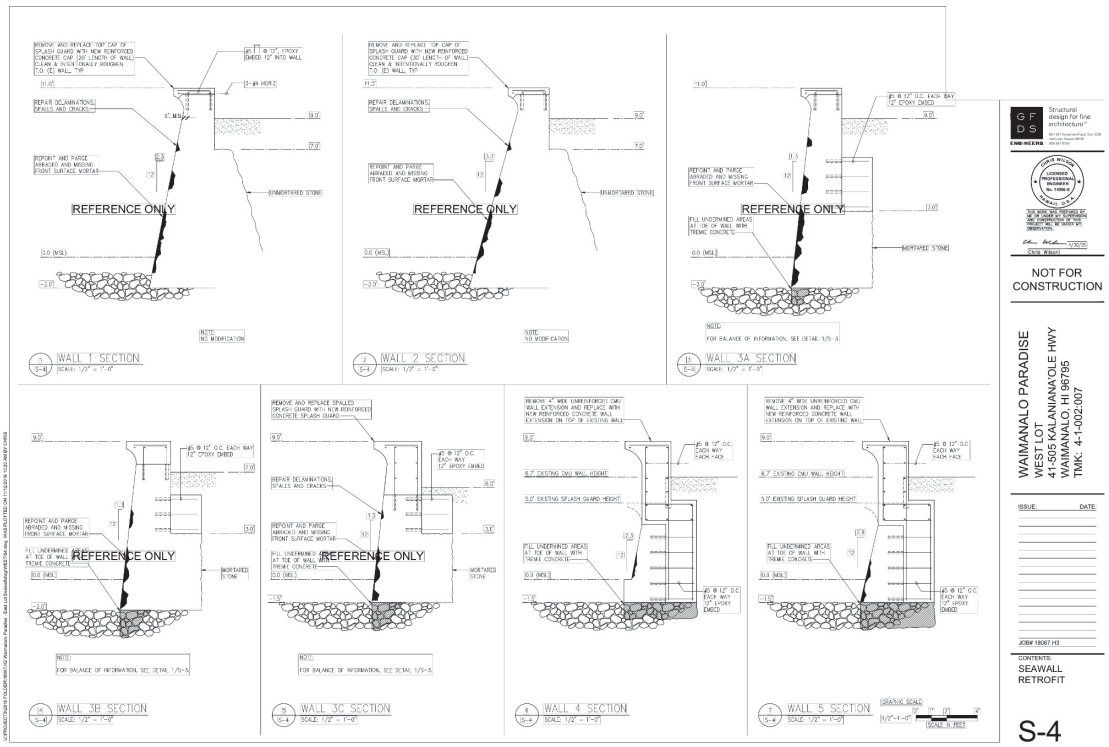

Figure 11-11 West Lot conceptual plan for seawall repairs (GFDS)

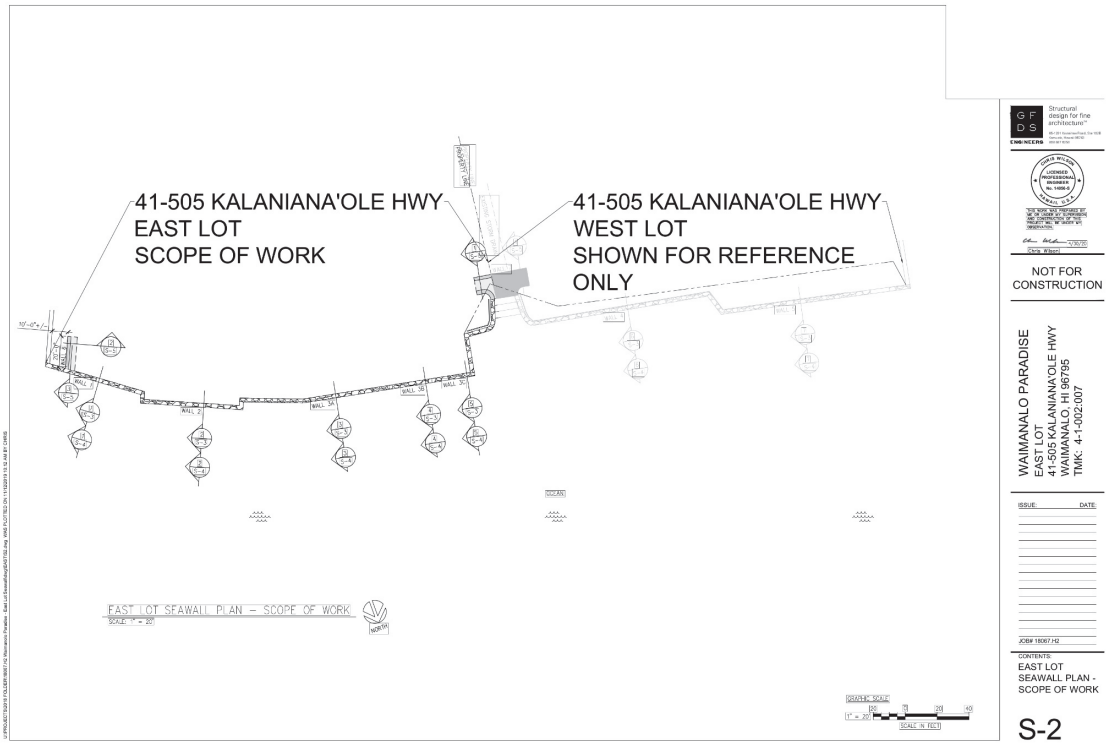

Figure 11-12 East Lot scope of work for seawall repairs (GFDS)

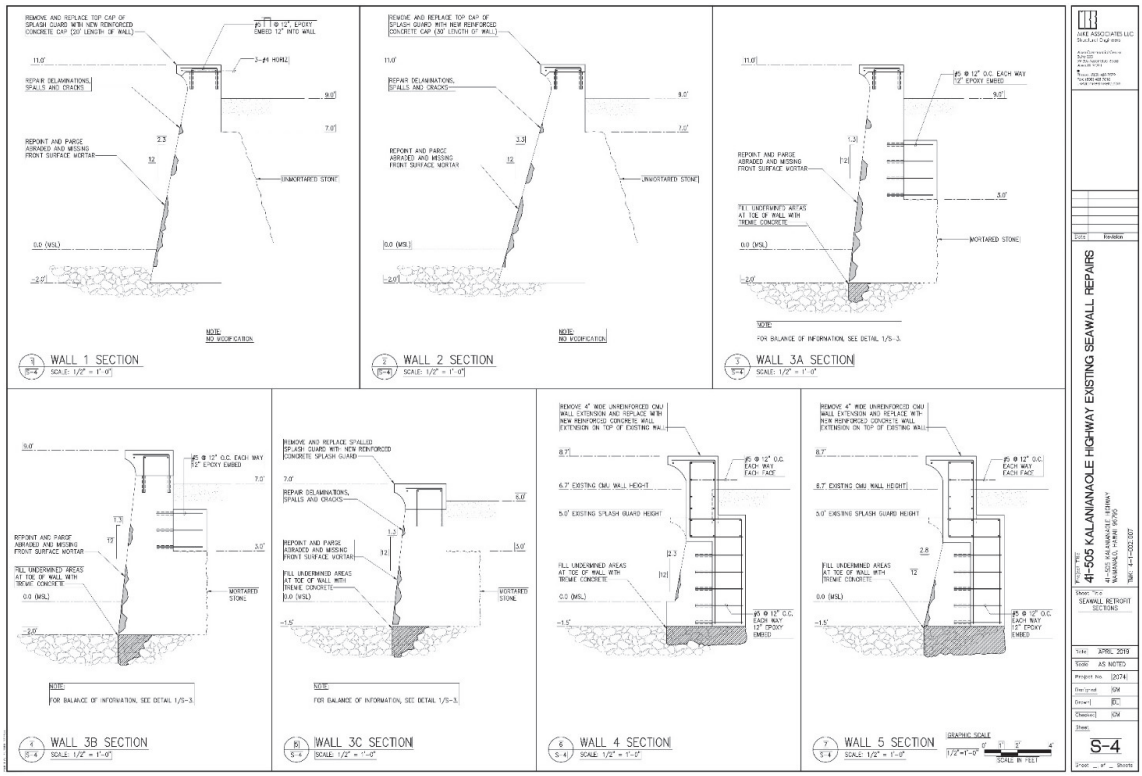

Figure 11-13 East Lot conceptual plan for seawall repairs (GFDS)

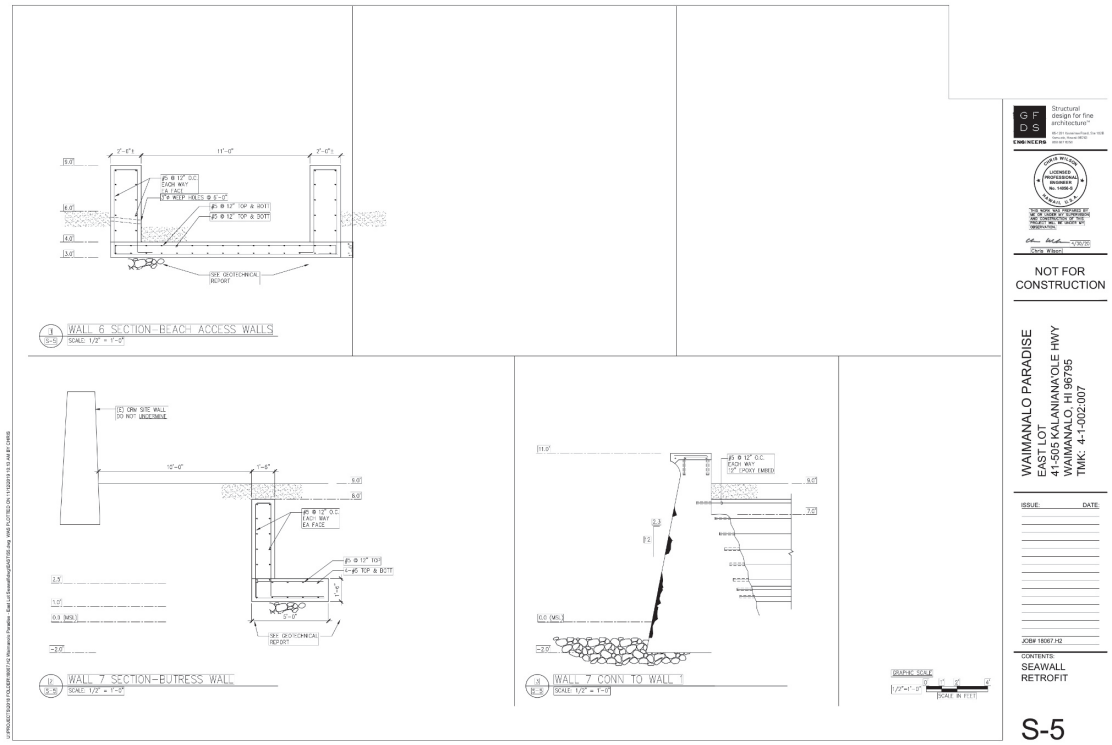

Figure 11-14 Conceptual plans for new buttress wall and ocean access (GFDS)

12. ENVIRONMENTAL REVIEW, PERMITTING & CONSTRUCTION

12.1 Environmental Review

Hawaii's environmental impact statement law (Chapter 343, Hawaii Revised Statutes) requires the preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) for more substantial projects. Based on the scope of the proposed seawall repairs, SEI anticipates that the project will require an EA.

The environmental review process would entail the following tasks:

- Early consultation meeting with relevant agencies, groups, and individuals;
- Submission of a Draft EA (DEA) to the Hawaii Office of Environmental Quality Control (OEQC), including responses to comments received during the early consultation meeting;
- Notice of Anticipated Finding of No Significant Impact (AFONSI) by the approving authority;
- Submission of a Final EA (FEA) to the OEQC, including responses to comments received during review of the DEA, and;
- Notice of FEA and Finding of No Significant Impact (FEA-FONSI) by the approving authority.

The EA may require additional studies and engineering services including but not limited to:

- Marine Biota & Water Quality Assessment
- Historical, Cultural, and Archaeological Assessment
- Cultural Impact Assessment
- Recreational Impact Assessment

The environmental review process will determine whether the project can be advanced to final design, permitting, and construction.

12.2 Permitting

The proposed seawall repairs will require approvals the State of Hawaii and City & County of Honolulu. Portions of the repair work would be landward of the shoreline in the Special Management Area, which will require approvals from the City & County of Honolulu. Final approval will be required from the Hawaii Board of Land and Natural Resources.

The proposed seawall repairs will require the following regulatory permits and approvals:

- Board of Land and Natural Resources Approval
- Shoreline Setback Variance
- Building Permit

Board of Land and Natural Resources Approval

The Hawaii State Legislature is the lawmaking body of the State of Hawaii. The Hawaii Department of Land and Natural Resources (DLNR) is the designated lead agency with regulatory authority over Public Trust lands, which includes unencumbered State land and submerged land. The unencumbered State land seaward of the record boundary, including the seawall, is covered by a non-exclusive easement. The Board of Land and Natural Resources (BLNR) governs land uses in the easement area. The proposed seawall repairs would require approval from the BLNR.

Shoreline Setback Variance

The City & County of Honolulu Department of Planning and Permitting (DPP) is the designated lead agency with regulatory authority over development landward of the shoreline within the shoreline setback area. Revised Ordinances of Honolulu (ROH) Chapter 23 establishes the types of land uses that are permissible within the shoreline setback area. The proposed seawall repairs would require a Shoreline Setback Variance (SSV) and Building Permit from the City & County of Honolulu.

12.3 Construction

Construction is planned to commence September 1, 2020 and be completed by December 31, 2020. The proposed project would take approximately 4 months to complete. Construction operations would be conducted between 7:30am and 4:30pm. The budgetary construction cost estimate for the *seawall repair* option is $3,188,900.

Construction Sequence

1. Mobilization
2. Conduct pre-construction Inspection
3. Install Best Management Practices
4. Repair voids with tremie concrete
5. Install concrete strengthening landward of existing wall and demo/remove boat ramp
6. Reconstruct removed section of Wall 5
7. Repair or replace delaminated splashguards
8. Repair cracks, spalls, and delamination on all wall sections
9. Install CRM ocean access walls at center of property
10. Install CRM buttress wall at east end of seawall
11. Demobilization

Project Materials

- 8" diameter BioSocks
- Non-woven geotextile fabric
- Concrete barriers - Jensen precast
- Form materials (3/4" MDO plywood sheets, 2x4x8 support lumber, collars, bolts, clamps)
- Stainless steel duplex reinforcing dowels and bars
- Simpson Strong Tie Set XP Epoxy Adhesive
- Simpson FX-225 underwater marine grout
- Sikacrete 211 SCC Plus
- Sika Armatec Epochem 110
- Sika - Latex R polymer modified admixture
- SikaQuick VOH patching material
- Concrete - 4000 PSI commercial mix with admixture

Project Equipment

- Cement mixer
- Concrete trailer pump
- Concrete vibrator

- Forklift
- Loader/Backhoe
- Flatbed
- Pickup truck
- Hydraulic ram
- Air compressor
- Oxy-acetylene torch
- 5kw gas-powered generator
- Shoring shields
- Pipe shoring jacks
- Concrete drilling bits and chipping bits

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APPENDIX B

Baseline Assessment of the Marine Environment

Prepared by Marine Research Consultants, Inc.

BASELINE ASSESSMENT OF THE MARINE ENVIRONMENT
WAIMANALO PARADISE SEAWALL RETROFIT
WAIMANALO, OAHU, HAWAII

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August 28, 2019

I. INTRODUCTION AND PURPOSE

The Waimanalo Paradise property is fronted by a seawall constructed of stone and concrete grout that was built between 1911 and 1928. The seawall, which forms the inner boundary of Pahonu fishpond, is approximately 175 meters (m) long and can be categorized into seven (7) segments (1, 2, 3A, 3B, 3C, 4, and 5) based on observed differences in height and profile. A structural assessment of the condition of the seawall identified various damages and structural deficiencies including cracks, delamination, spalling, abrasion, undermining, and sinkholes. Portions of the walls were determined to have inadequate design stability. The walls appear to be functioning but do not comply with modern design standards or codes. The primary objective of the project is to repair the seawall to increase the resilience of the property to sea level rise.

Sea Engineering, Inc., (SEI) evaluated options to repair, retrofit, or replace the existing seawall. Retrofit was selected as the preferred option. The objectives of the retrofit option are to 1) provide adequate resistance to design retained soil loads, and 2) provide a similar height above retained soil to prevent wave overtopping. The retrofits will consist of structural and cosmetic repairs. Structural repairs will include increasing the height and width of wall sections 4 and 5, and the width of the upper portion of Wall 3 so that these wall sections have similar resistance to design overturning forces and height above the retained soil as wall sections 1 and 2.

This report, intended to support the 401 WQC application, provides results of field assessments of the physical/ chemical and biological composition of nearshore waters encompassing the areas that may be affected by the retrofits of the Waimanalo Paradise seawall.

II. WATER QUALITY

A. Methods

The purpose of the assessment is to provide a quantitative depiction of the existing condition of marine water chemistry in the area that has the potential to be affected by the proposed seawall retrofit project. Evaluation of the existing condition of the water chemistry provides an insight into the physical and chemical factors that influence the marine setting. Understanding the existing physical and chemical

conditions of the marine environment provides a basis for predicting the potential affects that might occur as a result of the proposed project.

Water chemistry field collection was conducted on July 15, 2019. Water chemistry was assessed by collecting four linear sets of samples (i.e. transects) extending perpendicular to the shoreline, extending from the highest wash of waves to approximately 50 m offshore (Figure 1). All samples were collected by investigators working from a stand-up paddleboard. Transect 1 was located off the west end of the Waimanalo Paradise property line, Transects 2 and 3 extended from the central regions of the property through Pahonu fishpond, and Transect 4 was located at the east end property (Figure 1).

Water samples were collected at four locations along each transect starting at the most landward end adjacent to the beach. Such a sampling scheme is designed to span the greatest range of salinity with respect to potential freshwater efflux at the shoreline. Sampling was more concentrated in the nearshore zone because this area is closest to the region where seawall work will be performed, and hence is most important with respect to identifying the effects of shoreline modification. At sampling stations within 10 m of the shoreline, water samples were collected at a single depth approximately in the mid-point of the water column. Beyond 10 m from the shoreline two samples were collected at each station; a surface sample was collected within 10 centimeters (cm) of the air-water interface and a bottom sample was collected within 20 cm of the seafloor.

Water quality parameters evaluated included all specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (b) (Open Coastal waters) of the State of Hawaii Department of Health Water Quality Standards (HDOH-WQS). These criteria include: total nitrogen (TN), nitrate + nitrite nitrogen (NO_3^- + NO_2^-, hereafter referred to as NO_3^-), ammonium nitrogen (NH_4^+), total phosphorus (TP), Chlorophyll a (Chl *a*), turbidity, temperature, pH, and salinity. In addition, silica (Si) and orthophosphate phosphorus (PO_4^{-3}) were reported because these constituents are sensitive indicators of biological activity and the degree of groundwater mixing.

Analyses for Si, NH_4^+, PO_4^{3-}, and NO_3^- were performed with a Seal Analytical AutoAnalyzer 3 HR (AA3HR) using standard methods for seawater analysis. TN and TP were analyzed in a similar fashion following digestion. Total organic nitrogen (TON) and total organic phosphorus (TOP) were calculated as the difference between TN and dissolved inorganic N and TP and dissolved inorganic P, respectively.

Water for other analyses was kept chilled until analysis. Chl *a* was measured by filtering 150 ml through GFF/F glass-fiber filters; pigments on filters were extracted in 90% acetone in the dark at -20 °C for 24 hours. Fluorescence of the extract was measured with a Turner Designs Trilogy Fluorometer model 7200-000 equipped with an extracted chlorophyll non-acidification module. Salinity was determined using a Mettler Toledo Seven Excellence Multi-parameter meter with an InLab 731-ISM conductivity probe, calibrated to a Hach Instruments traceable salinity standard of 35.00 ppt, 53.0 mS/cm, with a readability of 0.01 parts per thousand (‰ or ppt). Turbidity was determined using a Hanna Instruments Model #HI88703 Turbidimeter, and reported in nephelometric turbidity units (NTU) (precision of 0.01 NTU). *In situ* measurements of salinity, temperature and depth were acquired using an RBR-Concerto CTD calibrated to factory standards.

EPA and Standard Methods (SM) methods that were employed for chemical analyses, as well as detection limits, are listed in the Code of Federal Regulations (CRF) Title 40, Chapter 1, Part 136, are as follows:

NH_4^+: EPA 350.1, Rev. 2.0 or SM4500-NH3 G, detection limit 0.48 µg/L.
NO_3^- + NO_2^-: EPA 353.2, Rev. 2.0 or SM4500-NO3F, detection limit 0.084 µg/L
PO_4^{-3}: EPA 365.5 or SM4500-P F, detection limit 0.28 µg/L.
Total P: EPA 365.1, Rev. 2.0 or SM4500-P E J, detection limit 0.93 µg/L.
Total N: SM 4500-N C., detection limit 1.96 µg/L.
Si: EPA 370.1 or SM 4500 SiO2 E, detection limit 0.45 µg/L.
Chlorophyll *a*: SM 10200, detection limit 0.006 µg/L.
pH: EPA 150.1 or SM4500H+B, detection limit 0.002 pH units
Turbidity: EPA 180.1, Rev. 2.0 or SM2130 B, detection limit 0.008 NTU.
Temperature: SM 2550 B, detection limit 0.01 degrees centigrade.
Salinity: SM 2520, detection limit 0.003 ppt.
Dissolved Oxygen: SM4500 O G, and detection limit 0.01% sat.

All fieldwork was conducted by Dr. Steven Dollar and Ms. Andrea Millan. All laboratory analyses were conducted by Marine Consulting and Analytical Resources, LLC, located in Honolulu.

B. Results

1. *Distribution of Chemical Constituents*

The nearshore area off the Pahonu fishpond consists of a seawall that abuts a rubble-boulder base. Seaward of the seawall and within the rock walls that comprise the fishpond boundaries, bottom composition consists of a shallow surface of coarse sand. The outer wall of the fishpond contains an opening that provides a tidal channel (makaha) facilitating exchange of water between the pond and the open ocean. The partial isolation of the fishpond is reflected in the patterns of water chemistry distribution.

Tables 1 and 2 show results of all water chemistry analyses on samples collected off the Waimanalo Paradise property on July 15, 2019. Concentrations of eight dissolved nutrient constituents are plotted as functions of distance from the shoreline in Figure 2. Values of salinity, Chl *a*, turbidity, pH, temperature, and dissolved oxygen are plotted as functions of distance from the shoreline in Figure 3.

Several patterns of distribution are evident in Tables 1 and 2 and Figures 2 and 3. Most evident is that on three of the four transects there are elevated values of several nutrient constituents at the shoreline that decrease with distance from shore. The values of Si are most elevated at the shoreline of Transect 2, coupled with correspondingly low values of salinity (Figure 3). While less than on Transect 2, concentrations of Si near the shoreline are also elevated relative to offshore values on Transects 3 and 4, but not on Transect 1. The pattern of elevated Si and lower salinity is indicative of freshwater entering the ocean at the shoreline. Such input of freshwater at the shoreline and retention within Pahonu fishpond is most pronounced at Transect 2 at the western boundary of the Waimanalo Paradise property. At a distance of 50 m from shore, values of Si and salinity were nearly identical at all four transects, indicating that at this distance from shore, all groundwater entering the ocean at the shoreline is mixed to background coastal ocean levels.

The concentrations of NO_3^-, NH_4^+, and TN on all transects show a general trend of elevated values at the shoreline with decreasing concentrations moving seaward. This trend is most apparent at Transect 4, and least evident on Transect 1. As there is depressed salinity in the nearshore waters of all four transects (Figure 3), the source of these elevated nutrients is likely from groundwater input at the shoreline.

Considering physical properties of the water column, turbidity, Chl *a*, temperature, dissolved oxygen, and pH all display similar patterns, with peak values at the shoreline, and decreasing values with distance seaward (Figure 3). At the shoreline the values of all of these physical properties were highest at Transect 2, located at the western boundary of the Waimanalo Paradise property.

2. *Compliance with HDOH-WQS Criteria*

State of Hawaii Department of Health Water Quality Standards (HDOH-WQS) that apply to the areas offshore of the Waimanalo Paradise are listed as "open coastal water" in HRS Chapter §11-54-6(b). Two sets of standards are listed depending on whether an area receives more than 3 million gallons per day (mgd) of freshwater input per shoreline mile ("wet standards"), or less than 3 mgd of freshwater input per shoreline mile ("dry"). As the study area off the northeast coast of Oahu probably receives more than 3 mgd per mile, wet criteria were used for this evaluation.

The HDOH-WQS are also separated into three standards: 1) geometric means, 2) "not to exceed more than 10% of the time," and 3) "not to exceed more than 2% of the time." As all of these classifications require multiple samplings, they cannot be used for a strict evaluation of whether a single sampling is within compliance standards. However, these values provide a guideline to evaluate the overall status of sampled waters in terms relative to State standards.

Shown in Tables 1 and 2 are all values that exceed the "not to exceed more than 10% of the time" under "wet" conditions. On Transects 2, 3, and 4 nitrate nitrogen (NO_3^-) exceeded the standard within 10 m of the shoreline. On all four transects, several measurements of ammonia nitrogen (NH_4^+) exceeded the 10% limits. As discussed above, the elevated concentrations of dissolved nutrients near the shoreline are likely a result of mixing of groundwater with ocean water. As the water quality standards do not take into account such natural mixing, and nutrient concentrations of all offshore samples are within the HDOH-WQS limits it appears that the waters off the Waimanalo Paradise project do not exceed water quality standards.

Values of turbidity at the shoreline of Transects 1, 2 and 4 exceeded the HDOH 10% limit. The elevated turbidity near the shoreline is likely a result of resuspension of the fine-grained sediment that comprises the floor of the fishpond. Concentrations of TP and Chlorophyll *a* did not exceed HDOH-WQS limits at any of the sampling sites.

Overall, with the exceptions described above, most of the area within the scope of the present project are close to or below the specific criteria of the HDOH-WQS, with the caveat that this consideration is for a single sample set. As a result, it does not appear that there are any significant inputs of materials from land beyond the immediate shoreline that are impacting coastal ocean waters offshore off the Waimanalo Paradise project site.

III. BIOTIC COMMUNITY STRUCTURE

A. Methods

Biotic community structure of the marine environment was semi-quantitatively assessed on August 2, 2019 by investigators swimming throughout the area from the shoreline to approximately 50 m offshore at each of the survey transect sites described in the sections above. During these reconnaissance swims, notes were taken on physical structure and marine species abundance. Numerous photographs were taken of typical features of all habitats to provide a descriptive representation of the area fronting the project site.

B. Results

The nearshore marine environment fronting the Waimanalo Paradise seawall is composed of several distinct habitats, defined by both physical and biotic composition. These habitats types are delineated in Figure 4 as colored polygons; photographs of the typical composition of each habitat are shown in Figures 5-11, with the location of each group of photographs identified in Figure 4.
Following is a description of the distinct habitats that occur in the marine environment off of the Waimanalo Paradise property.

1. Seawall

The most shoreward region of the marine habitat is bounded by a concrete seawall that extends the length of the property (Figure 5). The base of the seawall and intertidal area consists of rocks and boulders that form a band extending one to two meters offshore. No corals or other attached macrofauna were observed on the submerged seawall or boulder base. Schools of juvenile convict tangs (*Acanthurus triostegus*) were observed in the shallow rocky area along the base of the seawall.

2. Inside Pahonu Fishpond

Seaward of the shoreline two structures occur on the sand floor of the Pahonu fishpond. These consist of a square concrete block and a submerged boulder finger that extends perpendicular to the shoreline (Figure 6). No corals were observed on the submerged portions of the concrete block and no fish or other vertebrates were observed around the block.

The boulders comprising the finger that extends off the seawall, as well as the boulders that form the inner margins of the fishpond are similar in biotic composition. The most common corals colonizing the boulders are *Montipora capitata*, *Porites lobata*, *P. lutea*, *Pocillopora meandrina* and *P. damicornis*. None of these corals covered large expanses of the walls, and generally existed as isolated colonies (Figures 6-8). Other macroinvertebrates observed in this area were the sea urchins *Echinometra mathaei* and *Tripneustes gratilla*, the black-lipped pearl oyster *Pinctada margaritifera*, the sea cucumber *Holothuria atra*, and a single octopus (*Octopus* sp.). None of these invertebrates were abundant.

The boulder walls provided sheltered habitat for a number of fish species (Table 3). The most abundant species inside the fishpond were the convict tang (*Acanthurus triostegus*), goatfish (*Mulloidichthys flavolineatus*, *M. vanicolensis*) and the damselfish (*Dasyllus albisella*). Other genera of reef fish that were observed within the fishpond included several butterflyfish, wrasses, and triggerfish.

The floor of the fishpond consisted of a white sand surface with areas of concentrated shell fragments and other debris (Figure 8). No seagrass was observed on the sand floor, although some green algae were noted, primarily of the genus *Caulerpa*.

3. Outside Pahonu Fishpond

The open ocean marine habitat outside the fishpond consisted of a shallow sand bottom interspersed with patches of coral rock (Figure 9). On the eastern side of the fishpond wall, large spherical colonies of *Montipora capitata* were interspersed over the bottom (Figures 9 and 10). Many of these colonies were up to two meters in diameter indicating they were decades old. The size of these colonies indicates that they have survived recent El Nino induced bleaching events and other episodic instances of environmental stress. These large colonies were less common off the central part of the fishpond wall.

The marine community structure on the western side of the fishpond was substantially different than off the central region. Large coral colonies were very abundant, consisting primarily of spherical growth forms of *Porites* and *Montipora* (Figure 11). The difference in density of corals between the west and central areas outside of the fishpond is evident in the higher cover of dark areas in Figure 4. The probable reason for the higher cover to the west of the fishpond is increased protection from tradewind generated waves that arrive at the shoreline from the northeast.

No seagrass was observed outside the fishpond walls, and benthic macroalgae was not present in significant amounts. Sea urchins and other motile macrobenthos were also scarce outside the seawall. Species of fish that were noted only outside the fishpond included several surgeonfish (*Acanthurus xanthopterus*, *A. unicornis*, and *Naso unicornis)* (Table 3).

In summary, the marine communities directly off Waimanalo Paradise seawall where repairs are planned do not represent any rare or unique components. Within the inner boundaries of the Pahonu fishpond, corals occur, although there are no expansive areas of colonization, nor are any of the species considered rare. Outside the fishpond, and particularly off the western boundary, coral communities are well developed, consisting of large colonies that are at least several decades old. No seagrass is present within, or outside, the fishpond.

4. Threatened and Endangered Species

Several species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly throughout the Hawaiian Islands, and is frequently observed in the nearshore areas of Oahu. The endangered hawksbill turtle (*Eretmochelys imbricata*) is known infrequently from Hawaiian waters. No sea turtles were observed within the survey area during present study, although they undoubtedly occur in the area.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) winter in the Hawaiian Islands from December to April. While the present survey was conducted in August when whales are absent from Hawaiian waters, the survey area is not conducive to whale habitation owing to shallow depth and lack of access across the outer Waimanalo reef. The Hawaiian monk seal, (*Monachus schauinslandi*)

is an endangered earless seal that is endemic to the waters off the Hawaiian Islands. Monk seals commonly haul out of the water onto sandy beaches to rest. No seals were observed during the present survey work at Waimanalo Paradise, although the sand beaches in the area could provide haul-out areas.

IV. DISCUSSION and CONCLUSIONS

The purpose of this assessment is to assemble baseline information to make valid evaluations of the potential for impacts to the marine environment from the proposed repair of the seawall fronting the Waimanalo Paradise site. The information collected in this study provides the basis to understand some of the important processes that are operating in the nearshore ocean in order to address any concerns that might be raised in the planning process for the proposed project.

The physical structure of the intertidal marine habitat adjacent to the seawall is composed of boulders and rocks. Seaward of the rock base, the floor of Pahonu fishpond consists of a uniform sand bottom.

Analysis of a series of water samples collected along transects that extended from the shoreline to 50 meters offshore indicates that there is input of groundwater at the shoreline along the seawall. Naturally occurring groundwater contains substantially higher nutrients that seawater, resulting in concentrations in nearshore samples above State of Hawaii Department of Health Water Quality Standards. Values of turbidity near the shoreline are also elevated relative to offshore values. The elevated values of turbidity are primarily a response to wave-resuspended fine sediment near the shoreline. Overall, water quality off the Waimanalo Paradise seawall site represents typical marine settings in Hawaii with no indication of any contamination from activities on land.

Results of biotic surveys adjacent to the seawall reveal that the rock does not serve as settling surfaces for corals, other benthic macroinvertebrates or seagrass. The boulder surfaces within the Pahonu fishpond are colonized by scattered corals of the most common Hawaiian species. While corals occur on the boulders forming the fishpond walls, there were no areas where corals can be considered abundant, or unique. No seagrass was observed on the sand bottom of the fishpond.

The marine habitat outside of the fishpond consists primarily of a shallow sand bottom. The outer surfaces of the boulders forming the seawall are colonized by similar scattered coral colonies as the inside of the fishpond. On both the eastern and western sides of the fishpond, the corals occur as large (1-2 meters diameter) spherical colonies of *Montipora capitata* and *Porites* spp. The density of these large corals is substantially higher on the west side of the fishpond, likely as a result of shelter from waves emanating from the northeast.

Although the name of the fishpond indicates that its original purpose was to provide a captive space for sea turtles, none were in the pond at the time of the survey. As the pond presently contains an opening to the ocean to promote flushing, it no longer serves as an effective containment area for turtles. The possible small temporary changes to water quality that might occur from the seawall repair process should not be of a magnitude to affect turtle behavior, as they seem unaffected by turbid waters. During construction operations, observers should be in place to spot any turtles that might enter the work area. If such actions occur, a mitigation plan should be implemented to stop work until turtles leave the area.

Based on the results of this survey, it can be concluded that with proper management and mitigation practices to limit to the extent possible any release of construction-related materials to the water column, the proposed seawall repairs should have little or no potential for significant effects to the existing marine environment.

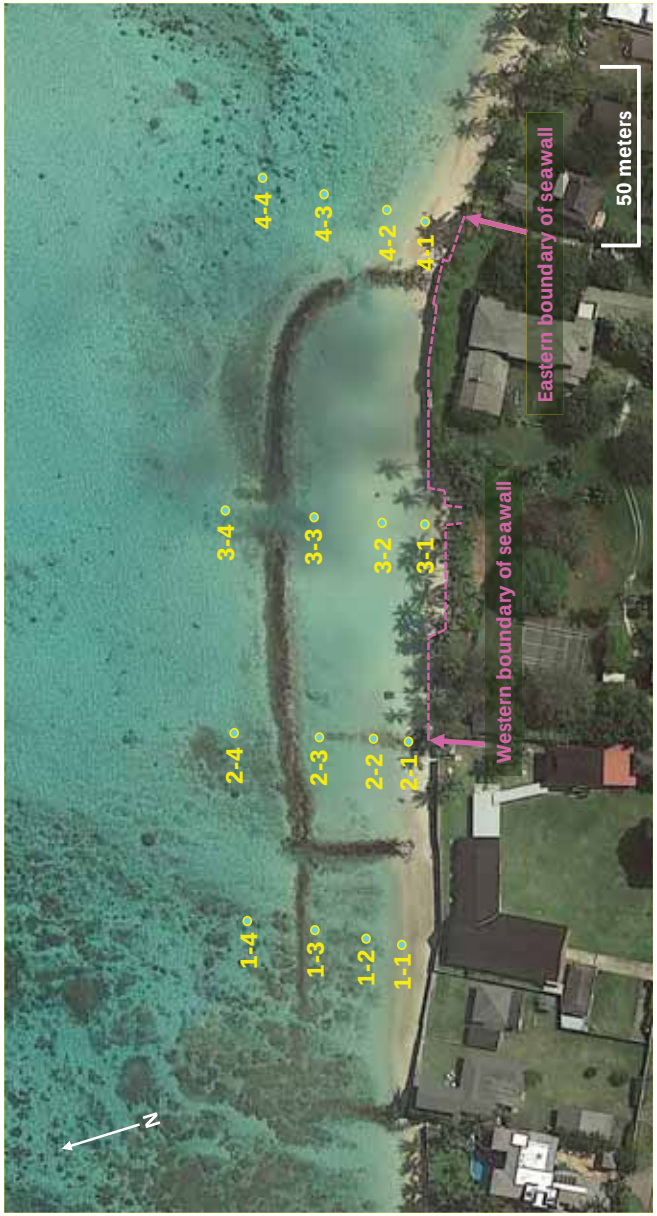

Figure 1. Aerial photograph of section of Waimanalo shoreline showing location of the Waimanalo Paradise seawall. Also shown are locations of water sampling stations along four transects that extend from the shoreline to approximately 50 m offshore.

TABLE 1. Water chemistry measurements off the Waimanalo Paradise project collected on July 15, 2019. Nutrient concentrations are shown in micromolar (µM) units. Abbreviations as follows: S=surface; D=deep; DFS=distance from shore. Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for open coastal waters under "wet" conditions. Shaded and boxed values exceed DOH 10% standards. For transect site locations, see Figure 1.

TRANSECT	DFS (m)	DEPTH	PO_4^{3-} (µM)	NO_3^- (µM)	NH_4^+ (µM)	Si (µM)	TOP (µM)	TON (µM)	TP (µM)	TN (µM)	SAL (ppt)	CHL a (µg/L)	TURB (ntu)	TEMP (deg C)	pH	O2 (%sat)
1	0	S	0.06	0.46	1.37	2.07	0.31	6.00	0.37	7.83	34.45	0.40	1.85	28.43	8.194	102.13
	10	S	0.04	0.30	0.29	1.75	0.20	5.69	0.24	6.28	34.51	0.21	1.08	28.11	8.195	101.42
	20	S	0.06	0.32	0.47	1.95	0.29	5.12	0.35	5.91	34.64	0.25	0.71	27.75	8.175	94.48
	20	D	0.06	0.30	1.24	2.21	0.30	5.74	0.36	7.27	34.64	0.28	1.48	27.75	8.168	94.66
	50	S	0.08	0.32	0.46	1.69	0.28	5.15	0.37	5.93	34.64	0.19	0.64	27.72	8.158	93.60
	50	D	0.07	0.32	0.37	2.84	0.28	5.83	0.35	6.52	34.67	0.38	2.50	27.72	8.149	92.99
2	0	S	0.04	1.49	1.34	23.22	0.47	8.39	0.50	11.22	33.79	0.89	2.60	29.27	8.235	113.55
	10	S	0.28	1.53	1.46	17.42	0.30	11.13	0.58	14.12	33.99	0.47	0.83	28.60	8.220	112.19
	20	S	0.05	0.54	0.36	4.13	0.30	5.89	0.35	6.79	34.46	0.22	0.60	28.09	8.191	100.76
	20	D	0.08	0.55	0.52	4.08	0.28	5.75	0.36	6.82	34.46	0.55	1.40	28.08	8.197	99.95
	50	S	0.09	0.40	0.41	2.50	0.17	5.42	0.26	6.22	34.63	0.24	1.04	27.74	8.156	94.67
	50	D	0.07	0.39	0.37	2.75	0.23	5.31	0.30	6.07	34.56	0.76	2.39	27.76	8.158	92.95
3	0	S	0.07	1.33	0.47	10.12	0.33	6.48	0.40	8.28	34.32	0.70	1.06	28.70	8.235	112.62
	10	S	0.10	1.43	1.38	7.07	0.34	6.48	0.44	9.29	34.46	0.41	1.13	28.47	8.178	104.39
	20	S	0.08	1.26	0.58	9.94	0.28	5.76	0.36	7.59	34.50	0.27	0.96	28.07	8.191	101.92
	20	D	0.07	0.75	0.69	5.23	0.29	5.74	0.36	7.18	33.85	0.35	1.04	28.06	8.193	100.98
	50	S	0.05	0.37	0.37	2.77	0.25	5.29	0.30	6.02	34.55	0.26	0.79	27.85	8.172	97.66
	50	D	0.05	0.37	0.47	3.51	0.30	5.72	0.35	6.56	34.55	0.27	0.48	27.90	8.165	93.56
4	0	S	0.33	1.47	2.05	8.18	0.32	22.44	0.65	25.96	34.35	0.42	1.85	28.61	8.187	104.34
	10	S	0.11	1.70	0.56	8.35	0.25	6.02	0.36	8.28	34.45	0.38	1.89	28.69	8.202	104.52
	20	S	0.04	0.44	0.44	4.34	0.35	5.05	0.39	5.93	34.52	0.24	0.85	27.91	8.155	97.01
	20	D	0.08	0.42	0.56	4.59	0.25	6.54	0.33	7.52	34.45	0.27	0.76	27.91	8.154	95.40
	50	S	0.04	0.29	0.33	1.52	0.32	5.36	0.36	5.98	34.63	0.20	0.57	27.89	8.154	94.66
	50	D	0.04	0.29	0.41	1.53	0.32	5.59	0.36	6.29	34.66	0.21	0.76	27.89	8.151	95.14
DOH	**NTE 10%**			**1.00**	**0.61**				**1.29**	**17.85**	*	**0.90**	**1.25**	**	***	
WQS	**NTE 2%**			**1.78**	**1.07**				**1.93**	**25.00**		**1.75**	**2.00**			

* Salinity shall not vary more than ten percent from natural or seasonal changes considering hydrologic input and oceanographic conditions.
** Shall vary no more that 1 °C from "ambient conditions"
*** Shall not deviate more than 0.5 units from a value of 8.1

TABLE 2. Water chemistry measurements off the Waimanalo Paradise project collected on July 15, 2019. Nutrient concentrations are shown as micrograms per liter (µg/L) units. Abbreviations as follows: S=surface; D=deep; DFS=distance from shore. Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for open coastal waters under "wet" conditions. Shaded and boxed values exceed DOH 10% standards. For transect site locations, see Figure

TRANSECT	DFS (m)	DEPTH	PO_4^{3-} (µg/L)	NO_3^- (µg/L)	NH_4^+ (µg/L)	Si (µg/L)	TOP (µg/L)	TON (µg/L)	TP (µg/L)	TN (µg/L)	SAL (ppt)	CHL a (µg/L)	TURB (ntu)	TEMP (deg C)	pH	O2 (%sat)
1	0	S	1.92	6.48	19.14	57.90	9.54	83.95	11.46	109.56	34.45	0.40	1.85	28.43	8.194	102.13
	10	S	1.33	4.16	4.07	48.87	6.17	79.62	7.50	87.85	34.51	0.21	1.08	28.11	8.195	101.42
	20	S	1.74	4.46	6.57	54.52	9.08	71.71	10.82	82.74	34.64	0.25	0.71	27.75	8.175	94.48
	20	D	1.98	4.25	17.29	61.76	9.27	80.30	11.25	101.84	34.64	0.28	1.48	27.75	8.168	94.66
	50	S	2.51	4.51	6.37	47.27	8.83	72.07	11.34	82.95	34.64	0.19	0.64	27.72	8.158	93.60
	50	D	2.20	4.41	5.24	79.52	8.77	81.62	10.97	91.27	34.67	0.38	2.50	27.72	8.149	92.99
2	0	S	1.15	20.84	18.69	650.10	14.42	117.51	15.57	157.04	33.79	0.89	2.60	29.27	8.235	113.55
	10	S	8.80	21.41	20.40	487.74	9.27	155.80	18.08	197.61	33.99	0.47	0.83	28.60	8.220	112.19
	20	S	1.49	7.55	4.97	115.62	9.30	82.47	10.78	94.99	34.46	0.22	0.60	28.09	8.191	100.76
	20	D	2.36	7.71	7.32	114.14	8.74	80.43	11.10	95.47	34.46	0.55	1.40	28.08	8.197	99.95
	50	S	2.73	5.53	5.71	70.08	5.32	75.83	8.05	87.08	34.63	0.24	1.04	27.74	8.156	94.67
	50	D	2.29	5.43	5.14	76.96	7.12	74.36	9.41	84.92	34.56	0.76	2.39	27.76	8.158	92.95
3	0	S	2.08	18.68	6.51	283.39	10.26	90.67	12.33	115.86	34.32	0.70	1.06	28.70	8.235	112.62
	10	S	3.01	20.01	19.38	197.93	10.63	90.73	13.64	130.12	34.46	0.41	1.13	28.47	8.178	104.39
	20	S	2.48	17.58	8.12	278.22	8.83	80.60	11.31	106.30	34.50	0.27	0.96	28.07	8.191	101.92
	20	D	2.08	10.53	9.59	146.56	8.95	80.41	11.03	100.53	33.85	0.35	1.04	28.06	8.193	100.98
	50	S	1.67	5.18	5.15	77.56	7.70	73.99	9.38	84.32	34.55	0.26	0.79	27.85	8.172	97.66
	50	D	1.61	5.12	6.58	98.22	9.22	80.11	10.83	91.81	34.55	0.27	0.48	27.90	8.165	93.56
4	0	S	10.23	20.63	28.63	229.17	10.01	314.21	20.24	363.47	34.35	0.42	1.85	28.61	8.187	104.34
	10	S	3.38	23.80	7.78	233.80	7.77	84.32	11.15	115.91	34.45	0.38	1.89	28.69	8.202	104.52
	20	S	1.30	6.16	6.16	121.44	10.82	70.71	12.12	83.03	34.52	0.24	0.85	27.91	8.155	97.01
	20	D	2.51	5.83	7.90	128.57	7.79	91.55	10.30	105.28	34.45	0.27	0.76	27.91	8.154	95.40
	50	S	1.21	4.01	4.65	42.58	9.84	75.02	11.05	83.68	34.63	0.20	0.57	27.89	8.154	94.66
	50	D	1.12	4.08	5.71	42.94	9.96	78.28	11.08	88.07	34.66	0.21	0.76	27.89	8.151	95.14
DOH	**NTE 10%**			**14.00**	**8.50**				**40.00**	**250.00**	*	**0.90**	**1.25**	**	***	
WQS	**NTE 2%**			**25.00**	**15.00**				**60.00**	**350.00**		**1.75**	**2.00**			

* Salinity shall not vary more than ten percent from natural or seasonal changes considering hydrologic input and oceanographic conditions.
** Shall vary no more that 1 °C from "ambient conditions."
*** Shall not deviate more than 0.5 units from a value of 8.1.

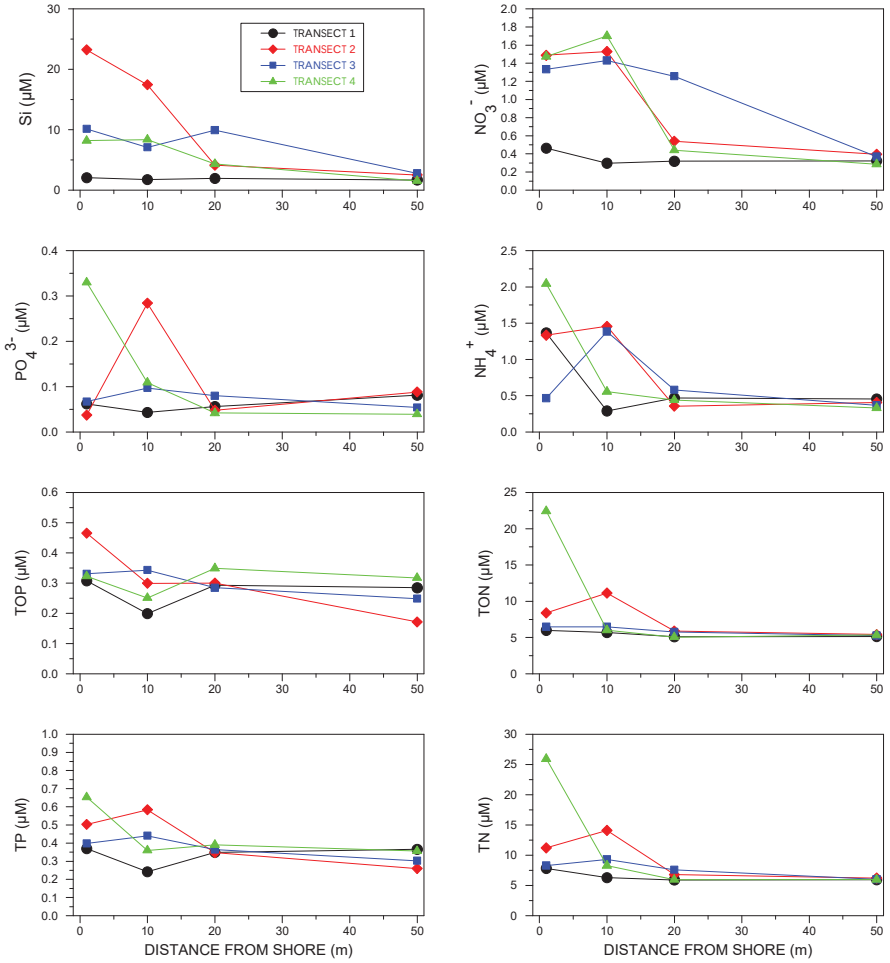

FIGURE 2. Plots of dissolved nutrients in surface samples collected on July 15, 2019, along four transects that extended from the shoreline to 50 meters from shore fronting the Waimanalo Paradise project site on the northeast shoreline of Oahu. For transect locations, see Figure 1.

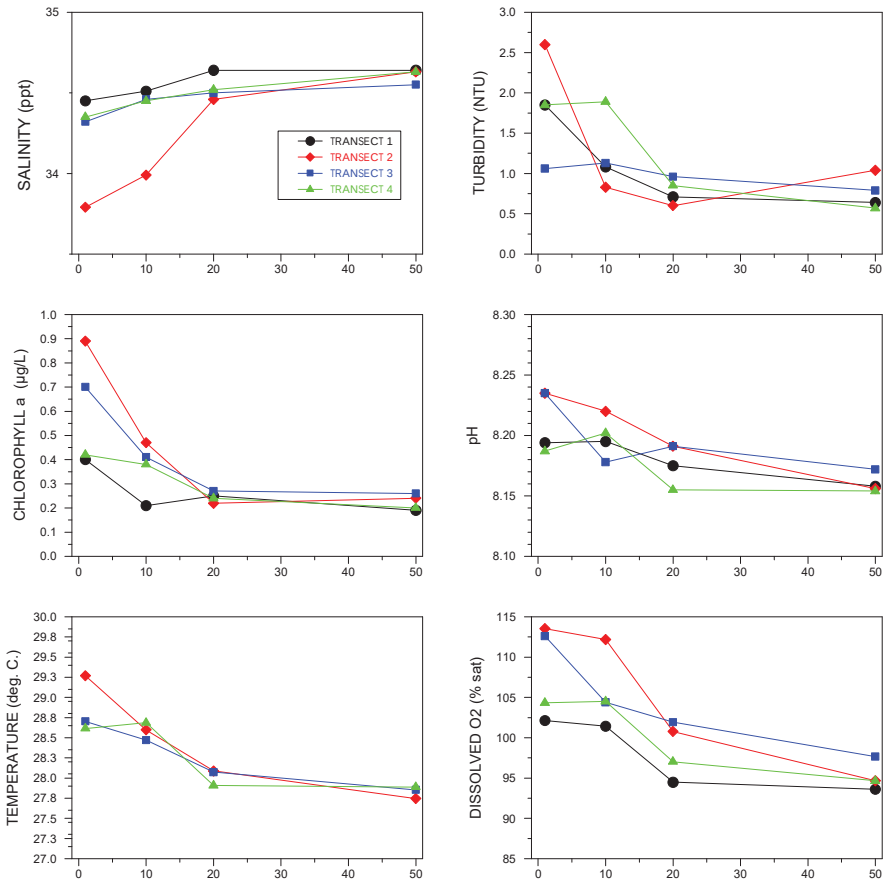

FIGURE 3. Plots of ater uality constituents in samples collected on July 15, 2019, along four transects fronting the Waimanalo Paradise project site on the northeast shoreline of Oahu. For transect locations, see Figure 1.

Figure 4. Aerial photograph of Waimanalo shoreline showing location of Waimanalo Paradise seawall and Pahonu fishpond. Colored polygons represent physical-biotic habitat zones. Numbers adjacent to each zone polygon correspond to Figure numbers showing representative photographs of habitat composition.

Figure 5. Seawall at the Waimanalo Paradise project site. Photos at top and bottom right show undermined areas at base of seawall.

Figure 6. Concrete block on sand surface off the Waimanalo Paradise seawall (top). Submerged boulder finger extending from the shoreline through the Pahonu fishpond (bottom).

Figure 6 (continued). Submerged boulder finger through Pahonu fishpond. Corals growing on boulders are *Porites lobata* (top left), *Pocillopora damicornis* (top right), *Montipora capitata* (bottom left).

Figure 7. Submerged boulder wall on inner west side of Pahonu fishpond. Bivalve in center of top right photo is the black-lipped pearl oyster *(Pinctada margaritifera).* Red/brown cover on rock in bottom left photo is unidentified cyanobacteria. Coral in lower right is *Montipora capitata*.

Figure 8. Inside of outer wall of Pahonu fishpond. Upper left photo shows typical sand floor of fishpond. Soft coral in upper right is *Palythoa tuberculosa*. Bottom photos show typical boulder bases of fishpond walls.

Figure 8 (continued). Inside offshore wall of Pahonu fishpond. Coral in upper left photo is *Porites lutea;* coral in upper right is *Porites lobata;* coral in bottom left is *Pocillopora meandrina;* and coral in lower right is *Montipora capitata*.

Figure 8 (continued). Inside offshore wall of Pahonu fishpond (top left) and adjacent sand floor (top right). Shell and debris piles adjacent to east wall of Pahonu fishpond (bottom left and right).

Figure 9. Seafloor outside of east side of Pahonu fishpond. Large coral head in upper right photo is *Montipora capitata.* Similar large heads up to 2 meters in diameter occur throughout the area on the east side of the fishpond.

Figure 10. Outside offshore wall of Pahonu fishpond. Upper left photo shows deep ripples in sand bed. Bottom left photo shows large spherical colony of *Montipora capitata* that occurs outside of seawall.

Figure 11. Outside west side of Pahonu fishpond. All photos show assemblages of large colonies of *Porites* spp. and *Montipora capitata*

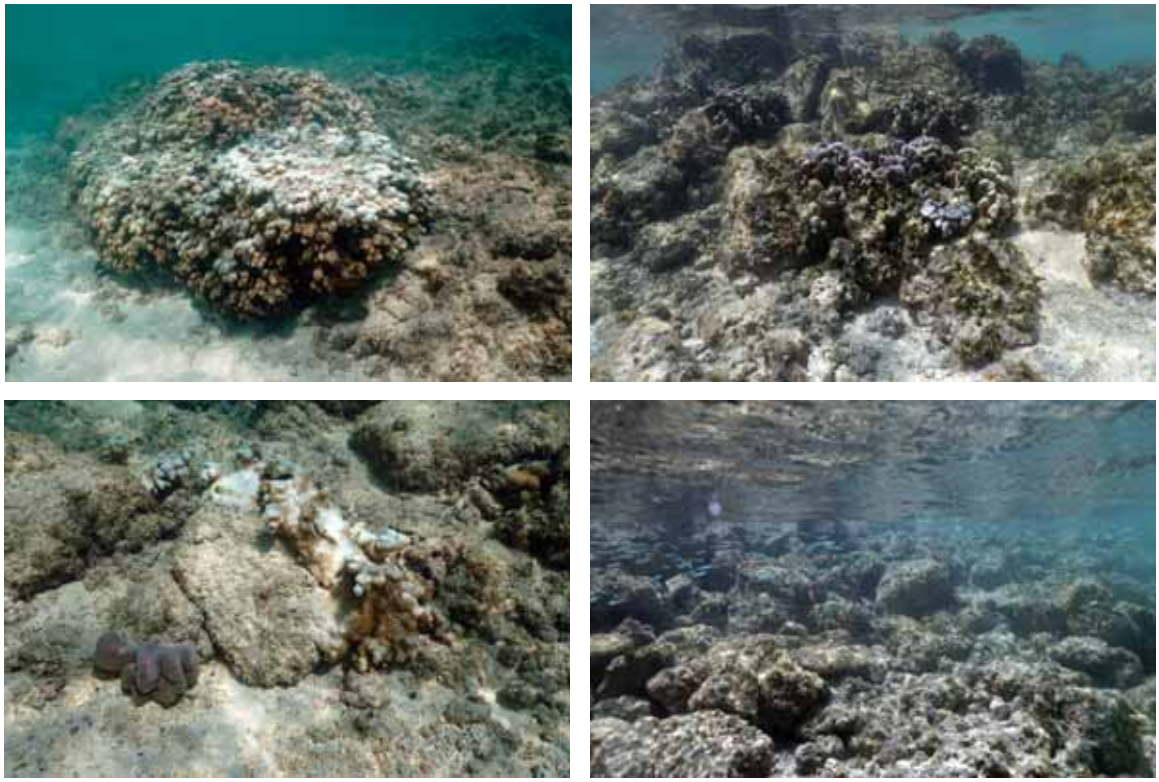

Figure 11 (continued). Outside west side of Pahonu fishpond inshore of submerged boulder wall that parallels shoreline. Large coral colonies are *Montipora capitata* and *Porites lutea*. Lower right photo shows school of *Atherinomorus insularum*.

Ta le 3. Fish species o served off Waimanalo Paradise pro ect site. A undance code is R Rare, C Common, A A undant. indicates fish seen only outside of Pahonu Fishpond.

Butterflyfishes	
Chaetodon auriga	*R*
C. lunulatus	*R*
C. milliaris	*R*
Damselfishes	
Abudefduf abdominalis	*R*
A. sordidus	*R*
A. vaigiensis	*R*
Dascyllus albisella	*C*
Stegastes marginatus	*R*
Goatfishes	
Mulloidichthys flavolineatus	*C*
M. vanicolensis	*A*
Parupeneus insularis	*R*
Pufferfishes	
Canthigaster amboinensis	*R*
Surgeonfishes	
Acanthurus blochii	*C*
A. triostegus	*A**
A. xanthopterus	*A**
Naso unicornis	*A**
Zebrasoma flavescens	*R*
Triggerfishes	
Rhinecanthus rectangulus	*R*
Wrasses	
Stethojulis balteata	*R*
Thalassoma duperrey	*A*
T. trilobatum	*A*
Others	
Atherinomorus insularum	*A*
Aulostomus chinensis	*R*
Bathygobius coalitus	*R*
Myripristis berndti	*R*
Neoniphon sammara	*R*
Urchins	
Echinothrix	*R*
Echinimetra matheai	*R*

APPENDIX C

Archaeological Inventory Survey Report

Prepared by Cultural Surveys Hawai‘i

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
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
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD., STE 555
KAPOLEI, HI 96707

December 20, 2019

IN REPLY REFER TO:
Log No.: 2019.00876
Doc. No.: 1912SCH07
Archaeology

Kathy K. Sokugawa
City and County of Honolulu
Department of Planning and Permitting
650 South King Street, 7th Floor
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Ms. Sharon Nishiura, Planner
Subdivision Branch
City and County of Honolulu
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Dear Ms. Sokugawa and Ms. Nishiura:

SUBJECT: **Chapter 6E-42 Historic Preservation Review –**
Subdivision Application No. 2018/SUB-112
Non-Exclusive Easement S-6083
Archaeological Inventory Survey Report for the Waimānalo Paradise Seawall Project
Waimānalo Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu
TMK: (1) 4-1-002:007 and State of Hawaiʻi coastal lands

This letter updates the State Historic Preservation Division's (SHPD's) comments concerning the subject application and non-exclusive easement and provides the SHPD's review of the draft archaeological report titled, *Draft Archaeological Inventory Survey Report for the Proposed Waimānalo Paradise Seawall Project, Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu TMK: (1) 4-1-002:007 and State of Hawaiʻi Coastal Lands* (Enanoria et al., December 2019). SHPD received the draft archaeological inventory survey (AIS) report on April 22, 2019. SHPD requested revisions via email (Samantha Hemenway [SHPD] to David Shideler [Cultural Surveys Hawaiʻi, Inc.]) on December 19, 2019 and received the revised draft AIS on December 20, 2019.

Cultural Surveys Hawaiʻi, Inc. (CSH) conducted the AIS at the request of the private landowner, Waimanalo Paradise LLC (landowner). The 0.17-acre (0.06-hectare) project area is located in the northern portion of 41-505 Kalanianaʻole Highway, Waimānalo. The project area is between the coast and Kalanianaʻole Highway and is approximately 160 m southwest of Kaiona Beach Park and 1,100 m northeast of Kaupō Beach Park and the Makai Research Pier. The proposed scope of work consists of Sea Engineering, Inc. (SEI) conducting subsurface investigations to confirm the wall dimensions and geotechnical soil parameters to accurately determine the feasibility and cost estimates for conceptual wall repair and replacement options.

In a letter dated March 29, 2019 (Log No. 2018.01746, Doc. No. 1903SL06), SHPD requested an AIS be conducted for the Waimānalo Paradise Seawall Project as specified by Stipulation 28 in the Grant of Non-Exclusive Easement S-6083 between the State of Hawaii, Board of Land and Natural Resources (Grantor) and Waimanalo Paradise LLC (Grantee), dated October 25, 2015. "The Grantee shall conduct an archaeological inventory survey, including assessment of the seawall, prior to the issuance of any future permits involving ground-disturbing activates." SHPD also approved the AIS research design in the March 29, 2019 letter.

The AIS field work was conducted on April 2 and April 3, 2019. A 100% pedestrian inspection was completed for the entire project area, along with GPS data collection, photographic documentation, and the recording of stratigraphic profiles and soil descriptions. A total of four backhoe test trenches (T-1 through T-4) were excavated at designated locations on the makai side of the seawall. The AIS identifies two previously identified historic properties, State Inventory of Historic Places (SHIP) Site 50-80-15-8748 and 50-80-15-8747.

SHIP Site 50-80-15-8747 Feature 5 was previously identified in the Crowell et al. (2019) AIS as a remnant portion of the former Anderson Estate-Pahonu seawall. Construction of the Estate was completed in 1933. Site 8747 Feature 5 was identified in all 4 test excavations. Crowell (et al. 2019) indicates that Site 8747 lacks sufficient integrity to be considered a significant historic property. The current AIS supports this previous assessment for both Site 8747 and specifically Feature 5.

SIHP # 50-80-15-8748 is a culturally expressed A horizon previously identified in the Crowell et al. (2019) AIS. Site -8748 is located in the makai section of the parcel. The current AIS documented Site 8748 in two test excavations (T-3 and T-4). In these trenches, Site 8748 likely represents a portion of the cultural deposit which was impacted by the construction of the seawall. The current AIS supports the Crowell et al. (2019) AIS assessment of Site 8748 as significant pursuant to HAR §13-284-6 under Criterion d for information it has yielded and still has potential to yield about former traditional Hawaiian and historic land use activities.

The integrity and significance assessments of each site are explained well. The effect determination for the proposed project is "Effect, with agreed on mitigation commitments." The recommended mitigation commitment is archaeological monitoring during all ground disturbances. On-site archaeological monitoring will be conducted in accordance with the SHPD-accepted archaeological monitoring plan (Belluomini et al. 2019 (March 29, 2019; Log No. 2019.00246, Doc. No. 1903SL08).

The revised AIS report reviews well the available environmental, historical, and cultural background information, and previous archaeological investigations. It provides a detailed discussion of the AIS field and laboratory methods and findings, and adequately assesses the integrity and significance of the historic properties identified. The revisions adequately address our earlier correspondence. This AIS report satisfies the requirements of HAR §13-276-5. **It is accepted.** Please send one hard copy of the document, clearly marked FINAL, along with a copy of this letter and a text-searchable PDF version of the report, to the Kapolei SHPD office, attention SHPD Library

Pursuant to HAR §13-284-3, Steps (1) through (4) of the historic preservation review process are complete. The SHPD concurs that the survey identification efforts were adequate, agrees with the significance assessments, agrees with the project effect determination, and accepts the agreed upon mitigation in the form of archaeological monitoring for the subject project, including all ground disturbing activities and all work associated with the modification of the seawall (Site 50-80-15-8747 Feature 5).

SHPD hereby notifies the County that Stipulation 28 in the Grant of Non-Exclusive Easement S-6083 has been fulfilled and that the permitting issuance for the seawall modification work may proceed.

SHPD requests written notification at the start of archaeological monitoring. Within 60 days of completion of archaeological monitoring fieldwork, SHPD looks forward to receiving for review and acceptance an archaeological monitoring report meeting the requirements of HAR §13-279-5.

Please contact Samantha C. Hemenway at (808) 692-8011 or by email at Samantha.Cragen@hawaii.gov if you have any questions or if we can be of assistance in any way

Aloha,

Susan A. Lebo

Signed For
Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

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March 29, 2019

IN REPLY REFER TO:
Log No. 2019.00246
Doc. No. 1903SL08
Archaeology

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Ms. Sharon Nishiura, Planner
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Dear Ms. Sokugawa and Ms. Nishiura:

SUBJECT: **Chapter 6E-42 Historic Preservation Review**
Subdivision Application No. 2018/SUB-112
Archaeological Monitoring Plan for Proposed Waimānalo Paradise Subdivision Project
Waimānalo Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu
TMK: (1) 4-1-002:007

This letter provides the State Historic Preservation Division's (SHPD's) review of the revised draft plan titled, *Archaeological Monitoring Plan for the Proposed Waimānalo Paradise Subdivision Project, Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu TMK: [1] 4-1-002:007* (Belluomini et al., February 2019), which our office received on February 5, 2019. The SHPD received the initial draft plan on October 12, 2018 (Log No. 2018.02412), prior to acceptance of the archaeological inventory survey (AIS). SHPD accepted the AIS report (Crowell et al., February 2019) on February 5, 2019 (Log No. 2018.02376, Doc. No. 1902SL02).

The AIS was conducted in support of the proposed subdivision of the property/project area (3.005 acres) into two separate lots comprised of approximately 1.344 acres and 1.659 acres, respectively; the cancellation of a storm drain easement; and the designation of easements for access and drainage purposes. Planned development of the project site includes retaining the two existing structures located on the western side of the site and constructing new residential buildings and structures with accessory uses such as service areas, lanai, decks, pools, driveway and parking areas, retaining walls, and landscaped areas. The two subdivided lots each will contain two dwellings. The project may involve future approval from State of Hawaiʻi Department of Transportation for driveway or utility line connection improvements extending into the adjacent Kalanianaʻole Highway right-of-way (ROW).

The AIS newly documented three historic properties: structures, structural remnants, and a pit feature associated with the former Anderson Estate-Pahonu (Site 50-80-15-8747); a pre- to late-post-Contact subsurface cultural layer and associated pit features (Site 50-80-15-8748); and a human burial (Site 50-80-15-8749). Site 8747 was assessed as not significant as the primary residential structures associated with the former Anderson Estate-Pahonu were demolished prior to initiation of the current project. Site 8748 was assessed as retaining sufficient integrity of location, design, and materials, and as significant under HAR §13-284-6, Criterion d. Lastly, the Site 8749 in situ sub-adult human burial was assessed as having integrity of location, design, materials, and workmanship, and as being significant under HAR §13-284-6, Criteria d and e. The burial context is associated with the Site 8748 cultural layer.

The AIS findings supported an HRS 6E project effect determination of "Effect, with agreed upon mitigation commitments" pursuant to HAR §13-284-7. The proposed development will affect one or more significant historic properties (Sites 8748 and 8749), and the effects will potentially be harmful. The agreed upon mitigation commitments are burial treatment for Site 8749 and data recovery in the form of archaeological monitoring.

A Burial Treatment Plan (BTP) was prepared for Site 50-80-15-8749. SHPD indicated in a letter dated February 11, 2019 (Log No. 2018.02538, Doc. No. 1902RKH08), that the plan was in compliance with HAR §13-300-33 and that the plan was placed on the agenda for the OIBC's February 13, 2019 meeting for discussion and for a determination for Site 8749 of preserve-in-place or relocation. Following the OIBC's determination of preserve-in-place, SHPD accepted the BTP and requested a hard copy of the plan, retitled as *Burial Site Component for SIHP #50-80-15-8749*...

The AMP (Belloumini et al., February 2019) stipulates the following:

- A pre-construction briefing will be conducted prior to construction activities;
- On-site monitoring will be conducted during all project-related ground disturbance below the concrete;
- The archaeological monitor has the authority to temporarily halt all activity in the area in the event of a potential historic property being identified, or to record archaeological information for cultural deposits;
- If human remains are identified, work will cease in the vicinity and the find shall be secured, and SHPD, the county Coroner's Office and the County Police Department shall be notified, and provisions outlined within the Hawaii Revised Statutes (HRS) §6E-43 and HAR §13-300-40, and any SHPD directives, shall be followed;
- Laboratory work will be conducted in accordance with HAR §13-279-5(6);
- Project materials will be stored temporarily at CSH's Waimānalo office until an appropriate curation facility is selected, in consultation with the landowner and the SHPD. All data generated during the project will be stored at the CSH offices; and
- Any deviation from these provisions shall occur only with written concurrence of the SHPD.

Documentation of non-burial cultural deposits may include recording stratigraphy using USDA soil descriptions, GPS point collection, recordation of feature contents through excavation or sampling of features, screening of features, representative scaled profile drawings, photo documentation, and appropriate laboratory analysis of collected samples and artifacts. Any samples suitable for radiocarbon analysis shall be submitted for wood taxa identification prior to radiocarbon dating.

The plan meets the minimum requirements of HAR §13-279-4. **It is accepted**. Please send one hard copy of the document, clearly marked FINAL, along with a text-searchable PDF version to the Kapolei SHPD office, attention SHPD Library.

SHPD hereby notifies the County that the permit issuance process may proceed. **SHPD requests written notification at the start of archaeological monitoring**. Within 60 days of completion of archaeological monitoring fieldwork, SHPD looks forward to receiving for review and acceptance an archaeological monitoring report meeting the requirements of HAR §13-279-5.

Please contact Dr. Susan Lebo, Archaeology Branch Chief, at Susan.A.Lebo@hawaii.gov or at (808) 692-8019 for any questions regarding archaeological resources or this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
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Draft
Archaeological Inventory Survey Report for the Proposed Waimānalo Paradise Seawall Project, Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu TMK: [1] 4-1-002:007 and State of Hawaiʻi Coastal Lands

Prepared for
Waimanalo Paradise LLC

Prepared by
Brittany Enanoria, B.A.,
David W. Shideler, M.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawaiʻi, Inc.
Kailua, Hawaiʻi
(Job Code: WAIMANALO 36)

April 2019

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Management Summary

Reference	Archaeological Inventory Survey Report for the Proposed Waimānalo Paradise Seawall Project, Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu, TMK: [1] 4-1-002:007 and State of Hawaiʻi Coastal Lands (Enanoria et al. 2019)
Date	April 2019
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: WAIMANALO 36
Investigation Permit Number	CSH completed the archaeological inventory survey (AIS) fieldwork under archaeological fieldwork permit number 19-07, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-282.
Agencies	SHPD; City and County of Honolulu Department of Planning and Permitting (DPP)
Land Jurisdiction	Waimanalo Paradise LLC (Private)
Project Proponent	Waimanalo Paradise LLC
Project Funding	Waimanalo Paradise LLC
Project Location	The project area is located at the northern boundary of 41-505 Kalanianaʻole Highway in Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu, TMK: [1] 4-1-002:007. The project area is between the coast and Kalanianaʻole Highway and is approximately 160 m southwest of Kaiona Beach Park and 1,100 m northeast of Kaupō Beach Park and the Makai Range pier. The project area is depicted on a portion of the 1999 Koko Head U.S. Geological Survey (USGS) topographic quadrangle map (see Figure 1).
Project Description	Sea Engineering, Inc. (SEI) is proposing to conduct subsurface investigations to confirm the wall dimensions (i.e., profiles, widths, and heights) and geotechnical soil parameters to accurately determine the feasibility and cost estimates for conceptual wall repair and replacement options. An AIS is required to obtain permits to repair or modify the seawall. The trenches will be located against the *mauka* (inland) side of the wall and will slope back into the property. The plan includes excavating four trenches approximately 10 to 20 feet (ft) long, and 12 ft wide on the taller section of the wall and 5 ft wide at the short section.
Project Acreage	The project area is approximately 0.17 acres (0.06 hectares) of the TMK: [1] 4-1-002:007 property, which encompasses a total of 3.005 acres (1.22 hectares).

Historic Preservation Regulatory Context	Although this project may extend into the State of Hawai‘i coastal lands, this is considered a “private” project needing historic preservation review. This document is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-42 and HAR §13-284, as well as the project’s environmental review under HRS §343. It is also intended to support any project-related historic preservation consultation with stakeholders such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. This AIS investigation fulfills the requirements of HAR §13-276 and was conducted to identify, document, and make significance assessments of any historic properties. An AIS (Crowell et al. 2019) for the overall TMK: [1] 4-1-002:007 parcel for the Waimānalo Paradise Subdivision project was accepted by the SHPD in a letter dated 5 February 2019 (Log No.:2018.02376, Doc. No.:1902SL02) (Appendix A). On 29 March 2019, the AIS testing strategy for the Waimānalo Paradise Seawall project was approved in a face-to-face meeting with SHPD (S. Lebo to D. Shideler). In a letter dated 29 March 2019 (A. Downer to K. Sokugawa and S. Nishiura) (Log No.:2018.01746, Doc. No.:1903SL06) (see Appendix A) SHPD had two requests: 1) that an AIS for the Waimānalo Paradise Seawall project be conducted (present study) and 2) that the seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian. SHPD architecture branch confirmed (April 17, 2019) that David M. Crowell, M.S. who described and evaluated the significance and integrity of the seawall (State Inventory of Historic Places (SIHP) # 50-80-15-8747 Feature 5) is a qualified Architectural Historian and that nothing further is needed to address architecture branch concerns for this feature.
Fieldwork Effort	CSH archaeologists Brittany Enanoria, B.A., Gina Farley, M.A., Chris Konen, B.A., and Tanyja Roberson, B.A., conducted fieldwork during 2 April 2019 and 3 April 2019 under the general supervision of Principal Investigator David Shideler, M.A. This work required approximately 7 person-days to complete.

Historic Properties Identified	Two previously identified historic properties were identified: SIHP # 50-80-15-8747 Feature 5 (Anderson Estate–Pahonu remnants, seawall) is assessed as not significant due to insufficient integrity. The historic property was previously demolished and therefore the historic property retains only integrity of location. SIHP # 50-80-15-8748 (culturally expressed A horizon) is assessed as significant pursuant to HAR §13-284-6, Criterion d (have yielded, or is likely to yield, information important for research on prehistory of history).
Project Effect	The proposed project will potentially affect one significant historic property (SIHP # -8748) within the project area. The project-specific effect recommendation is “effect, with agreed upon mitigation commitments” pursuant to HAR §13-284-7.
Mitigation Commitments	Mitigation commitments consist of archaeological monitoring (a form of data recovery). The agreed upon mitigation commitments outlined below will mitigate the project’s effect on the significant historic properties: Archaeological monitoring of all ground-disturbing activities is agreed upon for the entire project area. On-site archaeological monitoring will be conducted to identify and document any features associated with SIHP # -8747, including those already identified and those that may be newly identified, additional exposures of SIHP # -8748, and any newly identified historic properties that may be identified during construction. An archaeological monitoring plan that meets the requirements of HAR §13-279-4 will be submitted to the SHPD for review and acceptance.

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Section 1 Introduction

1.1 Project Background

At the request of Waimanalo Paradise LLC, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this archaeological inventory survey report (AISR) for the proposed Waimānalo Paradise Seawall Project, 41-505 Kalaniana‘ole Highway, Waimānalo Ahupua‘a, Ko‘olaupoko District, O‘ahu, TMK: [1] 4-1-002:007 and State of Hawai‘i Coastal Lands. The proposed project is located in the northern portion of 41-505 Kalaniana‘ole Highway in Waimānalo on private land owned by Waimanalo Paradise LLC. The project area is between the coast and Kalaniana‘ole Highway and is approximately 160 m southwest of Kaiona Beach Park and 1,100 m northeast of Kaupō Beach Park and the Makai Range pier. The 0.17-acre (0.06-hectare) project area is depicted on a portion of the 1999 Koko Head U.S. Geological Survey (USGS) topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

Sea Engineering, Inc. (SEI) is proposing to conduct subsurface investigations to confirm the wall dimensions (i.e., profiles, widths, and heights) and geotechnical soil parameters to accurately determine the feasibility and cost estimates for conceptual wall repair and replacement options. An AIS is required to obtain permits to repair or modify the seawall. The trenches will be located against the *mauka* (inland) side of the wall and will slope back into the property. The plan includes excavating four trenches approximately 10 to 20 feet (ft) long, and 12 ft wide on the taller section of the wall and 5 ft wide at the short section.

1.2 Historic Preservation Regulatory Context and Document Purpose

Although this project may extend into the State of Hawai‘i coastal lands, this is considered a “private” project needing historic preservation review. Thus, this document is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-42 and Hawai‘i Administrative Rules (HAR) §13-284, as well as the project’s environmental review under HRS §343. It is also intended to support any project-related historic preservation consultation with stakeholders such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups.

This AIS investigation fulfills the requirements of HAR §13-276 and was conducted to identify, document, and make significance assessments of any historic properties.

An AIS (Crowell et al. 2019) for the overall TMK: [1] 4-1-002:007 parcel for the Waimānalo Paradise Subdivision project was accepted by the SHPD in a letter dated 5 February 2019 (Log No.:2018.02376, Doc. No.:1902SL02) (Appendix A).

On 29 March 2019, the AIS testing strategy for the current project was approved in a face-to-face meeting with SHPD (S. Lebo to D. Shideler).

In a letter dated 29 March 2019 (A. Downer to K. Sokugawa and S. Nishiura) (Log No.:2018.01746, Doc. No.:1903SL06) (see Appendix A) SHPD had two requests for the current project: that an AIS specific to the seawall be conducted and that the seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian. These requirements are described in full below:

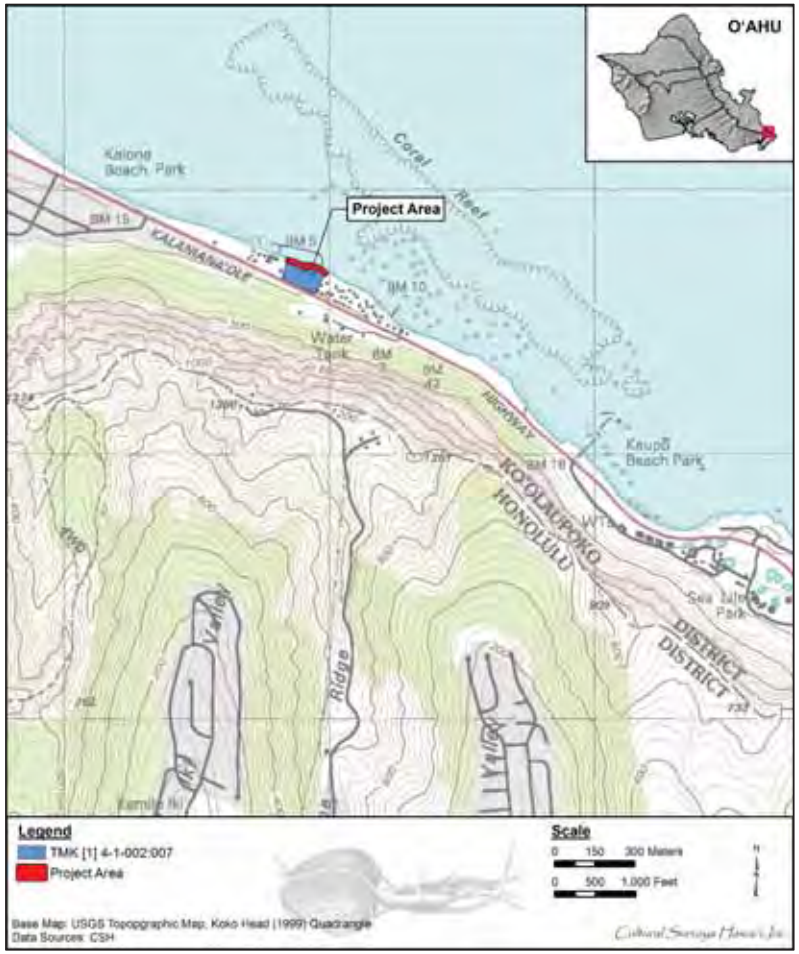

Figure 1. Portion of the 1999 Koko Head USGS 7.5-minute topographic quadrangle showing the project area

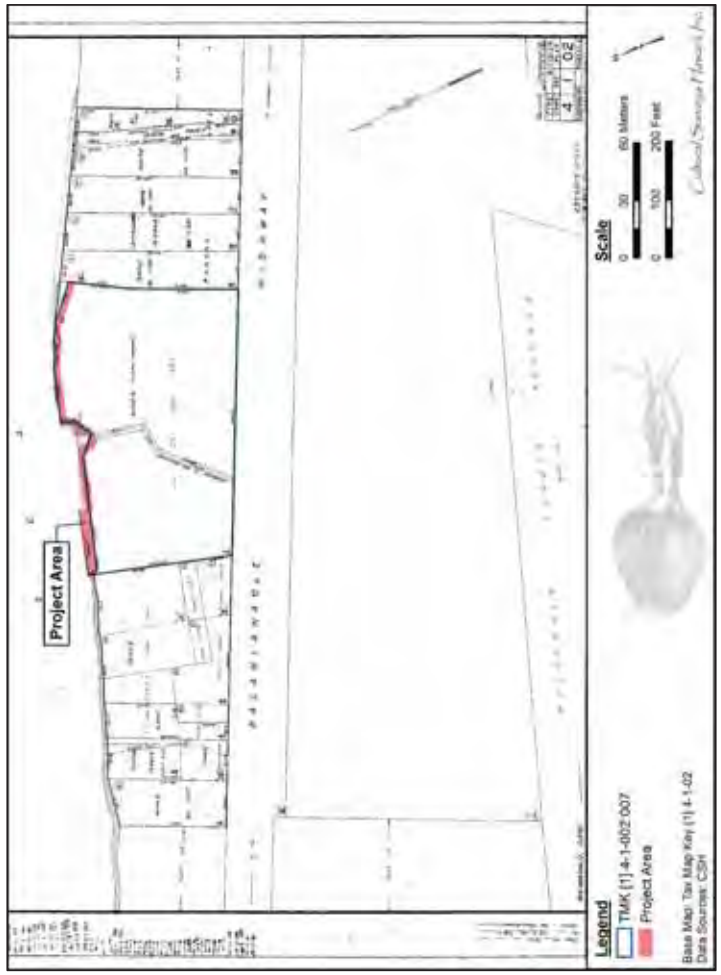

Figure 2. Tax Map Key (TMK) [1] 4-1-002 showing the project area (Hawai‘i TMK Service 2014)

Figure 3. Aerial photograph of the project area (Google Earth 2013)

1) An AIS be conducted for the current project as specified by Stipulation 28 in the Grand of Non-Exclusive Easement S-6083 between the State of Hawaii, Board of Land and Natural Resources (Grantor) and Waimanalo Paradise LLC (Grantee), dated October 29, 2015. Stipulation 28 states “The Grantee shall conduct an archaeological inventory survey, including assessment of the seawall, prior to the issuance of any future permit involving ground-disturbing activities.” The present study addresses this requirement.
2) The seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian who meets the qualifications set forth in HAR 13-824-4 or HAR 13-381-5; the assessment included in the AIS (Crowell et al. 2019) was completed by an archaeologist. The AIS identifies the seawall (Site 50-80-15-8747, Feature 5) as a component of the former Anderson Estate–Pahonu, which was completed in 1933. Most of the estate (including the seawall) were assessed as lacking sufficient integrity of design, setting, materials, workmanship, feeling, and association and, thus, Site 50-80-15-8747 was evaluated as not being a significant historic property. SHPD architecture branch confirmed (April 17, 2019) that David M. Crowell, M.S. who described and evaluated the significance and integrity of the seawall (State Inventory of Historic Places (SIHP) # 50-80-15-8747 Feature 5) is a qualified Architectural Historian and that nothing further is needed to address architecture branch concerns for this feature.

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is relatively level and flat land with a moderate drainage swale bisecting the property. This part of Waimānalo is rather circumscribed with the *pali,* or sea cliffs rising dramatically just 200 m from the shoreline, leaving only thin strip of somewhat flat land between the sea and the mountain. The project area is bordered by the ocean on the north and Kalaniana‘ole Highway on the south. The majority of the vegetation in the project area is landscaping that utilizes several indigenous, endemic, and naturalized plants and invasives including *‘ulu* or breadfruit (*Artocarpus altilis*), *‘uki‘uki* or Hawaiian lily (*Dianella sandwicensis*), *kukui* or candlenut trees (*Aleurites moluccanus*), *mahoe* or *hau* tree (*Hibiscus tiliaceus*), *naupaka kahakai* (*Scaevola gaudichaudii*), coconut palm trees (*Cocos nucifera*), *hala* or Pandanus/Screwpine trees (*Pandanus tectorius*), false kamani/*kamani haole*/sea almond trees (*Terminalia catappa*), ponciana (*Delonix regia*), areca palm (*Dypsis lutescens*), shower trees (*Cassia fistula*), and umbrella/octopus trees (*Schefflera actinophylla*).

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area’s soil consists of Jaucas sand, 0 to 15% slopes (JaC) and (Figure 4). Jaucas sand is described as follows:

> . . . excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean. These soils occur on all the islands of this survey area. They developed in wind- and water- deposited sand from coral and seashells. They are nearly level to strongly sloping. Elevations range from sea level to 100 feet; . . . The annual rainfall amounts to 10 to 40 inches. The mean annual soil temperature is 15° F. . . . These soils are used for pasture, sugarcane, truck crops, alfalfa, recreational areas, wildlife habitat, and urban development. The natural vegetation consists of kiawe, koa haole, bristly foxtail, bermudagrass, fingergrass, and Australian saltbush. [Foote et al. 1972:48]

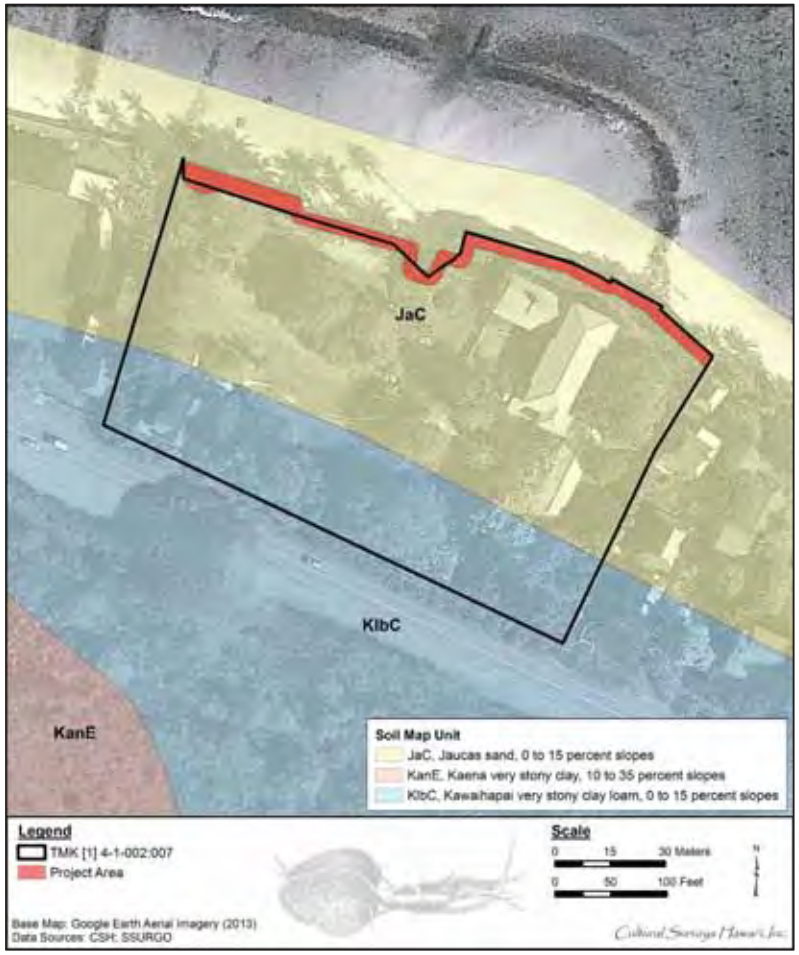

Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972; USDA SSURGO 2001), indicating soil types within and surrounding the project area (base map: Google Earth 2013)

> In a representative profile the soil is single grain, pale brown to very pale brown, sandy, and more than 60 inches deep. In many places the surface layer is dark brown as a result of accumulation of organic matter and alluvium. The soil is neutral to moderately alkaline throughout the profile.
>
> Permeability is rapid, and runoff is very slow to slow . . . The available water capacity is 0.5 to 1.0 inch per foot of soil. In places roots penetrate to a depth of 5 feet or more. Workability is slightly difficult because the soil is loose and lacks stability for use of equipment. [Foote et al. 1972:48]

Waimānalo Ahupua‘a is generally drier than the rest of the Windward O‘ahu and the climate in the project area is slightly different than most of the rest of the *ahupua‘a* (traditional land division) as it is generally hotter and dryer along the coast and in the shadow of the *pali* than in the broad valley plain. Mean annual rainfall in the project area is 797.3 mm (31.4 inches) with the wettest months between October and May and the driest months between April and September (Giambelluca et al. 2013). December receives the most precipitation (119.3 mm, or 4.70 inches) and September receives the least (18.5 mm, or 0.73 inches). There is little variation in temperature in the project area with the average monthly high of 21.58° C (77.32° F) in August and the average monthly low of 21.19° C (70.14° F) in January and February (Giambelluca et al. 2014).

The project area is in the larger Ko‘olaupoko Watershed, which extends from Kualoa on the north to Makapu‘u on the south. In Waimānalo, there are three watersheds (from north to south): Waimānalo, Kahawai, and Makapu‘u (Townscape, Inc. 2012: ES-6). The perennial Waimānalo stream and its Kahawai tributary feed the Waimānalo watershed and through urban Waimānalo, the stream is largely channelized with a concrete lining (Townscape, Inc. 2012: 2-36–2-37). The streams that feed the Kahawai watershed are the intermittent Ina‘ole Stream, also channelized with a concrete lining around Kalaniana‘ole Highway, and an unnamed intermittent stream (formerly named Muliwaiolena, but commonly referred to as “the ditch”) whose lower course mostly runs through ditches and underground culverts (Townscape, Inc. 2012: 2-37).

There are no streams within the Makapu‘u watershed and water flow consists of precipitation runoff down the fluted cliff face and surface runoff into natural drainages. One of these natural drainage areas is within the project area. There is a swale, running *mauka* to *makai* (seaward), bisecting the approximate middle of the property and a drainage easement over the property approximately follows the swale. A small, unnamed stream, approximately 70 m (230 ft) east of the project area, appears on historic topographic maps from 1934 and 1943 (see Section 3.2.5), although it does not appear on earlier maps or later maps, and is not mentioned in any background research materials or archival sources.

1.3.2 Built Environment

The project area is in a residential area (see Figure 3) and is within the northern portion of the site of the former Anderson Estate–Pahonu. Only two buildings and a few structures remain from the estate, which was completed in 1933 and largely demolished in 2018. A mortared basalt rock wall borders the property on the east, south, and west sides, and a mortared basalt seawall with concrete stucco runs along the north edge of the property (current project area). There are several other residences adjacent to and near the project area that also front Kalaniana‘ole Highway. The Pāhonu fishpond wall extends out into the ocean from the northeast project area boundary.

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this AIS under state archaeological fieldwork permit number 19-07, issued by the SHPD pursuant to HAR §13-282. CSH archaeologists Brittany Enanoria, B.A., Gina Farley, M.A., Chris Konen, B.A., and Tanyja Roberson, B.A., conducted fieldwork during 2 April 2019 and 3 April 2019 under the general supervision of Principal Investigator David Shideler, M.A. This work required approximately 7 person-days to complete.

This Waimanalo Paradise seawall AIS is being conducted, in part, to facilitate engineering analysis of the seawall. The engineering data information will be used to define an approach to subsequent seawall stabilization and repair.

In general, fieldwork included 100% pedestrian inspection of the project area, GPS data collection, and subsurface testing. Standard forms were used for all aspects of the AIS fieldwork, including but not limited to feature forms, test excavation record forms, bag list forms, photo logs, and stratigraphic record forms.

2.1.1 Pedestrian Survey

A 100%-coverage pedestrian inspection of the project area was undertaken for the purpose of historic property identification and documentation. The pedestrian survey was accomplished on both sides of the seawall. Archaeologists documented the general characteristics of the project area and took measurements and general photographs of the seawall and the project area. A 100%-coverage pedestrian inspection for the project area parcel was completed by Crowell et al (2019).

Documentation of structural remnants from potential surface historic properties included plan view maps, general descriptions, and photographs. Additional documentation of the potential surface historic properties included, when possible, size, horizontal extent, descriptions of features, presence and/or absence of surface remains, and information that can contribute to the assessments of integrity, function, age, and significance.

2.1.2 GPS Data Collection

Handheld Garmin GPSMAP 64s were used to record the GPS track log during the pedestrian inspection. These handheld units provide horizontal accuracy between 3 and 5 m. The locations of both ends of each of the test excavations and significant features were recorded using a Trimble Pro XH mapping grade GPS unit with real-time differential correction. This unit provides sub-meter horizontal accuracy in the field. GPS field data was post-processed, yielding horizontal accuracy between 0.5 m and 0.3 m. GPS location information was converted into GIS shape files using Trimble’s Pathfinder Office software, version 2.80, and graphically displayed using ESRI’s ArcGIS 10.3. CSH utilizes the NAD 83 HARN datum and UTM Zone 4N coordinate system.

2.1.3 Subsurface Testing

The subsurface testing program was backhoe-assisted and involved four rectangular test excavations at representative locations along the *mauka* side of the sea wall. The *makai* side of the seawall is basically at mean sea level. The testing strategy was based on consultation with the HPD and needs of Sea Engineers. The proposed AIS test excavations are depicted on

Figure 5 through Figure 9. Based on the existing conditions in the project area and the size of the excavator bucket, the dimensions of the test excavations for T-1 and T-4 were smaller than originally planned; dimensions for T-2 and T-3 were larger than originally planned. T-1’s original dimensions were 2.44 m (8 ft) by 1.22 m (4 ft), located 7.6 m (25 ft) east of the boat ramp. The excavated portion of T-1 measured 2.3 m (7.54 ft) by 2.25 m (7.38 ft). T-2’s original dimensions were 3.66 m (12 ft) by 2.44 m (8 ft) located 7.6 m (25 ft) west of concrete steps. The excavated portion of T-2 measured 4.0 m (13.1 ft) by 2.4 m (7.8 ft). T-3’s original dimensions were 3.66 m (12 ft) by 3.66 m (12 ft) located 30.5 m (100 ft) east of concrete steps. The excavated portion of T-3 measured 4.25 m (13.9 ft) by 2.4 m (7.8 ft). T-4’s original dimensions were 3.66 m (12 ft) by 3.66 m (12 ft) located 18.3 m (60 ft) west of southeast property boundary. The excavated portion of T-4 measured 3.5 m (11.4 ft) by 2.4 m (8.5 ft).

Test Excavation 3 is located near (25 m *makai*) the documented burial (designated State Inventory of Historic Places [SIHP] # 50-80-15-8749) to ensure that as the repair project moves forward the potential to encounter further burials has been assessed by this Waimanalo Paradise seawall AIS.

Excavations extended between 160 and 295 cm below the present ground surface upon reaching the water table except for one instance in T-4. Due to the abundance of fine sand fills in conjunction with a large excavator bucket, the trench walls were very unstable. Additionally, the trench walls were deemed too wide to accommodate proper shoring, therefore trench entrance after 4.5 ftbs was not feasible due to safety precautions.

Removal of fill deposits will be undertaken via backhoe with one archaeologist observing the test excavation and backhoe bucket and another closely observing the backdirt. The removal of fill deposits was informed by our knowledge of the depth of a previously identified human burial (SIHP # -8749) between 143-150 cmbs (Crowell et al. 2019:187) and the depth of the fill in the nearest prior test excavations (90 cmbs at Test Excavation 6) (Crowell et al. 2019:99).

A stratigraphic profile of each test excavation was drawn and photographed. The observed sediments were described using standard USDA soil description observations/terminology. Sediment descriptions include Munsell color; texture; consistence; structure; plasticity; cementation; origin of sediments; descriptions of any inclusions, such as cultural material and/or roots; lower boundary distinctiveness and topography; and other general observations. Exposed stratigraphic anomalies and potential cultural deposits were carefully represented on test excavation profile maps.

When archaeologists encountered potential historic properties, they documented them as discussed above in addition to illustrating a plan map, if possible. Additional documentation of the potential historic properties included, if possible, size, horizontal extent, descriptions of features, presence and/or absence of surface and subsurface remains, and information that can contribute to the assessments of integrity, function, age, and significance in accordance with HAR §13-276-5. The seawall was documented as an existing historic property, SIHP # 50-80-15-8747 Feature 5, Anderson Estate–Pahonu remnants.

CSH osteologists Allison Hummel, M.Sc., and Alison Welser, M.A., examined and identified all faunal remains in the field; they collected and recorded the provenience for further laboratory analysis and curation. When historic artifacts were present within historic fill deposits, CSH archaeologists collected a representative artifact assemblage for laboratory analysis and curation.

Figure 5. Aerial photograph showing four proposed locations for Waimanalo Paradise seawall archaeological inventory survey testing (and the location of the previously identified human burial SIHP # -8749)

Figure 6. Location of Waimanalo Paradise seawall AIS test excavation 1 pre-excavation; view to north

Figure 7. Location of Waimanalo Paradise seawall AIS test excavation 2 pre-excavation; view to northwest

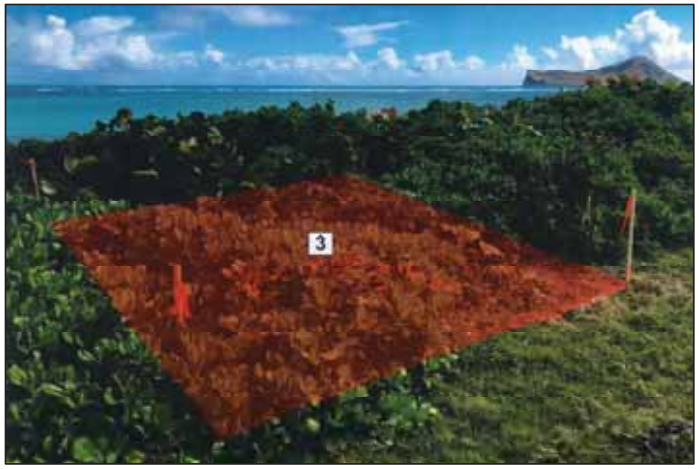

Figure 8. Location of Waimanalo Paradise seawall AIS test excavation 3 pre-excavation; view to northeast

Figure 9. Location of Waimanalo Paradise seawall AIS test excavation 4 pre-excavation; view to north

The representative artifact assemblage was selected to include examples of types of artifacts present and any artifacts with diagnostic features. CSH archaeologists recorded provenience for each artifact collected. CSH personnel cleaned, identified, and tabulated these historic artifacts from fill deposits, providing a sufficient characterization of the types and ages of historic artifacts within these fill deposits.

2.2 Laboratory Methods

Materials collected during AIS fieldwork were identified and catalogued at CSH’s laboratory facilities on O‘ahu. Analysis of collected materials was undertaken using standard archaeological laboratory techniques. Materials were washed, sorted, measured, weighed, described, and/or photographed.

2.2.1 Sediment Sample Cultural Content Analysis

Sediment samples collected from potential cultural strata and/or features were examined within the CSH laboratory to aid in characterizing the cultural content and chronology of these deposits. Samples were screened in the field and its contents were collected. All samples were labeled with provenience information, and the volume of each sample was recorded so that comparisons could be made between samples. Samples screened in the field utilized 1/8-inch wire mesh to remove the sedimentary matrix from the cultural content (faunal, floral, and artifactual remains). Wet screening of samples was performed as necessary. As applicable, the cultural material was washed, sorted, measured, weighed, described, photographed, identified, and catalogued.

2.2.2 Faunal Analysis

Faunal analysis generally focused on species identification and evidence of food consumption. For collected invertebrate remains, shell midden was first separated from non-midden shell. Non-midden shell was then weighed as a bulk total with no additional analysis warranted. Shell midden was identified to the lowest possible taxa, weighed, and analyzed. Common shells were identified and analyzed using an in-house comparative collection and reference texts (e.g., Abbott and Dance 1990; Eisenberg 1981; Kay 1979; Titcomb 1979). Collected non-human vertebrate skeletal material was identified to the lowest possible taxa and analyzed using an in-house comparative collection and reference texts (e.g., Adams and Crabtree 2012; Olsen 1964; Schmid 1972; Sisson 1953). Faunal Analysis was conducted by CSH osteologist Alison Welser, M.A.

2.3 Disposition of Materials

Materials collected during the current AIS (excluding human remains and grave goods) will remain temporarily curated at the CSH office in Waimānalo, O‘ahu. CSH will make arrangements with the landowner regarding the disposition and proper archiving of this material. Should the landowner request different archiving of material, an archive location will be determined in consultation with the SHPD. All data generated during the AIS are stored at the CSH offices.

2.4 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i at Mānoa, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop

Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Both English and Hawaiian Language Newspapers were researched. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (Waihona ‘Aina 2000).

Hawaiian language newspaper accounts that reference the term “Pāhonu” were summarized in English. A transliteration of the text of the article, as well as photocopies of the article when available, were compiled with the assistance of the Ulukau Hawaiian Electronic Library Hawaiian Nūpepa Collection website (Ulukau 2018). Hawaiian language article summaries were completed by CSH Hawaiian Language Translator, Jason Ford, B.A.

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area.

Section 3 Background Research

3.1 Traditional Accounts

Traditional accounts such as *ka‘ao* (legends), *mo‘olelo* (stories) , and *wahi pana* (storied places) present some generally recurring themes about Waimānalo including the scarcity of water, except for small springs and Waimānalo Stream; the abundance of food crops along Waimānalo Stream; the broad reef and good fishing resources in the ocean fronting Waimānalo; and the somewhat isolated nature of Waimānalo, especially in terms of land routes, but with a sandy beach frontage allowing easy access by sea. An example of traditional accounts that reference Waimānalo occurs in the Pele and Hi‘iaka epic. During her travels to locations throughout the Hawaiian Islands, Hi‘iaka arrived on O‘ahu at Makapu‘u (Figure 10), in southeastern Waimānalo Ahupua‘a:

> As they [Hi‘iaka and her companion Malei] traveled on, Makapu‘u and its neighbor hills passed out of sight. Arriving at Ka-ala-pueo, they caught view of the desolate hill Pohaku-loa, faint, famished, forlorn . . . ‘It [southeastern Waimānalo] is indeed a barren land. Fish is the only food it produces. Our vegetables come from Waimanalo. When the people of that district bring down bundles of food we barter for it our fish.’ [Emerson 1915:89]

Another theme associated with Hi‘iaka’s traverse of Waimānalo is her interactions with the local beauty ‘Āpuakea. Fornander (1919:4:343) relates, “At Kapua in Koolau Muliwaiolena and her daughter Apuakea were killed because the latter compared herself to Hiiaka in beauty.” A more comprehensive account is given in a rendition of the story of Hi‘iaka-i-ka-poli-o-Pele in the Hawaiian language newspaper *Ka Leo o Ka Lāhui*:

> They traveled past Kuhui (Kukui?) and Pahonu where the people shouted at the beauty of Hiiaka. The news reached the ears of Apuakea and she said to her mother, Muliwaiolena, ‘Oh, Muliwaiolena, go and take a look at the women whose beauty the people are shouting about and see if they are as beautiful as I am.’ Muliwaiolena came out and looked. Never had she seen anything on O‘ahu to equal the beauty of these women. Turning to Apuakea she said, ‘Daughter, your beauty does not compare with their great beauty. You are like the soles of their feet.’ Hearing this the expression on Apuakea’s face changed and she fainted away.
>
> Hi‘iaka overheard the words of the woman to her daughter and she uttered this chant:
>
> > O Apuakea-nui, you beautiful woman,
> > Comparisons have been made of your charms,
> > You are beautiful, beautiful indeed.
>
> Muliwaiolena then called out to Hi‘iaka and her friend, ‘Come in, eat and drink and when you are full then continue on your long journey.’ But the travelers did not accept as they did not like the embarrassing comparison that had been made between themselves and the young girl, Apuakea.

Figure 10. Traditional Hawaiian place names in Waimānalo in relation to the project area

> As the travelers went off Muliwaiolena suddenly fell dead. Shortly afterwards Apuakea died. [*Ka Leo o Ka Lāhui* 14, 15 March 1893 in Sterling and Summers 1978:248–249]

It is said the coastal area of central Waimānalo, northwest of the current project area, was named ‘Āpuakea (see Figure 10), or Fair ‘Āpua, for the maiden “whose skin was very fair and whose behavior was so loveable that the people named the place for her and for her fair skin” (Alona 1939 in Sterling and Summers 1978:245). The ancient village of Kapu‘a, the setting of the ‘Āpuakea story, was also said to have been the location of the legendary Muliwai‘ōlena Stream:

> When Kauholokahiki, sister of Kanehunamoku, came ashore from Ulukaa she landed at Ulupau in Mōkapu. There she built a shrine on which to lay her offerings, and there she was found by some women who went to gather sea weeds on the shore and made friends with her. The native women admired the beauty of the stranger who was covered only by a skirt of green pahapaha sea weeds. One of the women removed her own body covering and draped it around the hips of the stranger and invited her to her home. Her beauty glowed like a light in the house and many people came with gifts of tapas, skirts, dogs, hogs and poi. One day the chief Ilauhoe took Kauholokahiki, the stranger, to be his wife. She was so beautiful that even the palms of her hands were lovely. When the chief Ilauhoe married her, the chief wanted her to go bathing with him but she answered, ‘I am kapu and can bathe in no other water unless you go yourself and fetch my bathing water from Muliwaiolena.’ The husband said, ‘It may be in Kahiki and is too far. We do not know where this water is.’ She replied, ‘If you love me, O Chief, go yourself for my bathing water that I mentioned. It is in Waimanalo, at Kapua, a village belonging to the chief Lupe. It is the stream with the yellow water that runs quietly. That is the one.’ The chief ran at once with a container and in no time he dipped up the water and returned. It was indeed yellowish color and that was the first time that it was known that this was Muliwaiolena. It is there to this day. [Uaua 1870 in Sterling and Summers 1978:248]

In the mid-valley area of Waimānalo, *mauka* of Muliwai‘ōlena and northwest of the current project area, was a low hill known as Pu‘u o Moloka‘i:

> Long ago a Molokai man came here and went to live on a low hill not far from Muliwai-olena. The reason for his coming from Molokai to Oahu was forgotten long ago but others followed and dwelt with him. This hill was called Puu-o-Molokai or Molokai’s-hill. The newcomers made their homes on the hill itself and kept very much to themselves. When a boy married one of the girls of Waimanalo, he had to leave his own people to dwell with his wife’s. If a girl married a Waimanalo man she too left her own people. Gradually the Molokai people were absorbed by those of Waimanalo. [Alona 1939 in Sterling and Summers 1978:247]

There are also traditional accounts of two springs in Waimānalo Valley:

> The one called Kupunakane is away up in the mountains. The spring called Kupunawahine is a spring way down on the level land. The strange, strange thing about these ponds was that on calm, sunny days they begin to cry out to each other. Their voices were soft and sounded very much like a woman mourning her

> husband. On days that were over cast with clouds in the sky, then the water of the mountain spring changed. The water of the mountain spring came warm and when you drank the water in the lowland spring it was cool, according to their legend. [*Hoku o Hawaii* 11 March 1930 in Sterling and Summers 1978:247]

The current project area at Pāhonu and Waimānalo also figure in the legendary and traditional accounts of the genealogy of Kamapua‘a, the demi-god generally associated with the neighboring *moku* of Ko‘olauloa. According to an 1861 account from S.W. Kahiolo in the Hawaiian language newspaper *Ka Hae Hawaii* (Kahiolo, *Ka Hae Hawaii,* 26 June 1861:52 in E. Mookini et al. 1978:2-30) and summarized here, Pāhonu was the landing place of Kamauluaniho and Hina. They journeyed from Maui to fulfill Kamauluaniho’s promise to her daughter, Hina, that she would be given to Olopana, chief of O‘ahu, to be his wife. Olopana was impressed with Hina’s beauty, however, he decreed that Hina was to be the wife of his younger brother Kahikiula, to which Kamauluaniho agreed, but which was not right in Hina’s mind and she refused to settle down and live with Kahikiula. Following her mother’s advice, Hina relented and had to two daughters with Kahikiula, Keaokiikii and Keaokauikalaeo-makahaloa, who both died, and a son Kaikihonuakele, who survived.

Olopana missed his younger brother, Kahikiula, and he went to visit him. While he was visiting he slept with Hina, who gave birth to a son, Kekeleiaiku. Following the birth of Olapana and Hina’s child, Kahikiula and Hina had another child, Kamapua‘a, however, he was not born in the body of a human, but as a piece of cord. Kamapua‘a’s grandmother and older brother watched over the cord that was placed in an altar, worshipping it, which Hina and Kahikiula despised. The cord later became a pig, it ran off, and was not seen by anyone except Kamauluaniho. Following the reunion of Kamapua‘a with his family, his younger, half-brother Kekeleiaiku, watched over him with guidance from Kamauluaniho.

At one point, Kamapua‘a carried out an extraordinary feat of planting a bundle of taro tops without the assistance of farmers and then denounced the *kapu* on chickens that had been set by Olopana, because the people were hungry. Olopana’s chickens were killed and eaten and in response he launched a number of attacks against Kamapua‘a. Prior to the attacks, Kamapuua‘a transported the people to the safety of the mountains and though he was captured several times by Olopana’s troops, he always escaped to the chants of his grandmother and ate all of the men except the messenger who would relay what happened to the chief. Olopana then mobilized troops from all of O‘ahu, attacked Kamapua‘a, and following several fierce battles, Olopana was defeated and killed. Kamapua‘a retrieved his people from the mountains and the priest, Lonoawohi, requested that Kamapua‘a grant him all the *wai* lands, which was a riddle and meant all lands with the word *wai* as part of the name, including Waimānalo.

Another legendary and traditional account of Pāhonu is one that reports it as being the location for the origin of humans:

> A dispute arose between Kane, the mighty and merciful god, and Kanaloa, the evil one. Kanaloa portrayed his own image on the sand, but did not succeed in bringing it to life. Kane, perceiving the failure made a figure on the sand according to his own image and called out with a voice of thunder: ‘E hiki au e ola, e ola! E hiki au e ola, eola!! E hiki au e ola, eola!!!’ (When I am come, or am present, come to life, come to life!) and the figure arose from the sand in the shape of a man. The shadow

> and newly created man being observed on the sand, Kane thought he could not live without it. He therefore shouted in the same manner: ‘e ola e ola!!’ to the shadow, and behold, there stood up a beautiful woman.
>
> Kaneloa, filled with rage, tried to induce them to forsake Kane, and become his. He succeeded, and they went to Kualoa. Kane, seeing that they had left him, declared that he would not give them children in their own shape and form until they made amends. The name of the man was Hulihonu (In search of Land); the woman’s name was Keakaohulihonua, or, the Shadow of In Search of Land. In consequence of Kane’s anger, their first offspring were birds stopping at Mokulua.
>
> The first man and woman were made at Pahonua, Waimanalo, Oahu. The precipice of Lape, at Waimanalo, was always considered a sacred place, by the Kings of Oahu. From Hulihonua and Keakaohulihonua came all the people of these Islands. [*Hawaiian Gazette*, 7 October 1868:2]

Pāhonu, the pond enclosure seaward of the current project area, was described as a pen for turtles reserved for the *ali‘i* (chiefs):

> There was once a chief who was so fond of turtle meat that he ordered a sea wall built to keep captured turtles from escaping. Every turtle caught by a fisherman was put into this enclosure. No one else was allowed to partake of turtle meat under penalty of death. No one dared to eat turtle as long as the old chief lived. [Alona 1939 in Sterling and Summers 1978:249]

3.2 Historical Background

3.2.1 Early Historic Period

Waimānalo was a frequent point of arrival and departure from O‘ahu in the late pre-Contact and early post-Contact periods, as in the following account of the loss of O‘ahu sovereignty:

> When King Kahekili of Maui heard of the death of the priest, Kaopulupulu, by Kahahana (a chief appointed by Kahekili to govern Oahu), he sent some of his men thither by canoe, who landed at Waimanalo, Koolau, where as spies, they learned from the people respecting Kaopulupulu and his death, with that of his son; therefore they returned and told the King the truth of these reports, at which the affection of Kahekili welled up for the dead priest, and he condemned the King he had established. Coming with an army from Maui, he landed at Waikiki without meeting Kahahana, and took back the government of Oahu under his own kingship. The chiefs and people of Oahu all joined under Kahekili for Kahahana had been a chief of wrong-doing. [Thrum 1907:212–213]

In 1875, Native Hawaiian historian Samuel Kamakau related the following: “The ahupua‘a of Waimanalo, including the fish pond at Maunalua and the traveling uhu of Makapu‘u belonged to Maui-mua (First Maui)” (*Kuokoa* 27 November 1875 in Sterling and Summers 1978:244).

During Kamehameha’s conquest of O‘ahu, part of his fleet landed near Makapu‘u and then joined with Kamehameha’s other forces, finally conquering O‘ahu. Prior to the invasion, Kamehameha sent a messenger to Kahekili:

> Ki-kane, Kamehameha’s messenger to Kahekili, threw down two *maika* stones, a black one and a white one. Ka-hekili said when he saw these stones, ‘This stone (the white) brings life through farming and fishing, rearing men, and providing them with food; this other stone (the black) brings war.’ Let the reader ponder the meaning of this answer. Kahekili asked, ‘Is Kamehameha coming to Oahu to fight?’ ‘Yes,’ answered Ki-hane. ‘What harbor will he choose?’ ‘It was Kiko‘o’s counsel to make Waimanalo the harbor and battle site.’ ‘It is too low there to cast sling stones to reach the heights. It is good only for food and fish. If stones are thrown from above nothing can save the battlefield . . . ’ [Kamakau 1961:150]

After Kamehameha’s conquest of O‘ahu and his division of the island among his chiefs, Waimānalo was apparently retained as Kamehameha’s personal property. This seems to be the case as in 1845, Kamehameha III, Kauikeaouli, who had “inherited” the land as a son of Kamehameha I, claimed the *ahupua‘a* of Waimānalo “to be the private lands of his Majesty Kamehameha III, to have and to hold to 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” (Commissioner of Public Lands 1929:28).

Two early foreign visitors, both missionaries, visited Waimānalo. In 1828, Levi Chamberlain commented on Waimānalo as being a “considerable settlement.” While there, Chamberlain stayed in a native house, which he described as “a miserable place for the abode of human beings and presented a motley group of children and women, dogs, hogs and fowls.” Chamberlain also noted “though there are a good many inhabitants in the settlement, yet but very few seemed to give any attention to instruction (Chamberlain 1957:30). In 1838, Edwin Hall wrote the following:

> We could not however, but notice, that most of the inhabitants on the eastern end of the island were much more degraded, and exhibited far less evidence of improvement than any we saw on other parts of the island; a fact calling for our sympathy and pity, and for our endeavors to enlighten and elevate them. [Hall 1839:111]

While early European and American accounts give insight into the early historic period in Hawai‘i, albeit often biased at best or outright dismissive, undermining, racist, and oppressive at worst; Hawaiian language newspapers are also a valuable resource of information and insight into this time. Hawaiian language newspapers were invaluable for the documentation of the long and storied oral history and traditions of so many aspects of Hawaiian culture as discussed in the previous section. While some of the traditional *ka‘ao* accounts are fantastical and mythical, residing in the *wao akua* (realm of the gods) and an elemental time or are stories, histories, traditions, or morality tales relayed through *mo‘olelo*; some of the accounts in the these newspapers were more pedestrian, however, they can help add to the history and knowledge of the time and communicate the value and meaning of a place. CSH conducted an exhaustive search of historical Hawaiian language newspapers for articles that referenced the current project area, Pāhonu, and translated these articles for this report.

The earliest reference to Pāhonu is an account of men, women and children congregated in Wailupe for church services and prayer. Pūlama, after returning with others from fishing, gives the congregation 80 *‘anae* (full sized *‘ama‘ama* mullet fish) fish, and it is discussed how they will carry the fish around O‘ahu. It is decided that Pūlama and the people of Pūlama will take care of

the fish and distribute them around to the homes of the people of the congregation. The author (Punihaole), Wahineali‘i, and Tineka travel from Makapu‘u to Pāhonu where Lono resides (*Ke Kumu Hawaii*, 29 March 1837:85).

Another article authored by Punihaole who stated that Lono collected the men, women, and children together to meet in a location of which the author at that time was uncertain of. However, Wahineali‘i and Kineka are aware of the place. Punihaole learns of the location when they are arriving at Pāhonu, where they shared food and held church service and prayer. The foods listed are *poi* (pounded kalo), *manini* (reef surgeonfish), *pāuhuuhu* (a red and brown parrot fish), *ōpule* (a wrasse), and *maiko* (a surgeonfish). Services were also held at Puhā (Waimānalo), a place near where Ka‘ahumanu first held a meeting when they travelled the island. Later, another meal was prepared containing many *‘uala* (sweet potato), *mokulaia* (a fish), and *moa* (chicken) from the place where Lono is from, which is said to be Pāhonu. A person asks what kind of fish the *mokulaia* is, and it is stated that Lono, who lives in Waimānalo, brought that fish (*Ke Kumu Hawaii*, 13 April 1837:89).

References to Pāhonu disappear from Hawaiian language newspapers for almost the next 30 years until the 1861 account of part of the Kamapua‘a story (see 3.1) in *Ka Hae Hawaii* (26 June 1861:52). From 1862–1865, Pāhonu is referenced in three different articles and contexts.

In a lamentation for Paulo who had passed, Pāhonu was referenced poetically in the statement, "*ku‘u hoa mai ka lā wela o Pāhonu*," which translates as "the beloved friend who is from hot sun of Pāhonu." (*Ka Hoku o Ka Pakipika*, 6 February 1862:49).

An editorial piece was written to Mr. Benikila, who responded to another article written by Z.P. Poliala concerning the question "how can Hawai‘i (the population of Hawaiians) grow after diminishing?" The writer of this piece agreed with Mr. Benikila that Hawai‘i (the Hawaiian people) cannot increase because the law "*ho‘okamakama*" was released. This was a discussion on making prostitution legal, or *noa*, and it was the author's concern that the Hawaiian community cannot grow because of heavy wrongdoing associated with this *noa*. *"A lohi apa ana i ke one o Pahonu"* appears to be a poetical expression with a rough literal translation of "and slow lingerings due to the sand of Pāhonu," or "linger slowly to the sand of Pāhonu" (*Ka Nupepa Kuokoa*, 19 January 1865:1).

The author Kalauli responded to children who attempted to answer a riddle presented in a previous paper. Kalauli stated that no one has provided the correct answer and then provided another question as a clue. It was said that the answer was walled in with the shining sands of Wailea and Pāhonu, and that was the thing that is making the answer unknown (*Ka Nupepa Kuokoa*, 6 July 1865:3).

Only two other references to Pāhonu could be found in the historic Hawaiian language newspapers and both are for places on different islands. One is a reference to a place on Maui that is also known as Pāhonu (*Ka Nupepa Kuokoa*, 8 December 1866:1) and the Hawaiian place name database on Ulukau: The Hawaiian Electronic Library verifies this is in the *ahupua‘a* of Lole (Ulukau 2018). The other is a reference to Pāhonu in the *ahupua‘a* of Kawaihae 1, South Kohala District, on the island of Hawai‘i (Ulukau 2018).

3.2.2 Land Commission Award Documentation

In 1845, the Board of Commissioners to Quiet Land Titles, also called the Land Commission, was established "for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property" (Chinen 1958:8). This led to the Māhele, the division of lands among the king of Hawai‘i, the *ali‘i*, and the common people, which introduced the concept of private property into Hawaiian society. In 1848, Kamehameha III divided the land into four categories: Crown Lands reserved for himself and the royal house; Government Lands set aside to generate revenue for the government; Konohiki Lands claimed by *ali‘i* and their *konohiki* (supervisors); and *kuleana,* habitation and agricultural plots claimed by the common people (Chinen 1958:8–15). Ralph Kuykendall notes the concept of private land ownership was a radical departure from the local traditional land tenure system: "The old feudal arrangement of joint and undivided ownership had given place to the system of individual allodial tenures, and aliens had been admitted to the enjoyment of the same rights as Hawaiian subjects in the ownership and use of land" (Kuykendall 1967:298).

The *ahupua‘a* of Waimānalo was awarded to Victoria Kamāmalu, subject to the *kuleana* claims of the commoners. She received the third largest share of lands among the *ali‘i nui* (high chiefs) of the Kingdom of Hawai‘i, including 47 *ahupua‘a*-sized parcels in addition to Waimānalo. Approximately 113 *kuleana* land claims were awarded in Waimānalo. Nearly all of these Land Commission Awards (LCA) were located along Waimānalo Stream, or its upper tributaries, in the northwestern portion of the *ahupua‘a* (Figure 11). While the Hawaiian population of Waimānalo was likely much larger and more dispersed in pre-Contact times, it nevertheless appears that the traditional Hawaiian population of Waimānalo was always clustered along Waimānalo Stream and its upper tributaries, focused on wetland taro and sweet potato cultivation.

Land Commission Award data indicated it was common for *kuleana* awards to have a parcel along the coast as well as a parcel in the upland area. The following account describes the traditional utilization of both land and sea:

> A spring called Wai-kupanaha was pointed out to us, (in valley mauka of Mill), surrounded by tall taro plants, banana trees and fragrant white gingers. According to Mr. Alona, the Wai-kupanaha on the west side of Mr. Castle's place was a lele, or a part of this kuleana, so both were given the same name. The upland piece was for taro growing and the piece near the sea was for fishing. The former owners of Wai-kupanaha went inland to raise taro and then to their land by the shore to fish. Both places had water but today only the upland Wai-kupanaha has water. [Alona 1939 in Sterling and Summers 1978:246]

Additional *kuleana*, primarily consisting of house lots, were sparsely scattered along the coastal areas of central and southeastern Waimānalo. These *kuleana* awards were likely used to focus on the procurement of marine resources. One *kuleana*, LCA 234-I, awarded to Paahonua/Pahanua, was in the northeast corner of the project area (Figure 12; see also Figure 25 and Figure 26). There were also two other LCAs nearby: LCA 234-Y which was 209 m, or 686 ft, to the northwest and LCA 3265 which was 323 m, or 1,060 ft, to the south east (see Figure 12).

According to the Waihona ‘Aina database (2000), in the testimony for LCA 234-I, Paahonua/Pahanua claimed four *lo‘i* (taro patches) in the *‘ili* of Waikupanaha (‘Āpana 1) and one *kahua hale* (house lot) in the *‘ili* of Pāhonu (‘Āpana 2); which he claimed as "his land from Lono

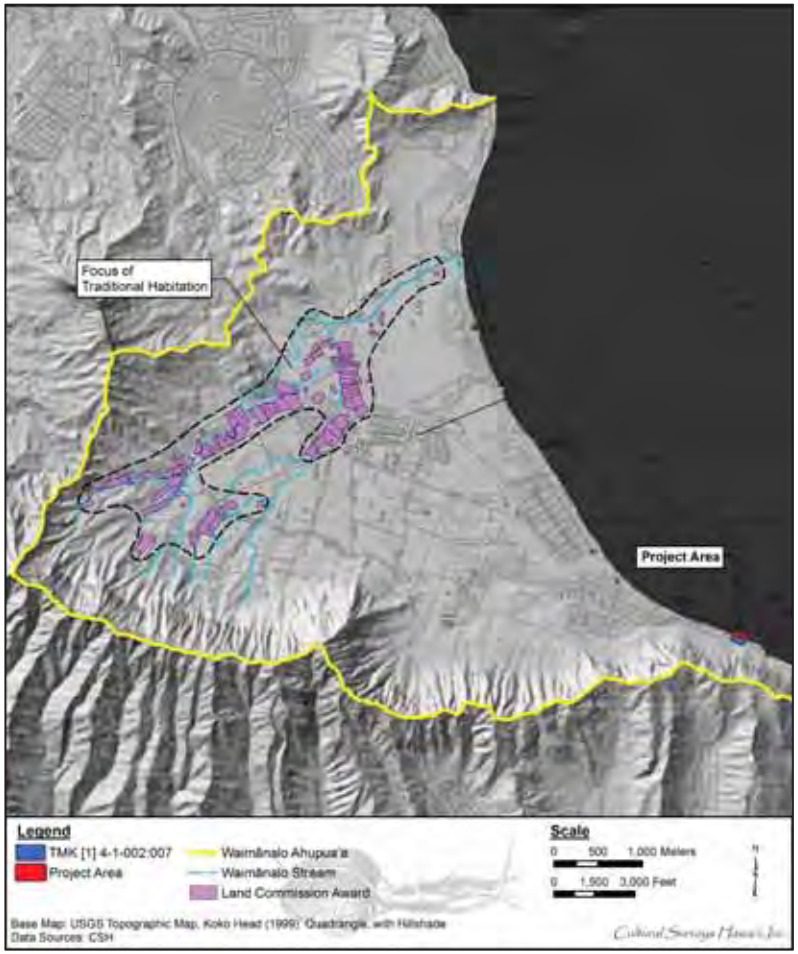

Figure 11. 1999 Koko Head USGS topographic quadrangle, showing the focus of traditional Hawaiian habitation along Waimānalo Stream and its tributaries (based on LCA data), in relation to the project area

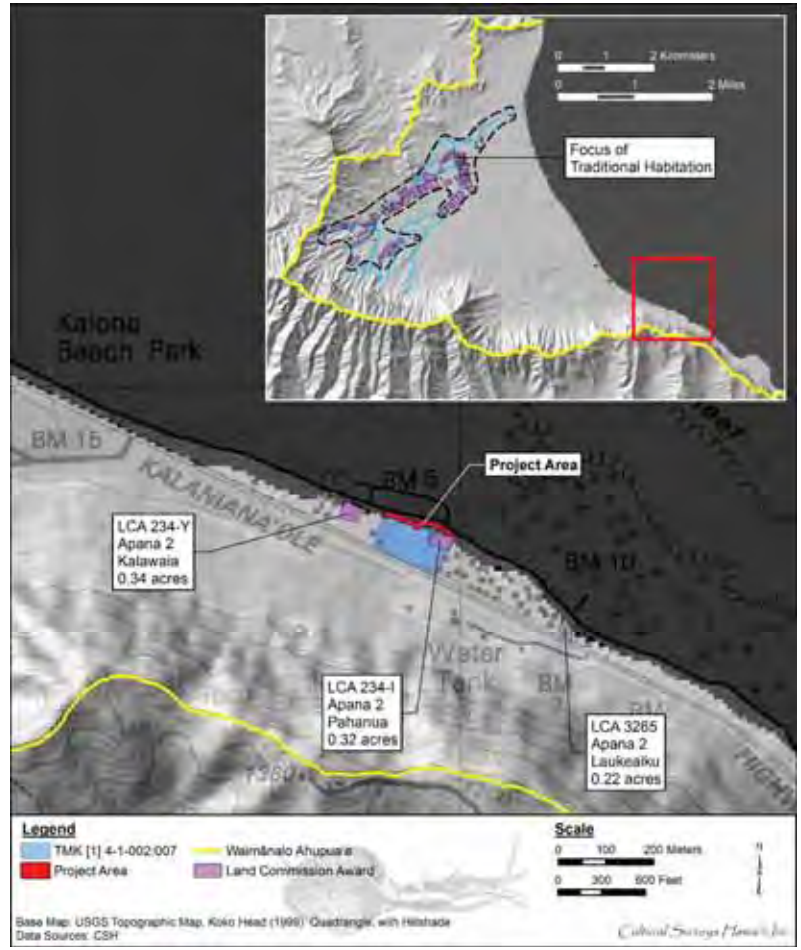

Figure 12. 1999 Koko Head USGS topographic quadrangle showing the LCA in the project area and nearby LCAs

in the time of Kinau.” According to the testimony, the house lot was bounded on the *mauka* side by a *pali* (cliff), the house of Piko on the Kāne‘ohe side, uplands on the *makai* side, and a plat of *lauhala* on the Kona Makapu‘u side. LCA 234-I was awarded in 1850 (Ava Konohiki 2015).

In the testimony for the nearby LCA 234-Y, Kalawaia claimed five *lo‘i* in the *‘ili* of Iole (‘Āpana [lot] 1) and one *kahua hale* in the *‘ili* of Pāhonu (‘Āpana 2) and he also claimed that “he had his land from Kinau and has it in peace to that time” (Waihona ‘Aina 2000). According to the testimony, the house was bounded by the house lot of Kalawaia on the *mauka* side, the sea and beach on the Kāne‘ohe side, the house lot of Mahoe on the *makai* side, and a *pali* on road on the Kona Makapu‘u side. LCA 234-Y was awarded in 1850 (Ava Konohiki 2015).

In the testimony for the nearby LCA 3265, Laukeaiku claimed two *lo‘i* in the *‘ili* of Waikuphanaha (‘Āpana 1) and one *kahua hale* in the *‘ili* of Pāhonu (‘Āpana 2) and he also claimed that “had his land from Kaalehu in the time of Kinau and has had [it] in peace to the present time” (Waihona ‘Aina 2000). According to the testimony, the house was bounded by the uplands on the *mauka* side, the uplands on the Ko‘olauloa side, the house lot of Ihu on the *makai* side, and uplands on the Kona side. LCA 3265 was awarded in 1850 (Ava Konohiki 2015).

3.2.3 Ranching in Waimānalo

In 1828, Englishman Thomas Cummins arrived in Hawai‘i. Soon after, he married the High Chiefess Kaumakaokane, a relative of Kamehameha I, who provided Cummins with connections to the throne. Cummins received a Royal Patent to an estate of crown lands in Waimānalo in 1842 and in 1850, Kamehameha III leased 6,970 acres of land in Waimānalo to Cummins for a period of 50 years at $350.00 per annum (Silva 1981:A-33). Thomas Cummins and his son John A. Cummins then proceeded to turn Waimānalo into a large cattle and horse ranch. The Cummins Estate, known as “Mauna Rose,” became famous for its lavish parties, commonly hosting the royal Kamehameha family, King Kalākaua, Queen Lili‘uokalani, and American, British, and Russian naval officers visiting O‘ahu (*Honolulu Star-Bulletin* 22 June 1935:9 in Silva 1981:A-22). Cummins constructed a landing at Waimānalo Bay, as access to Waimānalo prior to the construction of the Nu‘uanu Pali road was primarily by sea (Condé and Best 1973:364). A railroad line was also constructed to connect the landing to the Cummins Estate:

> Kamehameha V often visited the [Cummins’] plantation. When he grew too heavy to make the trip over the Pali on horseback, he is said to have acquired a small steamboat to transport him around the southern tip of Oahu to Waimanalo. A railroad track was laid to carry the rotund monarch from the landing to the Cummins home. [Thomas 1983:77]

In general, the introduction of livestock to Hawai‘i had an exceedingly negative impact on the natural environment and contributed to the demise of traditional Hawaiian life. Lacking walls and fences to contain the vast herds of cattle, sheep, and horses, the animals trampled the small scattered homesteads and stripped the land of native vegetation. The relationship between cattle and the natural environment of Hawai‘i has been described by William A. Bryan:

> Since the coming of the whites there have been many causes . . . that have been at work bringing about a change in the natural conditions. Chief among the disturbing elements, however, have been the cattle. As early as 1815 they were recognized as a serious menace to the native forests. Roaming at will through the forests they and other animals, as goats and pigs, have done untold damage, and brought about conditions that have been most serious in many places. [Bryan 1915:226–227]

The following account describing Waimānalo ca. 1847 illustrates the damage to the natural landscape caused by the development of the Cummins Ranch:

> At that time, it seemed that the valley was filled with breadfruit, mountain apples, kukui and coconut trees. There were taro patches, with banks covered with ti and wauke plants. Grass houses occupied the dry lands, a hundred of them here and sweet potatoes and sugar cane were much grown. It was a great help toward their livelihood . . . The whole ahupuaa of Waimanalo was leased to white men except the native kuleanas and because the cattle wandered over them, they were compelled to build fences for protection. The taro patches that were neatly built in the time when chiefs ruled over the people and the land, were broken up. The sugar cane, ti and wauke plants were destroyed. The big trees that grew in those days, died because the roots could not get moisture. The valley became a place for animals. [*Kuokoa* 26 October 1906 in Sterling and Summers 1978:244]

The Cummins family eventually began to buy up the *kuleana* of the native farmers, gaining some 200 acres in fee. By the early 1870s, Chinese rice farmers were using some of these lands under agreement with John A. Cummins.

3.2.4 The Waimanalo Sugar Company

In 1876, the Hawaiian Kingdom entered into a Reciprocity Treaty with the United States. This allowed the growing Hawaiian sugar industry a free market and the potential for great profits. One of the Chinese rice farmers, Tai Lee, began sugar cultivation on Cummins’ Waimānalo lands. Eventually Tai Lee and other Chinese farmers cultivated up to 1,200 acres of cane in Waimānalo (*Honolulu Advertiser* 8 November 1931:1 in Silva 1981:A-22).

John A. Cummins saw the potential of sugar production at Waimānalo. He organized the Waimanalo Sugar Company and began construction of a sugar mill in 1880 approximately 5 km (3.1 miles) northwest of the present project area (Figure 13). During this time, sugar and most other goods were transported between Honolulu and Waimānalo by steamer via the Waimanalo Landing. The Cummins Estate was still renowned for its extravagant hospitality. Lavish weeklong lū‘au were given for Hawaiian royalty. In 1883, King Kalākaua visited Waimānalo for John Cummins’ birthday celebration:

> After landing from the SS *Waimanalo*, a train of six cars was waiting to convey the party to Waimanalo proper. The spectacle was a magnificent one. The wharf was lined with evergreens; the locomotive and cars were ornamented with flags and banners, the Royal cars being commodiously fitted up with sofa, arm chairs and a canopy. When it was reported ‘All Aboard,’ away we went, booming along thru’ the cane fields, towards the mill. On arrival at Mr. Cummins’ house, hundreds of natives flocked to welcome His Majesty. A noticeable feature was the respectful manner in which the Chinese laborers uncovered their heads as the train went by them in the cane fields. [*Honolulu Advertiser* 1883 in Condé and Best 1973:365]

Despite the growth of the Waimanalo Sugar Company and the larger community of Waimānalo, there was little development near the present project area during this time, outside of a small collection of coastal house lots (Figure 14). The walls of the Pāhonu Pond are also depicted on the 1884 map. An improved Government Road is shown running past the current project area, however, examination of later maps and archival sources indicate this was a proposed route; the transportation corridor that existed at the time was simply a path, nearly impassable.

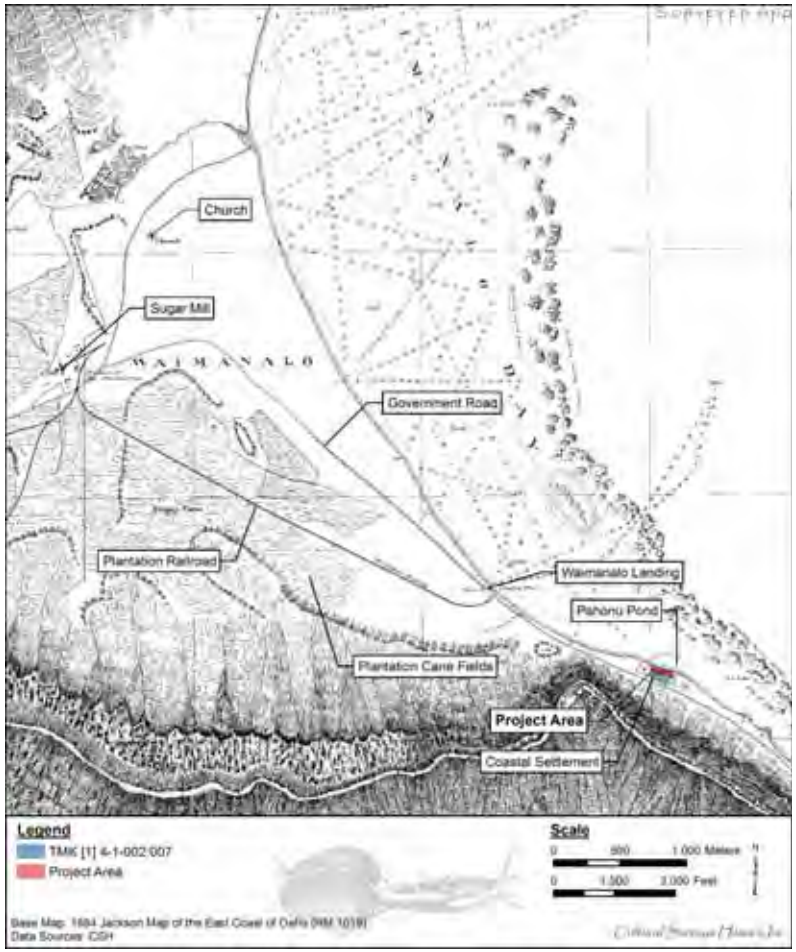

Figure 13. 1884 Jackson map of the east coast of O‘ahu showing project area

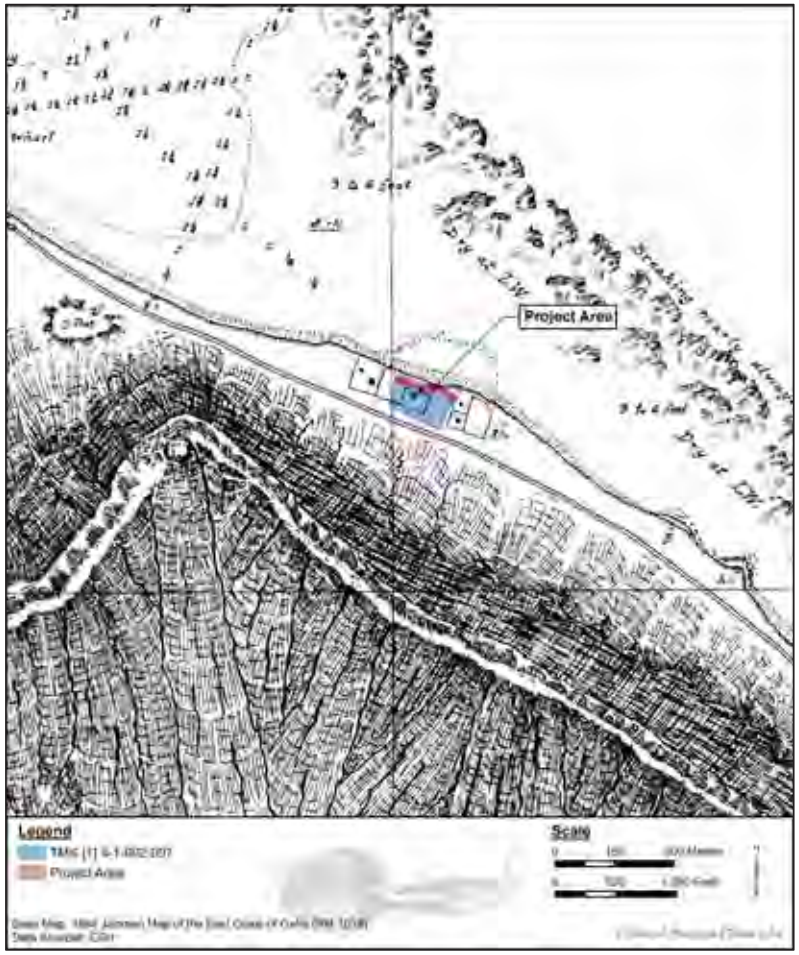

Figure 14. Close-up of the 1884 Jackson map of the east coast of O‘ahu showing project area

In 1885, W.G. Irwin & Company (which later merged with C. Brewer & Company) became agents for the Waimanalo Sugar Company, with John Cummins remaining as manager. In 1890, J.A. Cummins renegotiated his father’s original lease on the Waimānalo lands for an additional 30 years and sublet the lands to the Waimanalo Sugar Company. The Waimanalo Sugar Company continued to buy sugar from the Chinese farmers until ca. 1900, when the plantation began to do most of its own cultivation. The Waimanalo Sugar Company continued to grow throughout the closing decade of the nineteenth century and the beginning of the twentieth century with more and more lands being put under cultivation. As the plantation grew, former ranch lands were converted to cane fields. New irrigation ditches and railroad lines were constructed, and improvements were made to the mill and Waimanalo Landing.

A 1906 map of O‘ahu shows the growth of the Waimanalo Sugar Company and the extent of the increasing lands being put under cultivation (Figure 15). The Government Road is also shown on the 1906 map as being an improved road within Waimānalo that runs to the landing where it becomes an unimproved road that goes along the coast, past the project area to a pass at Makapu‘u where it turns inland, linking the south shore with the windward coast. Despite the presence of an overland transportation corridor, most transportation was still by sea because of the extremely treacherous Makapu‘u Saddle trail that was so rugged that horses could be led over the precarious trail, but not ridden (McGuire and Hammatt 2000:12). An account from the late 1800s demonstrates how dangerous the *pali* route at Makapu‘u could be:

> A noted fisherman of Waimanalo was killed a few days ago while on his way to fish. He had passed the point where the road turns down the pali at Makapuu, and stepping upon a ledge on the face of the bold precipice beyond, the rocks gave way and precipitated him a torn and mangled body a hundred feet below. [*Hawaiian Gazette*, 28 July 1880:3]

A 1916 map of Waimānalo (Figure 16), compiled from surveys in 1880 and 1884, shows the expanding plantation and associated development such as the Waimanalo Landing; the plantation railroad connecting the landing to the mill; the proposed “Kamehameha Highway” alignment through Waimānalo that approximates the present day Kalaniana‘ole Highway; and the proposed improved road corridor along the coast past the project area. One new development depicted on the 1916 map is the construction of a pipeline to carry water from the large reservoir at the very back of the valley to the then newly constructed Mokapu‘u Lighthouse (see Figure 16). The pipeline ran through Waimānalo to the landing where the water was pumped in the pipeline along the coast, through the current project area, bringing water to the house lots (Figure 17).

A 1919 map of Waimānalo shows the continued expansion of the Waimanalo Sugar Company and the associated development such as the constructed railroad lines built near the mill and Waimanalo Landing and an increase in fenced areas (Figure 18). New fences and/or walls are visible around and near the project area in 1919, like to prevent wayward cattle and livestock out of the house lots. Also, Pāhanu Pond is not depicted, and a dock or pier appears to have been constructed along the shoreline at the north edge of the project area (see Figure 18).

With John Cummins death in 1913, his estate sold the remaining fee simple lands and the unexpired lease of Waimānalo lands to the Waimanalo Sugar Company. A 1922 map of the Waimanalo Sugar Company’s fields (Figure 19) shows the plantation’s cane fields stretching

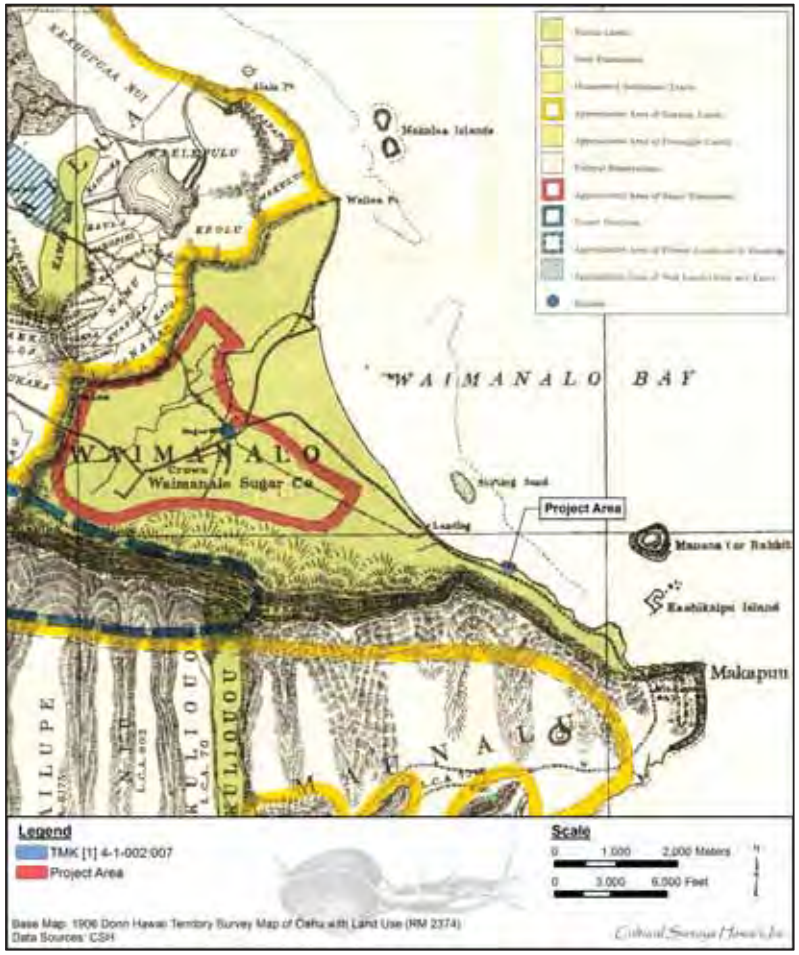

Figure 15. 1906 Donn Hawaii Territory Survey map of O‘ahu with land use showing project area

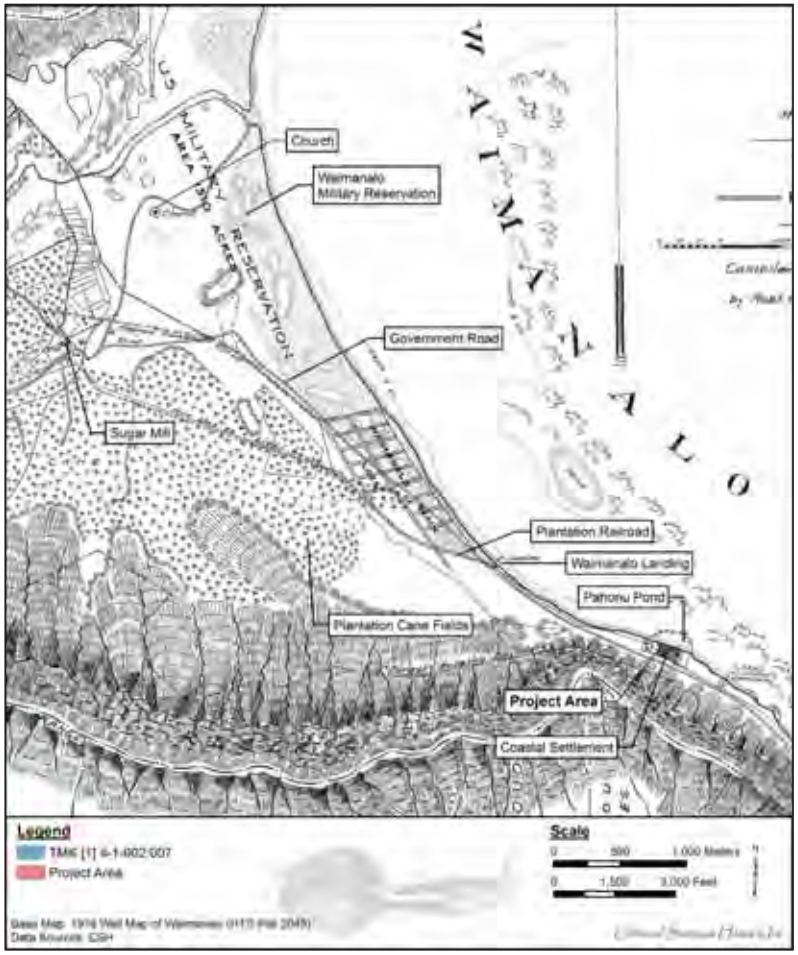

Figure 16. 1916 Wall map of Waimānalo, Walter E. Wall Surveyor showing project area and features discussed in the text

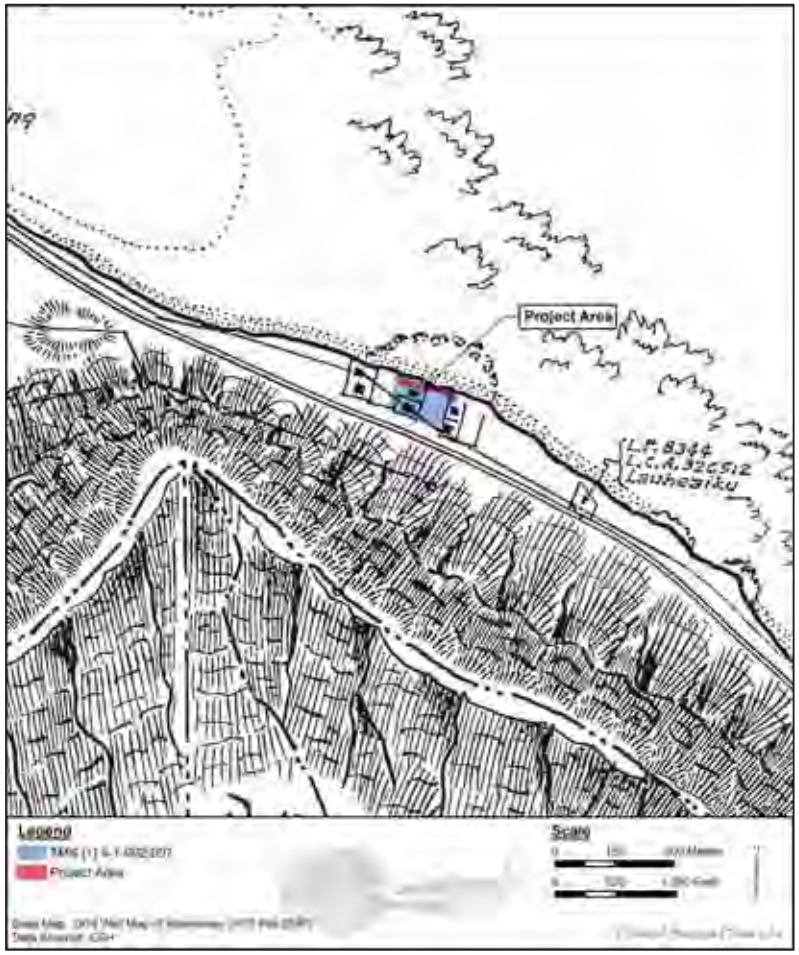

Figure 17. Close-up of the 1916 Wall map of Waimānalo, Walter E. Wall Surveyor showing project area

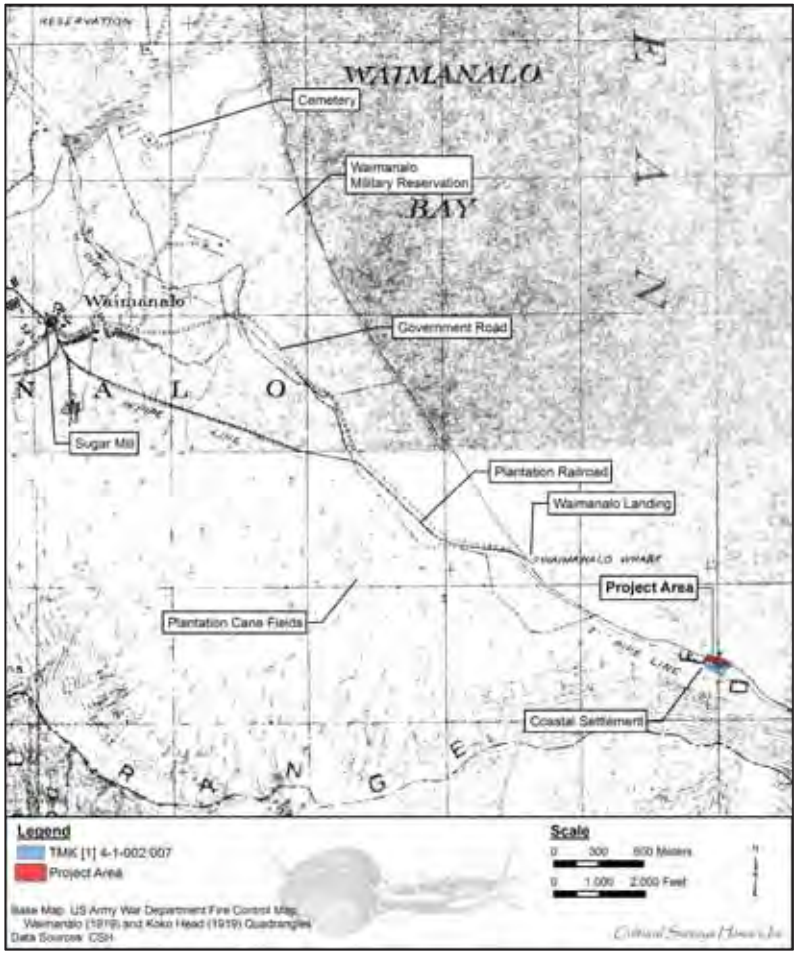

Figure 18. 1919 U.S. Army War Department fire control map, Waimanalo and Koko Head Quadrangles showing project area

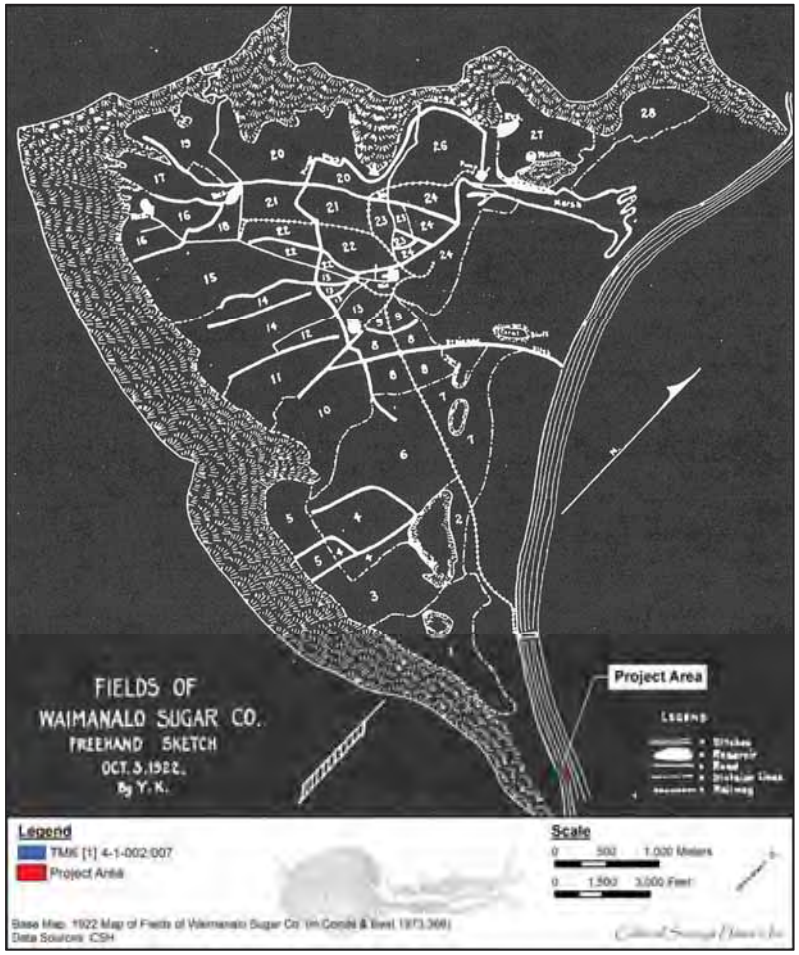

Figure 19. Map from 1922 of fields of Waimanalo Sugar Company, showing project area (Condé and Best 1973:368)

across the floor of Waimānalo Valley to the base of the Ko‘olau Range and almost extending south to the current project area.

Under the management of George Bennett, the Waimanalo Sugar Company undertook a series of modernization efforts in the 1930s that included rebuilding the water and irrigation system, mechanized land clearing, and improved road transportation routes (*Honolulu Advertiser* 31 March 1940:1-2 in Condé and Best 1973:367). The Waimanalo Sugar Company continued operations into the 1940s, however, facing rising operational costs and diminishing returns, it ceased operations in 1947. Following the closure of the Waimanalo Sugar Company, the plantation’s water license and irrigation ditch system reverted to the Territory of Hawaii.

3.2.5 Military Development in Waimānalo

The Waimanalo Military Reservation, including approximately 1,500 acres along the northern, coastal portion of Waimānalo, was established in 1917 (see Figure 16). Limited development and little activity occurred on the military reservation through the 1920s. In 1933, Waimanalo Military Reservation was renamed Bellows Field. Bellows Field then consisted of an infantry and artillery training area, also including a runway for the Air Corps. Bellows Field developed rapidly during the build-up to World War II, the beginnings of which can be seen in Figure 20. Prior to the bombing of Pearl Harbor in 1941, Bellows was a training area for new recruits and contained only one runway (THANG 2006).

With the onset of World War II, even more accelerated development occurred at Bellows Field, which became a permanent military post in 1941. A 1943 War Department map (Figure 21) shows the additional roads, structures, and runways constructed at Bellows Field and a major facility arranged around an oval road 300 m northeast of the project area.

Following World War II, activity at Bellows Field declined with much of the area only being used for military recreational purposes and as an emergency landing field. In 1948, the base was placed “on caretaker status” and Bellows Field was renamed Bellows Air Force Base and later, Bellows Air Force Station (THANG 2006:112). A 1952 map (Figure 22) shows the layout of military infrastructure just seaward of the project area including a church and the development of Waimanalo Village 300 m to the west. Schools are shown on both the *mauka* and *makai* sides of Kalaniana‘ole Highway approximately 200 m west of the project area. In 1956, an Air Force communications facility was constructed with extensive antennae installations.

In 1961, the base was augmented to accommodate the air defense capabilities of a Nike missile site (Figure 23 and Figure 24).

> The 112-acre Bellows launch site was built behind the beach at the southern end of Bellows; the permanent dual control site was located on Waimanalo Pali at the north end of Kamehameha Ridge (Farrell, et al 1997). Dedicated on 4 March 1961, this activity continued until December 9, 1969 when HIARANG was relieved of its air defense mission (Adjutant General of Hawai‘i 1970; Stone 1961; von Hoften 1970:108). The O‘ahu launch sites were entirely above ground in contrast to the CONUS [Convoys within the continental U.S.] operations that usually supplied underground magazines. [THANG 2006:112–113]

Bellows AFS was the first site selected in Hawai‘i for a Nike Hercules battery site (Bennett 2009). The decision to construct the missile site came with much objection from the former

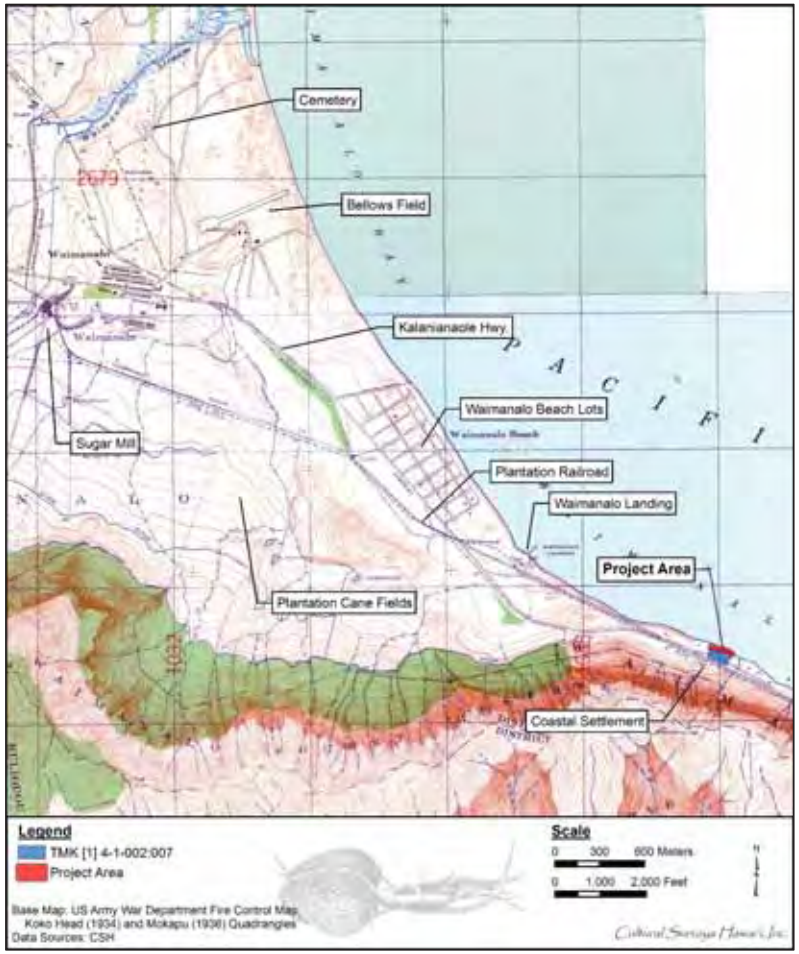

Figure 20. 1934 Koko Head and 1936 Mokapu U.S. Army War Department fire control map, showing project area

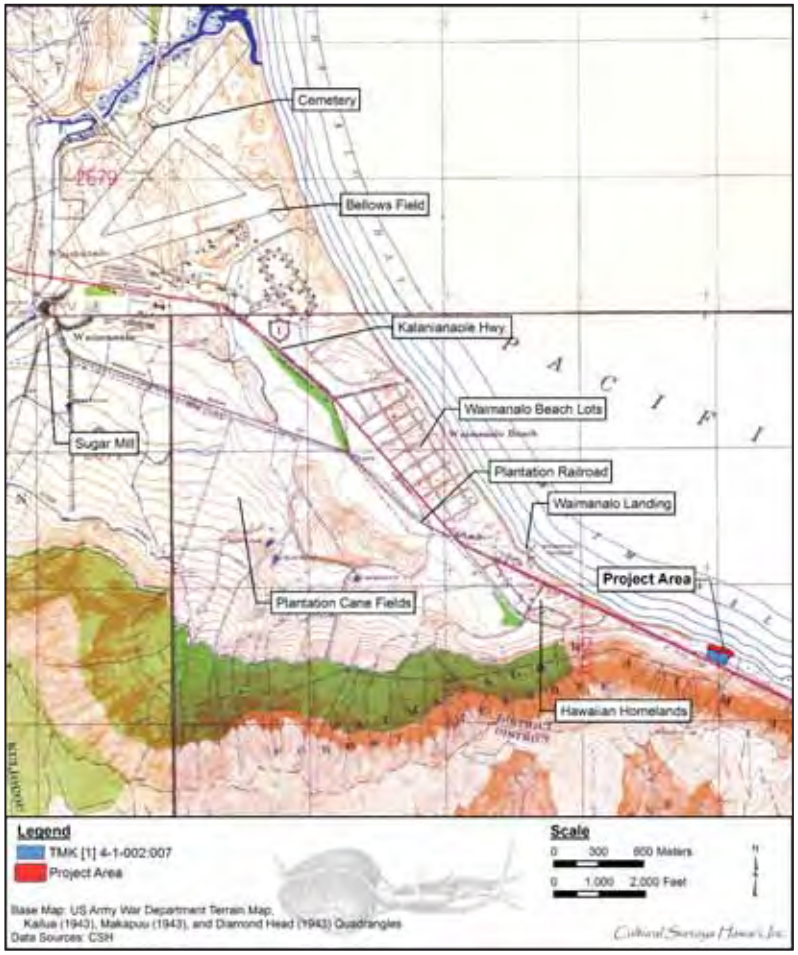

Figure 21. 1943 U.S. Army War Department terrain map, Kailua, Makapuu, and Diamond Head Quadrangles showing project area

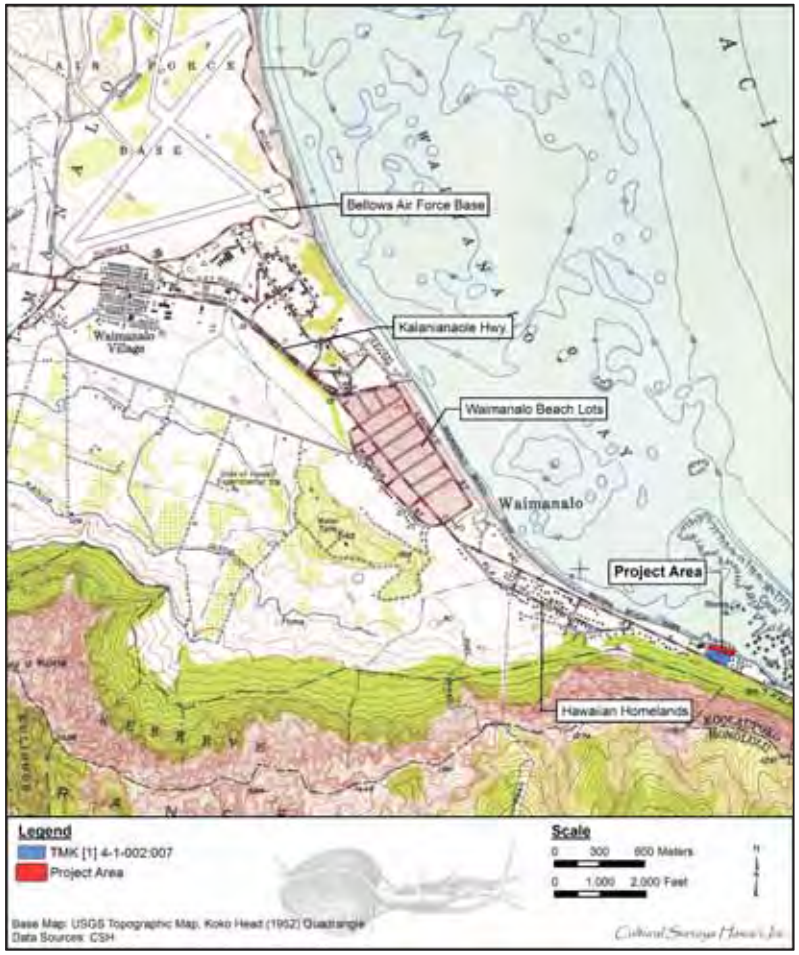

Figure 22. 1952 Koko Head USGS topographic quadrangle showing project area

Figure 23. Portion of the 1969 Koko Head USGS topographic quadrangle showing the locations of OA-32 and OA-45 at Bellows AFS and Kamehame Ridge

Figure 24. Photo of Nike Hercules missiles at Bellow AFS, notice the raised berms surrounding the launch location (Bennett 2009)

governor William F. Quinn (Slocumb 2004). However, upon completion the battery conducted annual tours of the missile launch site, which was “typically attended by the public” (Slocumb 2004:5). According to Bennett (2009), Bellows AFS had two Hercules batteries containing a total of 24 Nike Hercules missiles and 16 launchers. Due to the dual launcher sites, some sources refer to the battery as OA-32 and OA-45 (Bennett 2009). Bennett (2009) relates that the launcher sites are currently in an abandoned state, with only two buildings remaining. The structures are thought to have been a Missile Warhead Test building and a generator building.

The U.S. Marine Corps acquired most of Bellows Air Force Station in 1999 and it is now Marine Corps Base Hawaii, Marine Corps Training Area Bellows (MCTAB), which continues to be used for military training and recreational purposes.

3.2.6 Residential Development in Waimānalo

The primary residential area in Waimānalo in the early 1900s was located in the vicinity of the Waimanalo Sugar Company’s sugar mill, although the current project area was a small settlement of house lots that were established following the *kuleana* awards in 1850. Waimanalo Village was established as housing for plantation workers and their families. Further residential development was hampered by the lack of available land as much of Waimānalo was under sugarcane cultivation, and the lack of adequate overland transportation routes that linked the area to the commercial, civic, and political center of O‘ahu, Honolulu. There was a road from Waimānalo to Kailua, but an improved Nu‘uanu Pali route that would link the windward side of the island with Honolulu was still in its nascent stages in the early part of the 1900s. The road leading to the Mokapu‘u Saddle and then to the south shore of O‘ahu via the “Road from Honolulu Koolau” (Webster 1851) through Kealakipapa Valley was also a route in and out of Waimānalo, but the *pali* option to get over the pass was a considerable barrier to transportation other than by foot or horse, which could not be ridden over the pass, only carefully led (McGuire and Hammatt 2000:12).

In December 1918, Waimānalo lands were advertised for purchase at public auction, under the deed of trust made by John Cummins in 1896 (*Honolulu Advertiser*, 13 December 1918:11). These lands included the residue and unexpired portion of the lease of 6,970 acres in the Waimānalo Ahupua‘a. At this time, there were three years remaining on the 30-year lease, signed in 1890 and extended one extra year, the cost of which was $1,500 annually. There were also approximately 180 acres of freehold lands, tenements and hereditaments of LCA lands for sale, which included ‘Āpana 2 of LCA 234-I, awarded to Pahanua (listed as 0.30 acres; LCA 234-I was misidentified as 234-J). Despite it being listed for sale in 1918, ‘Āpana 2, LCA 234-I had already transferred several times since 1850 and was recorded as privately owned. Section 3.2.6.1 below provides the land ownership, land use, and development history of the current project area. An additional approximate 18 acres of estate, title, and interests of LCA lands were also offered up for public auction. All the properties for sale were to be sold as a whole and subject to the Waimanalo Sugar Company lease (*Honolulu Advertiser*, 13 December 1918:11).

After 1920, the Territory of Hawaii undertook an extensive road improvement and construction project when the provisions of the Federal Highways Act (FHA) of 1921 were extended to the Territory by an act of Congress in 1924 (MKE Associates and Fung Associates 2013:2-36). On 21 July 1924, Executive Order 4052 returned 4.18 acres of land, previously part of the Waimanalo Military Reservation, to the Territory of Hawaii to support road construction in Waimānalo. The

acreage was “set-aside” land no longer suitable for training and was returned because the development of Kalaniana‘ole Highway required additional lands (Belt Collins Hawaii 1995:E-9).

After years of slow progress, the asphalt macadam constructed Kailua-Waimanalo Road was opened in 1924 and it vastly improved overland access (*Honolulu* Advertiser, 3 April 1924:5; McGuire and Hammatt 2000:12). Also in 1924, the Nu‘uanu Pali Road officially opened, linking Waimānalo to both Honolulu and Kailua. The new roads eliminated the need for the landing, which was no longer being used for shipping and transportation (UH Marine Option Program 1999:13). The Kailua-Waimānalo road still terminated at the treacherous Makapu‘u Pali switchback pass and throughout the second half of the 1920s and early 1930s, funding was sought to make the road connection from Koko Head to Waimānalo (*Honolulu Star-Bulletin*, 25 February 1927:19).

With the improved accessibility and visibility of the area, the first successful significant sale of Waimānalo lands to the public occurred with the establishment of the Waimanalo Beach Lots subdivision in 1925. The subdivision, located 1.6 km (1 mile) northwest of the present project area, included 266 lots on 90 acres of land (Bartholomew and Associates 1959:16). Additional residential development occurred in the coastal portion of central Waimānalo with the establishment of Waimanalo Homestead by the Hawaiian Homes Commission in 1925. Qualified homesteaders with 50% or more Hawaiian blood were awarded residential lots in the vicinity of Waimanalo Landing and located inland of Kalaniana‘ole Highway, approximately 1.4. km (0.9 miles) northwest of the project area.

In contrast to the award of residential lots in the Waimanalo Homesteads to qualifying Hawaiians, the Waimanalo Beach lot parcels were auctioned off by the Territory of Hawaii with the basis of the award being one’s ability to submit (and pay) the highest bid. An early sale in the Waimanalo Beach Lots subdivision was made in December 1925, for Lots 34 and 35, which were bought by Harriet Sybil Hocking for $4,300 and $5,100, respectively, and awarded under Land Patent Grant 9042 (Dooley 2011:11). One of the first homes built in the subdivision was on Lots 34 and 35, Hale Pohaku, the Alfred Hocking Beach House, which was completed in 1926 and was listed in the Hawai‘i Register of Historic Places (HRHP) in 2011. The pattern of Hawaiian *ali‘i* and other affluent O‘ahu citizens building grand oceanfront estates began in the 1870s and 1880s in Waikīkī and lasted until the 1960s (Dooley 2011:10), although the development and redevelopment of these properties continues into the present day. The major changes in transportation and utility infrastructure in the early twentieth century enabled the development of housing at what were once more remote oceanfront locations such as Waimānalo. These remote areas became some of the most desirable locations to build oceanfront estates and a semi-building craze began, reaching its peak in the 1920s and 1930s with the construction of several new estates on the north shore and windward and leeward coasts of O‘ahu (Dooley 2011:10).

In 1931 and 1932, Congress made emergency appropriations to be used to relieve the unemployment situation with construction jobs and to be used in place of funds that states usually provided as match to Federal Aid project funds. The Territory of Hawaii received one million dollars in emergency appropriations and the Territory used $880,000 to create a Hawaii Special Fund to take to the Federal Aid System in 1931. This funding allowed for the construction of hundreds of miles of new roads and road improvements (MKE Associates and Fung Associates 2013:2-36). The influx of federal funding led to the construction of the long proposed Kalaniana‘ole Highway, which was improved in 1933 from the original construction of the

Waimānalo-Kailua Road in 1924 (McGuire and Hammatt 2000:12). In 1936, the Territory abandoned the ROW easements it held for the old Waimānalo-Kalua road (*Honolulu Advertiser*, 15 April 1936:5).

3.2.6.1 The Development of the Anderson Estate–Pahonu

Outside of the record of the *kuleana* award in 1850, the earliest archival record located for the current project area dates to 1910. No record was found of how and from whom they obtained ownership, however, the former Paahanua LCA property was owned by the somewhat infamous Elizabeth Kainana Puahi (Hiram), Lizzie, or Madame Puahi as she was known in the newspapers, and her husband, Moses Puahi. She was a onetime advisor to Queen Kapi‘olani (their relationship ended with a series of dueling lawsuits), a well-known hula dancer and *pa‘u* rider, and notorious owner of a “hula hall” on Kapahulu Avenue in Waikīkī. Moses Puahi was an equally well-known police officer. An announcement in the *Honolulu Advertiser* notes the transfer of the mortgage on the *kuleana* parcel (although it is misidentified as ‘Āpana 2, LCA 234-T, not I) and a tract of land in North Kona from the Puahis to William R. Castle, the prominent Honolulu business person, for the sum of $400 (*Honolulu Advertiser,* 21 August 1910:11).

William R. Castle only held the properties he gained from the Puahis for 5 years when the mortgage for the Waimānalo *kuleana*—although it is misidentified as ‘Āpana 2, LCA 234-J, not I—and the North Kona parcel were transferred to George A. Seyde and Charles S. Crane for $1 on 9 September 1915 (*Honolulu Advertiser,* 11 September 1915:10). George Seyde and Charles Crane were friends and coworkers at the *Honolulu Advertiser*. Charles S. Crane was a prominent business person, journalist, and politician. Charles Crane’s journalism career included being the assistant manager of the *Hawaiian Gazette*, publisher of the Hawaiian language newspaper *Ka Nupepa Kuokoa*, and business manager and later, executive vice president, of the *Honolulu Advertiser*. His political career included serving on the board of supervisors for the City and County of Honolulu, as the sixth Mayor of Honolulu, and as a Territorial Senator. Charles Crane was also well-known for his involvement in the development of the Kaimukī neighborhood and with the Boys Scouts, especially Troop 10.

Regarding Crane and Seyde’s development plans for the *kuleana* parcel, George Seyde cheekily remarked, “I am strong for giving country homes here Hawaiian names and I will call my summer place in Waimanalo ‘Ala Moana Hale,’ which means the boss tells me ‘the wind that blows the mosquitos away’” (*Honolulu Advertiser*, 17 October 1915). Just a few days after that, a building permit was issued for a $650 beach house (*Honolulu Star-Bulletin*, 23 October 1915).

There are numerous references in the newspapers from 1916-1920 to a Boy Scout Camp at Waimānalo, either “Camp Waimanalo” or “Camp Wilder,” and many accounts of Charles Crane’s involvement in organizing and leading these camping trips. Analysis of the few photographs that exist from scenes at the camp were compared to modern satellite and photo imagery, and the written descriptions of the camp were carefully analyzed to ascertain whether this camp was located on Charles Crane’s property and within the current project area. All indications are that the camp, while near to Charles Crane’s property and the current project area, was located in the vicinity of current day Kaupo Beach Park, Sea Life Park, and Hawai‘i Pacific University’s Oceanic Institute.

As there was only one LCA in the current project area, the rest of the land contained therein was Crown, then Territory Land, although earlier maps depict what appear to be house lots and/or

a small coastal settlement (see Figure 13 and Figure 14; Figure 16 through Figure 18). The lands were subject to be sold by the Territory and under Land Patent (LP) 7618 dated 11 October 1920, Nohokula was granted the Preference Right to Purchase (or first right of refusal) on a 0.99 acre property for $2,000 (OHA 2018). The parcel included a large portion of the western part of the current project area. One day later, on 12 October 1920, it was reported that the property was transferred to Ella D. Hamman for $2,000 (*Honolulu Star-Bulletin*, 14 October 1920:2).

As discussed, above, the visibility of and interest in Waimānalo grew because of the improved road access and helped fuel the trend of country beach houses. Charles Crane, a well-known Honolulu, and by now Waimānalo, fixture, had been traveling between the capital and the country for well over ten years before the construction of the Kailua-Waimanalo Road and helped serve as a construction inspector (*Honolulu Star-Bulletin*, 2 April 1924:17). The road was well received, and people began flocking to Waimānalo, not only to build beach homes, but also for social events, a pattern that continues to the present day:

> **‘Ain’t We Got Fun’ Echos Over Waimanalo When The Advertiser Enjoys Frolic**
>
> Members of The Advertiser force were the guests of Charles S. Crane, business manager and Mrs. Crane at a get-together celebration of the newspaper family yesterday at Crane’s Roose, Waimanalo, better known as Pahonu (Turtle Pen).
>
> Nearly everyone connected with the editorial, business, and printing offices turned out for the affair, which began in the morning and lasted throughout the day. A program of sports was enjoyed under the management of Ezra Crane, Allan McGuire and Howard Lyman, assisted by H.R. Johnson, Nigel Jackson and Fred Green. The judges were John Traut, D.D. Thaanum, S.P. Correa, Dan Pokipala and G.L. Sampson.
>
> There were swimming races and all kind of land races, tug-of-war and other contests. Baseball and volleyball with A. McGuire, L.P Thurston, and Frances Sing as captains, were played. At 1 o’clock everyone took part in an eating contest which demolished great stores of good things served by Mrs. Crane, Assisted by R.S. Coll, Mrs. A. Perry, Mrs. Allan McGowan and Mrs. G.L. Samson.
>
> As it was the birthday of the host, a golf outfit was presented to him. Late in the afternoon a great birthday cake was cut and served with punch.
>
> Music for the occasion was given by an orchestra under the direction of G.J. Boisse and Dan Pokipala.
>
> L.P. Thurston was chairman of the committee of arrangements, assisted by George A. Seyde, Robert K. Brown and L.P. Scott. [*Honolulu Advertiser*, 5 January 1925]

The Territory of Hawaii continued selling off Waimānalo lands (and other lands throughout the islands) through the 1920s and as the decade drew to a close, an expansion of the holdings up for sale was planned. The practice of selling public lands to private interests was not universally well received because while they were legally and technically public auctions, the practice was more akin to private sales and disputes of rights of ownership over many lands ensued (*Honolulu*

Advertiser, 12 March 1930:1). The current project area was one of the more visible subjects of one of these disputes when Julia Grossman Wall applied (997) to the Land Commission for purchase of the property (*Honolulu Advertiser*, 12 March 1930:1).

Julia Grossman Wall was the daughter of Edward Shepherd, a prominent Chicago businessmen, and widow of Dr. Moses Edmund Grossman (d. 1921), who was one of the pioneer dentists in Hawai‘i (Siddall 1921:111). Edward Shepard died in August 1922 and Julie was bequeathed a robust $3,800,000 inheritance from her father’s estate (*Honolulu Advertiser*, 8 September 1922:6). In 1926, she married Dr. Ormond Edgar Wall (Hawai‘i State Archives 2006), another preeminent Honolulu dentist and successful inventor (Siddall 1921:401; Hawai‘i State Archives 2006).

In 1930, Julia Wall held an option to purchase a portion of the Hamman parcel (LP 7618) and applied to purchase the adjacent Territory lands, which had been subdivided into lots in preparation for auction (*Honolulu Advertiser*, 12 March1930:1). During this time, a claim to the land had been made by a local Japanese family who had been living on the lot for several years, however, it was reported that a settlement with the family had been reached and the application had already been approved by the land board (*Honolulu Advertiser*, 12 March 1930:1). On 1 April 1930, the auction of Territory lands adjacent to LP 7618 was advertised, with an easement for the Kailua-Waimanalo Road over the property until the proposed Kalaniana‘ole Highway was built (*Honolulu Star-Bulletin*, 1 April 1930).

The land commission approved Julia Wall’s application to purchase the Territory lands at a higher price than advertised, dismissing the preference right to purchase claim by Toshi Kumagai, who said she had lived on the property for over 20 years. The preference right of purchase claim stated that Toshi Kamagai’s father, an employee of Waimanalo Sugar Company, moved to the property, then being leased to the sugar company, in approximately 1908 (*Honolulu Advertiser*, 11 April 1930:5). The matter was referred to the Territory Governor, Lawrence Judd, for a final decision (*Honolulu Advertiser*, 11 April 1930:1); following an investigation he refused to interfere with the sale (*Honolulu Star-Bulletin*, 2 May 1930:1). On the day the Territory lands were set to be auctioned and following a hearing on the Kumagai petition for injunction, the Territorial court halted the sale with a stay of 30 days (*Honolulu Star-Bulletin*, 2 May 1930:1).

Undeterred, Julia Wall moved forward with her plans to build a large beach home in the current project area and purchased a portion of the Hamman parcel (LP 7618) for $11,000 shortly after the court’s decision to halt the sale of the Territory land (*Honolulu Advertiser*, 6 May 1930:1; *Honolulu Star-Bulletin*, 10 May 1930:13; *Honolulu Advertiser*, 21 August 1930). A few days later, Charles Crane sold his beachfront lot (‘Āpana 2, LCA 234-I) to Julia Wall for $19,000 (*Honolulu Advertiser*, 9 May 1930:13; *Honolulu Advertiser*, 21 August 1930:15). With the purchase of these two lots, Julia Wall bookended the Territorial properties that were embroiled in the legal proceedings.

The territorial commission of public lands decided to authorize the sale of the Waimānalo lots for August 1930, which had been postponed from May and then to June because of the Kumagai injunction (*Honolulu Advertiser*, 27 June 1930:1-2). The sale of the lands was re-advertised, and the price Julia Wall was reported as being willing to pay for the lots had increased from her initial offer (*Honolulu Advertiser*, 27 June 1930:1-2; *Honolulu-Star Bulletin*, 8 July 1930:5).

While there are no accounts that explicitly state what became of the Kumagai claim to the Territory lands, as there is no record of a settlement or a court decision, it appears that Toshi

Kumagai and the land commission arrived at an agreement. The Territory was clearly eager to make the sale of the contested land “at auction” to Julia Wall and at a price well over their appraisal. It would appear that in exchange for Kumagai dropping her preference right to purchase claim on the lots between the Wall holdings, she was given the preference right to purchase, under a “Special Sales Agreement,” the nearby Lot R in July 1930 (State of Hawai‘i DAGS 2018a).

In August 1930, Julia Wall’s purchase offer of approximately $30,000 for the Territory lands was accepted. Combined with her purchase of the Hamman and Crane lots, she owned a contiguous 3-acre parcel that comprises the current project area. Her total investment in the property was upwards of $60,000 (*Honolulu Advertiser*, 21 August 1930:1) and it was reported that she “plans to establish an estate on which she will build a pretentious home. Her plans, it is said, contemplate beautification of the entire area which she now owns at Waimanalo” (*Honolulu Advertiser*, 21 August 1930:1).

A 1930 Territory of Hawaii Survey (conducted in 1928) map of the property shows the parcels purchased by Julia Wall: LP 7618 (por.), ‘Āpana 2 234-I (por.), and the Territory Lots E, F, G, and H (Figure 25). Several dwellings and other buildings and structures depicted on the map, include the Crane and Seyde beach homes on the *kuleana* parcel; possibly Hamman beach homes on the Nohokula parcel; and what may be the Kumagai home and associated structures on the Territory lots. The 1930 map also shows the Kailua-Waimanalo Road, constructed in 1924, crossing across the southern half of the current project area and the proposed Kalania‘ole Highway alignment (see Figure 25), which was depicted as early as 1884 (see Figure 13 and Figure 14), but which had remained unbuilt through this time.

A seawall and pier are shown in LP 7618 and the *kuleana* parcel (see Figure 25). These portions of the seawall are still currently in use (it was later extended), however, the piers no longer exist. This map indicates the seawall predates the Wall ownership of the property, however, no records detailing the development and construction of the seawall and pier were found. An examination of historic maps indicate the pier and seawall were constructed sometime after 1916 as one of the piers appears in a 1919 map, but not in the map from three years earlier (see Figure 17 and Figure 18). Also depicted on the 1930 map are stone walls around both LP 7618 and ‘Āpana 2, LCA 234-I. Kumagai’s “Special Sales Agreement” on Lot R, west of the Wall property, is also recorded on the 1930 map. In 1937, the Shriners purchased Lot R from the Territory (State of Hawai‘i DAGS 2018b).

Figure 26, the 1930 Land Court Application 997 Map 1, shows not only the property boundaries, but also the location and the terms of the drainage and existing water pipeline easement over the property. The map also shows the fast pace of development on the Wall estate and surrounding area. The sale of the property was in August 1930, the map was drawn in September 1930, and field-verified in January 1931. From the time the Territory survey map was created (see Figure 25), through the sale of the property, to the time the of the land court application map was field-verified (see Figure 26) this section of Kalaniana‘ole Highway was moved out of the ROW easement (the easement was terminated) that crossed the Wall property and was completed (the rest of the road was completed in 1933) and a stone perimeter wall was constructed around the west, south, and east sides of the property. Archival and historic map and photo research and the results of the AIS show this is the same perimeter wall around the current project area and it was the first portion of the Pahonu estate construction.

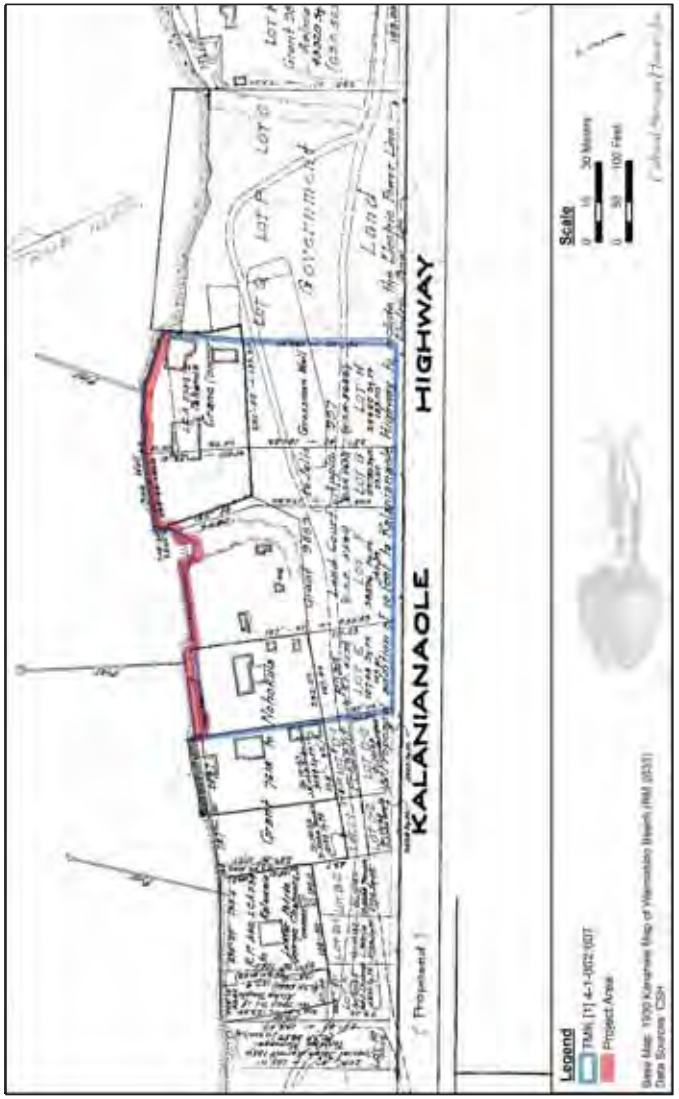

Figure 25. Portion of 1930 Kanahele map of Waimanalo Beach showing project area

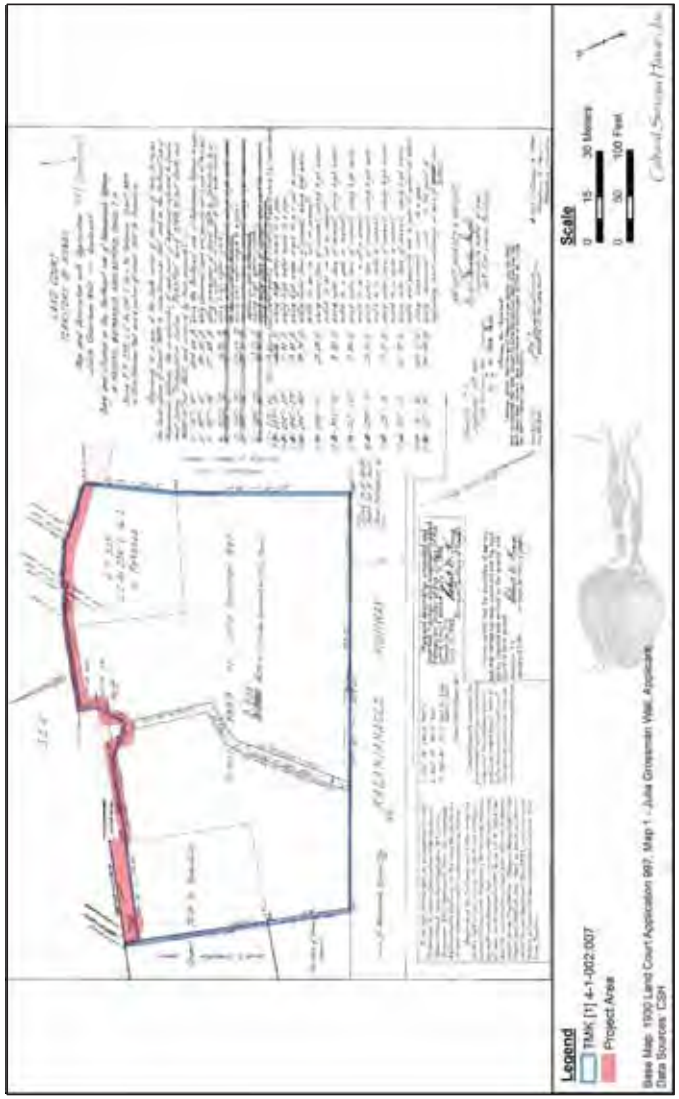

Figure 26. 1930 Land Court Application 997, Map 1–Julia Grossman Wall, Applicant showing project area

Eager to get started on the Waimānalo estate, the Walls had selected an architect and builder for Pahonu by December 1930, three months after purchasing the Territory land (*Honolulu Star-Bulletin*, 1 December 1930:17). By February 1931, the *Honolulu Advertiser* reported there were a number of building sites across Honolulu and rural O‘ahu, including at the Wall property: “The largest single project is that of the home for Mrs. Julia Grossman Wall at Waimanalo, designed by Louis S. [E.] Davis and being built by A.S. Cantin. The distinctive features of the Wall home is the fact that it is being built almost entirely of redwood” (*Honolulu Advertiser*, 8 February 1931:32).

Louis E. Davis, a prominent local architect who designed several significant residential, commercial, government and public buildings across O‘ahu, was renowned for his work in the Spanish Colonial Revival, Mission Revival, Spanish Eclectic, and Mediterranean Revival architectural styles (Cheever and Cheever 2003:91; Sakamoto et al. 2008:38, 42). Davis worked extensively with Theo H. Davies & Company on other residential projects, designing several Spanish Eclectic style residences in the then new subdivision of Kāhala (Sakamoto et al. 2008:42). The most well-known examples of Davis’ work include President William McKinley High School, Honolulu Police Station (Merchant Street), State of Hawai‘i Agriculture and Forestry Building, the Spanish Colonial Revival Pahonu estate, Lipolani House, and a number of theaters around the state (Princess, New Pawaa [later Cinerama], New Palama [later Zamboanga], Waipahu, and Lihue) (Angell 2011).

Augustus S. Cantin was the builder of Pahonu and a well-known figure in the O‘ahu construction industry in the early part of the twentieth century. He served for a time on the Waikiki Sanitation Reclamation, and Improvement Commission (Hawaii Governor 1914:91) and as the City and County of Honolulu Engineer (Thrum 1917:197). According to multiple newspaper accounts, he was also very involved in the Contractors’ Association of Hawaii, was primarily known for his residential construction in Honolulu, and frequently collaborated with Louis Davis and Theo H. Davies & Company.

Initial construction on Pahonu progressed quickly and it was featured in the “News and Views of Honolulu Real Estate” column in the *Honolulu Advertiser* (3 May 1931:14; Figure 27).

A little under a month after the feature on Pahonu in the *Honolulu Advertiser*, it was reported that

> The atractive residence being built at Waimanalo for Mrs. O.E. Wall is rapidly nearing completion. Finishing details are now in progress, and the house will be ready for occupancy the latter part of June.
>
> Consisting of a spacious main house, gate lodge and servants quarters, boathouse and bathing pavilion, this project has been seven months under construction The cost is $125,000. . . [*Honolulu Star-Bulletin*, 30 May 1931:15]

Despite the flattery and rosy projections, the Walls did not move to Pahonu until November 1933, a few weeks prior to their daughter, Eva Grossman Wall, getting married (*Honolulu Star-Bulletin*, 4 November 1933:22). On 22 November 1933, Eva married James W. Glover, a prominent contractor in Hawai‘i and a Territorial Representative; the reception for 500 guests was held at the Pahonu estate (*Honolulu Star-Bulletin*, 25 November 1933:23–24), starting a tradition of using the estate for entertaining that lasted into the present day. The Glovers had two children:

Figure 27. Rendering of Pahonu that appeared in the “News and Views of Honolulu Real Estate” column in the *Honolulu Advertiser* (3 May 1931:14)

a son, Reed, in 1936 and a daughter, Eve, born in 1938 (*Honolulu Star-Bulletin*, 9 January 1951:1). Following the deaths of Ormond Wall in 1937 (*Find A Grave* 2018a) and Julia Grossman Wall in 1948 (*Find A Grave* 2018b*),* Eva Glover (née Reed Grossman) and Edward Shepherd Grossman each received one-half of the estate (including a half-interest each in Pahonu). Julia’s will also provided James Glover with $20,000 and Reed and Eve Glover with $10,000 as well as some miscellaneous sums to others (*Honolulu Star-Bulletin*, 18 November 1948:5). A 1949 aerial photo shows Pahonu, the current project area, and the continued development of adjacent beachfront lots at this time (Figure 28).

Eva Glover died in 1951 at 38 years old, just three years after her mother, after being admitted to Queen’s hospital in November 1950 (*Honolulu Advertiser*, 10 January 1951:1). Upon Eva’s death, her estate was inherited by James W. Glover and their children in 1952. The total value of the estate was over $500,000 (over 70% comprised of stocks) including the 50% interest in Pahonu, which had a total appraised value of $81,824 (*Honolulu Advertiser*, 21 March, 1951:1); significantly less than the nearly $200,000 it cost for Julia Grossman Wall to acquire the property and build the estate.

In March 1952, 14 months after Eva’s death, James Glover married Barbara Blair Cox Kennedy (later Anthony), daughter of former Ohio Governor and media magnate James Cox (*Honolulu Star-Bulletin*, 7 March 1952:1). In 1953, Edward Shepherd Grossman died (Find a Grave 2018c) and his one-half interest in Pahonu reverted to the Glover children, Reed and Eve, the only surviving family members and remaining heirs to the Walls (*Honolulu Star-Bulletin*, 4 December 1953:12).

Six years after the death of Eva and five years after he remarried, James Glover died at Pahonu in 1957 (*Honolulu Star-Bulletin,* 1 March 1957:1). His estate was valued at nearly $3,000,000; the beneficiaries were his wife Barbara and his children, Reed and Eve (*Honolulu Star-Bulletin*, 8 November 1957:7). The bulk of the estate was reported to be used to establish trusts for Reed and Eve (*Honolulu Advertiser*, 8 November 1957:1). Shortly thereafter, Reed married Diane Knutzen (*Honolulu Advertiser*, 14 December 1958:48) and Eve was engaged to John Anderson (*Honolulu Star-Bulletin*, 29 December 1959:24). Eve and John wed in 1961 and for a time made their home in Honolulu (*Honolulu Star-Bulletin*, 26 February 1961:36), but subsequently they moved to Pahonu, which, according to several newspaper accounts, continued to function as the site for many social affairs and fundraisers. Eve and John later divorced in 1968 (*Honolulu Advertiser*, 26 September 1968:26). A 1975 aerial phot shows the Anderson Estate–Pahonu with a tennis court that was built sometime after 1950 (Figure 29). The continued development of beachfront lots is also shown in the aerial photo.

Eve Glover Anderson is a well-known citizen on O‘ahu as an accomplished swimmer, athlete, and outdoorsperson; health, women’s rights, education, environmental and animal advocate and activist; community volunteer; and she was also a former Republican State of Hawai‘i Representative for District 51 (Waimānalo) from 1995-1996 (State of Hawai‘i House of Representatives 2009:36). Eve Glover Anderson was also the longest tenured resident of Pahonu, by far, having lived there most of her life (*Honolulu Advertiser*, 10 August 1995:2). In addition to the prominent role the estate played in social and fundraising events, it was also well known as a site location for television and film production, primarily the television show *Magnum P.I.* (1980-1989) in which the exterior and grounds of Pahonu were used as the setting of the fictional

Figure 28. 1949 Waimanalo Coast aerial photograph (UH SOEST) showing project area

Figure 29. 1975 Waimanalo Coast aerial photograph (UH SOEST), showing project area

“Robin’s Nest” estate. Other productions shot at Pahonu included the original *Hawaii Five-O* television series.

In 2014, Eve G. Anderson put the Pahonu estate up for sale for $15,750,000 (*Honolulu Star-Advertiser*, 9 February 2014:R14) and it was sold in 2015 to Waimanalo Paradise LLC for $8,700,000 (*Honolulu Star-Advertiser*, 19 March 2015:B5). Most of the Anderson Estate–Pahonu was demolished in 2018 in preparation for the redevelopment of the property.

In modern times, additional residential development has occurred in the Waimanalo Village, Waimanalo Beach Lots, and Waimanalo Hawaiian Homelands subdivisions including a major “boot-shaped” Hale Aupuni Subdivision focused on Inoa Street and Inoa‘ole Street approximately 600 m (1,969 ft) northwest of the present project area (Figure 30). The trend of building luxury beach homes well outside the urban core of Honolulu that started in the 1880s and which flourished in the 1920s and 1930s continues into the present day with many of the older properties being demolished and new, larger, and modern residences replacing them. Many residences in the immediate vicinity of the project area have been converted into luxury and beach house rentals that are used for vacations and social engagements.

3.2.7 Diversified Agriculture in Waimānalo

The Waimanalo Sugar Company sold its fee-simple land holdings and the remaining years of its lease of government-owned lands to the Waimanalo Agricultural Development Company (Bartholomew and Associates 1959:17). The Waimanalo Agricultural Development Company then sublet 1- to 20-acre farm lots and up to 150-acre pastoral lots to individual farmers in Waimānalo Valley for diversified agriculture. Following the expiration of the agricultural leases in 1953, the Territorial Government began selling approximately 9-acre agricultural parcels in the central valley, known as the Waimanalo Farm Lots subdivision (Bartholomew and Associates 1959:17). Portions of the former plantation irrigation system, with some modifications, continued to be used to provide water to the Farm Lots.

Circa 1950, the University of Hawai‘i established an approximately 30-acre agricultural research farm known as the Waimanalo Agricultural Experiment Station in the central valley, south of the current project area. Research conducted at the experiment station provided local farmers with scientific knowledge about crops and agricultural practices to improve agricultural production in Hawai‘i. The Waimanalo Agricultural Experiment Station was later expanded to approximately 130 acres; it is located approximately 3.5 km (2.2 miles) northwest of the project area (see Figure 22 and Figure 30).

In 1967, the L.W. Campos Ranch relocated from Kailua to Waimānalo, establishing an approximately 200-acre dairy farm. Campos Ranch was purchased by Foremost Dairies in 1969, which expanded the dairy by acquiring an additional approximately 140 acres for pasture. In 1984, the dairy sub-leased an approximately 21-acre parcel to Universal Synergetics (Unisyn). Unisyn was established to research and develop a commercial anaerobic digestion technology for manure and organic waste conversion into agricultural products or other products to be used by farmers. Unisyn developed a full-scale facility and began converting biomass such as trees, grasses, agricultural wastes, animal manures, ocean plants, garbage, and other wet organic wastes into renewable resources such as soil amendments, irrigation water, heat, steam, electricity, or liquid or gas fuels for transportation (e.g., ethanol) (Hammatt et al. 1999:10–11).

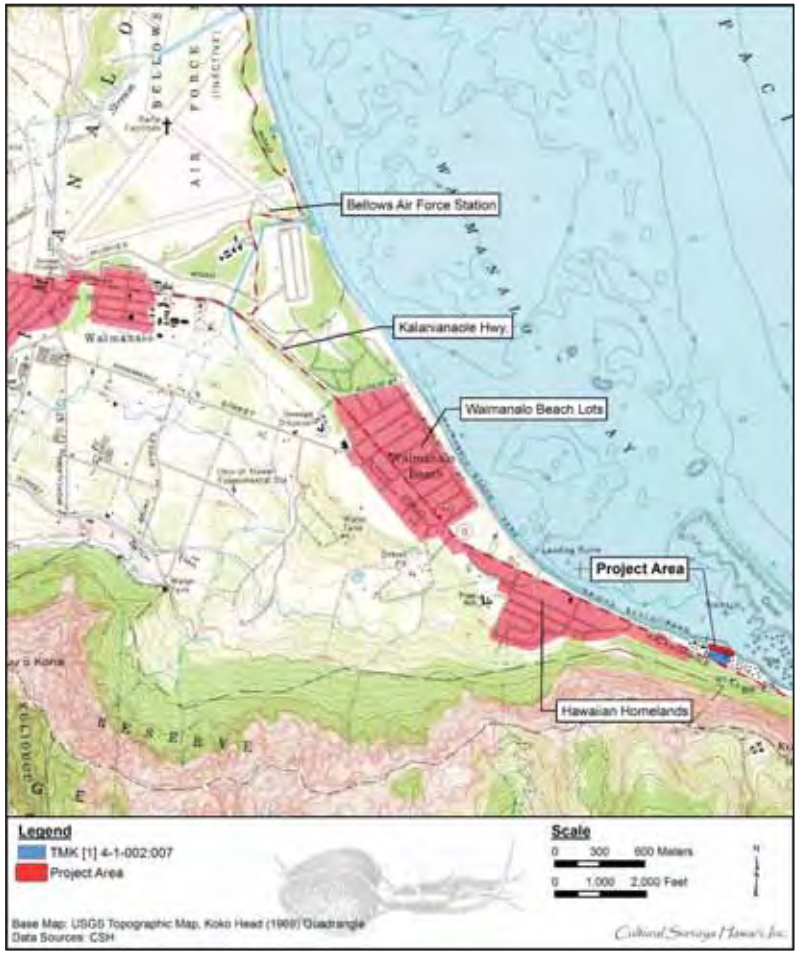

Figure 30. 1969 Koko Head USGS topographic quadrangle showing project area

3.3 Previous Archaeological Research

One of the earliest archaeological investigations in the Hawaiian Islands took place in Waimānalo. In 1879, Mr. Otto Finsch reported on human burials in sand deposits and associated artifacts in an area that is now MCTAB, formerly Bellows Air Force Station (Finsch 1879). To date, there have been approximately 100 archaeological studies in Waimānalo Ahupua‘a.

In the early 1900s, Thomas G. Thrum attempted to document the *heiau* of the Hawaiian Islands, which he published as part of his “Tales from the Temples” series in the *Hawaiian Annual.* In 1907, he listed the *heiau* for O‘ahu Island, along with any documentation he collected. Only two *heiau* were listed for Waimānalo—Olohana and Pueo. Other than the mention of the names, no further information was included about either *heiau* at the time of the printing. In his discussion of *heiau*, Thrum noted that “Information relative to the Ko‘olau and ‘Ewa districts, as yet, are very meager” (Thrum 1907:60).

In 1930, J. Gilbert McAllister conducted the first systematic survey of archaeological sites on the island of O‘ahu. The fieldwork identified, mapped, and described 384 sites. The Waimānalo and Makapu‘u area sites McAllister identified are listed in the table below (Table 1).

The major foci in archaeological research in Waimānalo has been the Bellows area and to a much lesser extent the Waimānalo State Recreation Area. MCTAB is one of the most extensively studied areas on O‘ahu. Beginning in the 1960s, approximately 70 separate reconnaissance, survey, excavation, and monitoring projects have taken place, most in conjunction with construction activity. Human burials, lithic scatters, soil features and/or occupation layers have been found almost everywhere archaeological investigations have taken place. Possibly, the most important finds occurred in dune deposits adjacent to the mouth of Waimānalo Stream referred to as State Inventory of Historic Places (SIHP) # 50-80-15-018. Radiocarbon dates on charcoal from cultural layers within the dune which placed the earliest occupation to around 300-400 C14 years AD have been much disputed (see for example Dye and Pantaleo 2010) but these deposits are still considered to be among the oldest in Hawai‘i (Cordy and Tuggle 1976; Kirch, 1985:71; Pearson et al. 1971). Much of the research since this discovery of early Bellows Dune occupation has focused on attempting to connect other archaeological finds in more inland areas of Bellows to this early Polynesian settlement. Bellows remains a focus of continuing archaeological research.

Approximately a dozen archaeological studies were carried out at the Waimānalo State Recreation Area just south of MCTAB mostly between 1976 and 1980. There was hope that the occupation layers documented just to the north might be present in the State Recreation Area but findings thus far have been rather disappointing.

Relatively little work has been conducted in Waimānalo Ahupua‘a inland of Kalaniana‘ole Highway. Studies by Barrera (1984), Dixon (1993), and Sinoto and Pantaleo (1993) have reported nothing of significance. Hammatt and Borthwick (1988) and others have documented plantation era infrastructure (e.g., ditches, flumes, tunnels, reservoirs) in surveys of former cane lands. Perzinski et al. (2002) reports three inadvertently disturbed human burials and a cultural layer (SIHP # 50-80-15-5939), which were encountered during construction activities on Department of Hawaiian Home Lands (DHHL) adjacent to Kalaniana‘ole Highway. These finds were, however, in Jaucas sand deposits close to the coast.

Table 1. McAllister (1933) sites in Makapu‘u and Waimānalo

Site #	Location	Type of Site	Description	Comments
1	Makapu‘u Point, above lighthouse	Kū‘ula	A *pōhaku* (stone) image of Malei, a female *kupua* who was the deity for the *uhu* (parrotfish)	Disappeared, probably destroyed
2	Top of Waimānalo Gap	–	Stone pile, 15 x 45 ft and 9 ft high	–
3	Kealakīpapa Valley Rd	Old trail	Trail from Wāwāmalu to Makapu‘u	Trail runs “from a point slightly mountainwards of the lighthouse road up Kealakīpapa Valley, down the Waimānalo gap, and through the village site in Waimānalo”
381	Waimānalo side of Olomana, on the edge of Waimānalo cane field facing Ko‘olau Range	*Heiau* (unnamed)	Approx. 250 ft x 130 ft with two terraces, with some waterworn pebbles and “an amazing amount of old coral scattered throughout the rocks”; site known to E.P. Kaniaupio	McAllister unable to obtain names of two *heiau* (Sites 381, 382); however, he believed it likely the two *heiau* mentioned by Thrum, Pueo and Olohana, probably refer to Site 381 or 382
382	Pōhakunui, Waimānalo	*Heiau* (unnamed)	A small *heiau*, approx. 50 x 90 ft, built on crown of a little hill, at foot of *pali* on mountainward edge of cane field just back of Waimanālo mill	–
383	Haununaniho, near sea side of mill, Waimanālo	Pu‘uhonua	A small hill said to have been famous in olden days as a place of refuge	–
383-A (SIHP # -1037)	Pāhonu	Pond	A pond approx. 500 ft x 50 ft; turtles raised here for use by *ali‘i*	Located at Shriners Beach

Site #	Location	Type of Site	Description	Comments
384	Kaupō Village complex	Various	“In its prime, it consisted of a few fishing huts, a fishing shrine (*ko‘a*), and possibly a small *heiau*”; lists sites o, j, b, k, n, e as being most important	–
384-a	Kaupō Village complex	Sand-floored enclosure, 5 x 14 paces	Well-preserved, with two wide 3-4-ft high entrances; lava tube near inland end 15 ft long x 2-3-ft high, with adjoining clear area 25 ft x 30 ft marked by line of stones	–
384-b	Kaupō Village complex	Lava tube and habitation site	“Ruins centered around a lava tube,” 15 ft long, 4 ft high, floor 10 ft wide; entrance faced and stepped; wall surrounds tube with small enclosure in NW corner, with cache in one of the walls	Excavation found: four bone buttons, one pearl button, a rib fragment (human?), and pelvis of a small animal; lava tube inhabited until “recently” by Kakilaka, “a Hawaiian hermit who avoided contact even with his own people”
384-c	Kaupō Village complex	Lava bubble shelter	Sanded floor, 37 ft diameter with dome-like 6-ft-high ceiling, with center opening	Found bits of ash, charcoal, *‘opihi* and cowrie shell on floor
384-d	Kaupō Village complex	Many enclosures	“Varying sizes and workmanship”	–
384-e	Kaupō Village complex	Portion of old roadway	14 ft wide and bordered by walls 2 ft high, part of it paved with flat slabs of lava	“. . . paved and bordered by walls, would seem not to have been needed by the Hawaiians before pack animals and vehicles came into use.”
384-f	Kaupō Village complex	Present roadway	–	–
384-g	Kaupō Village complex	Lava block wall	Irregular, narrow, 3 ft high	–
384-h	Kaupō Village complex	Low walled enclosure	20 ft x 95 ft; walls on all sides except inland side; inner wall separates eastern third	–

Site #	Location	Type of Site	Description	Comments
384-i	Kaupō Village complex	Platform	Well-built, 3 ft high on *makai* side, paved with small rough lava; rocks at base of wall placed on end	–
384-j	Kaupō Village complex	Possible *heiau*	“Only a corner of a very old platform, which suggests a *heiau*, remains”; 5 ft high, constructed of lava blocks evenly fitted to form faces, adjoining is old weathered coral wall 3 ft high	McAllister based his suggested function of *“heiau”* on style of construction; also, “. . . the construction of the present highway obliterated the greater portion of the site”; memo in SHPD files confirms this
384-k	Kaupō Village complex	Large rectangular enclosure	79 x 110 ft. x 5 ft high before its top stones had been removed; two smaller walled enclosures adjoining it on north	McAllister notes at the time of the survey, the site “. . . which is now pointed out as a *heiau*, was undoubtedly a cattle pen. If it was ever a *heiau*, all features have been completely obliterated.”
384-l	Kaupō Village complex	Small platform	Platform surrounded by large lava blocks on end and paved with small fragments of lava and coral	–
384-m	Kaupō Village complex	Enclosures (2)	5 ft x 10 ft with walls 3-4 ft high and 2 ft thick; 30 ft x 60 ft outlined rectangle lies east of it and similar one on west	–
384-n	Kaupō Village complex	Probable house site	“a slightly elevated area” 10 x 20 ft with low walls on three sides	–
384-o	Kaupō Village complex	Fishing shrine (*ko‘a*)	Approximately 10 ft high with uneven surface 15 ft x 25 ft	“Unique in its lack of small pieces of coral … and in being built just off shore … It is said that the top was formerly evenly paved, forming a level platform.”

Archaeological studies near the current project area are listed and briefly summarized in Figure 31 and Table 2. This section serves as an overview of all previous archaeology near the current project area. Historic properties near the project area are depicted in Figure 32.

3.3.1 Sterling and Summers 1978

Sites of O‘ahu was first published in 1962 as a compilation of McAllister’s 1933 work along with history, tradition, legend, place names, and land descriptions from several different sources. Reprinted in 1978, the work provided a comprehensive volume pertaining to O‘ahu archaeology. Charles Alona, a local informant, whose interviews are a part of the Bishop Museum Hawaiian Ethnographic Notes (HEN) Collection, some of which were included in *Sites of O‘ahu* (Alona 1939 in Sterling and Summers 1978), identified two sites near the current project area. Site 21 was a large rock, *Kini*, a female rock that attracted *akule* (bigeye scad) and *o‘io* (bonefish) fish. It is located 408 m (1,339 ft) to the southeast of the current project area and was originally closer to the coast but moved inland when the road was built (Alona 1939 in Sterling and Summers 1978:149-250). Approximately 1 km (0.62 miles) to the southeast of the current project area is *Kaluhine Koa*, a small, stacked rock fish shrine (Alona 1939 in Sterling and Summers 1978:251). *Pohaku Paakiki* was identified by one of the authors, Catherine C. Summers, in 1954. It is a stacked rock mound, approximately 1.75 km (1.1 miles) from the current project area, at the shore of Kaupō Beach. At low tide, *Pohaku Paakiki*, rises out of the water and at high tide, it is in the water (Sterling and Summers 1978:252). Sites 21–23 do not have designated SIHP #s.

3.3.2 Hammatt 1988

CSH conducted archaeological reconnaissance of a 3.9-acre parcel adjacent to the west side of Sea Life Park. The parcel had been levelled and filled, likely during the construction of Kalaniana‘ole Highway. Despite historic properties being present in the surrounding area (Kaupō Village), no sites had been recorded within the study area before the parcel was modified.

3.3.3 Medical Examiner 1988a and 1988b

The City and County of Honolulu Police Department and the Department of Medical Examiner investigated two burials at Kaiona Beach Park in Waimānalo. Two reports regarding the burials were written, however, these reports are not publicly available.

3.3.4 UH Marine Option Program 1999

The University of Hawai‘i Marine Option Program (1999) conducted an underwater survey of the remains of Waimānalo Landing, in the near-shore waters of Waimānalo Beach Park. The remains of the pier, machinery, pilings, loading equipment, and various other material remains were observed, though no SIHP number was assigned to the site area

3.3.5 McGuire and Hammatt 2000

McGuire and Hammatt (2000) conducted archaeological monitoring during the installation of light poles at a ball-field at Waimānalo Beach Park. No cultural material was observed.

3.3.6 Perzinski et al. 2001

CSH conducted archaeological monitoring of the installation of fiber optic cable lines along roadways *mauka* of Kalaniana‘ole Highway and the Waimānalo Beach Lots subdivision (Perzinski et al. 2001). No historic properties were identified.

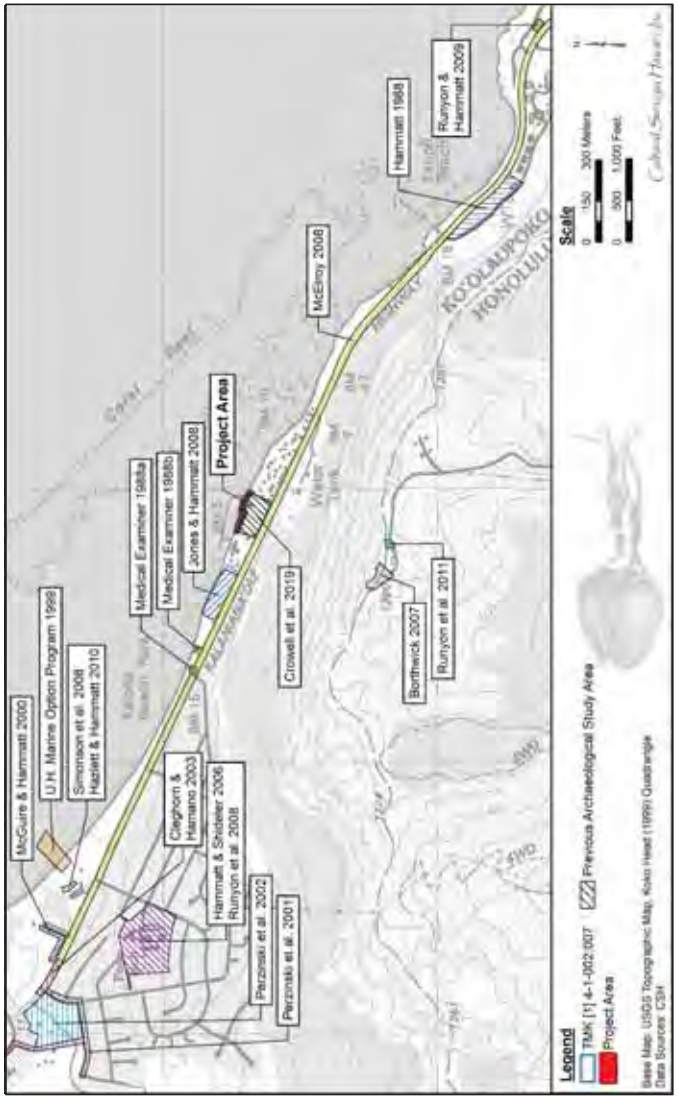

Figure 31. Previous archaeological studies near the present project area

Table 2. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results
McAllister 1933	Island-wide survey	O‘ahu	Identified three *heiau* (Sites 380, 381, and 382), a *pu‘uhonua* (Site 383), a fishpond (Site 383-A/ SIHP # -1037), and abandoned coastal village (Site 384)
Sterling and Summers 1978	Compilation	O‘ahu	Three sites identified *Kini* (Site 21), *Kaluahine Koa* (Site 22), and *Pohaku Paakiki* (Site 23)
Hammatt 1988	Archaeological reconnaissance	3.9-acre parcel adjacent to Sea Life Park, Waimānalo	No findings; parcel had been leveled and filled
Medical Examiner 1988a	Police and Medical Examiner’s reports	Kaiona Beach Park, Waimānalo	Not available
Medical Examiner 1988b	Police and Medical Examiner’s reports	Kaiona Beach Park, Waimānalo	Not available
UH Marine Option Program 1999	Underwater survey	Waimānalo Landing	Documents machinery, pilings, and various pieces of loading equipment
McGuire and Hammatt 2000	Archaeological monitoring	Waimānalo Beach Park	No cultural materials observed, no historic properties identified
Perzinski et al. 2001	Archaeological monitoring	Roadways *mauka* of Kalaniana‘ole Hwy and Waimānalo Beach Lots subdivision	No historic properties identified
Perzinski et al. 2002	Archaeological monitoring	*Kupuna* (elderly) housing project, *mauka* of Kalaniana‘ole Hwy	Three human burials and a cultural layer (SIHP # 50-80-15-5939) identified within Jaucas sand

Reference	Type of Study	Location	Results
Cleghorn and Hamano 2003	Archaeological monitoring	Sandwich Isles Communications Rural Fiber Optic Ductlines Project (TMK: [1] 4-1-037:001–003)	One historic property identified consisting of a small charcoal pit and historic road bed (SIHP # 50-80-15-6518) and assessed as not significant.
Hammatt and Shideler 2006	Archaeological literature review and field inspection	Blanche Pope Elementary School, Waimānalo	Archaeological monitoring program recommended because of presence of three burials and a cultural layer at a site 500 m to northwest of the school
Borthwick 2007	Archaeological field inspection	HECO site, Kamehame Ridge	No historic properties identified
Jones and Hammatt 2008	Archaeological monitoring	Proposed Wastewater System and Utilities Upgrades at Kaiona Beach Park (TMK: [1] 4-1-003:016)	Two historic properties identified, SIHP #s 50-80-15-6751, two separate cultural layers, and 50-80-15-6752, three separate burial events containing four individuals total
McElroy 2008	Archaeological monitoring	Kalaniana‘ole Hwy ROW, Sandy Beach Park to Waimānalo Beach Park	Eight isolated artifacts (pre- and post-Contact) throughout project corridor; one historic property identified: a disturbed cultural layer, SIHP # 50-80-15-6696, a temporary use marine exploitation site
Runyon et al. 2008	Archaeological monitoring	Blanche Pope Elementary School, Waimānalo	No cultural materials observed, no historic properties identified
Simonson et al. 2008	Archaeological inventory survey	Waimānalo Beach Park for reconstruction of wastewater system	One site near coast, northwest of project area; SIHP # 50-80-15-7042, a pre-Contact subsurface cultural layer

Reference	Type of Study	Location	Results
Runyon and Hammatt 2009	Archaeological monitoring	Makapu‘u Beach Park reconstruction of wastewater systems project	Documentation associated with Kaupō Village, a Hawaiian fishing village established during early 1850s, indicates village was partially within today’s Makapu‘u Beach Park; no archaeological cultural deposits identified as a result of project’s monitoring program
Hazlett and Hammatt 2010	Archaeological monitoring	Waimānalo Beach Park for reconstruction of wastewater system	Only sparse cultural material observed (disarticulated animal bone, a soda bottle, and two pit features)
Runyon et al. 2011	Archaeological literature review and field inspection	DAGS Radio Facilities project at Kamehame Ridge location on summit of Ko‘olau Ridge overlooking present project area	One historic property designated (SIHP # 50-80-14-7191); consisting of two concrete foundations related to a former Nike military Oahu Defense Area (OA) facility, OA-32
Crowell et al. 2019	Archaeological inventory survey	Waimānalo Paradise Subdivision Project, (present project) TMK: [1] 4-1-002:007	Three newly identified historic properties were documented within the project area:: SIHP # 50-80-15-8747, former Anderson Estate–Pahonu remnants, assessed as not significant due to insufficient integrity; historic property previously demolished and therefore retains only integrity of location SIHP # 50-80-15-8748, a pre- to late post-Contact subsurface cultural layer SIHP # 50-80-15-8749, human burial, SIHP # -8749 designated as a separate site per consultation with SHPD History & Culture Branch, but burial is in a cultural/ archaeological association with SIHP # -8748 cultural layer

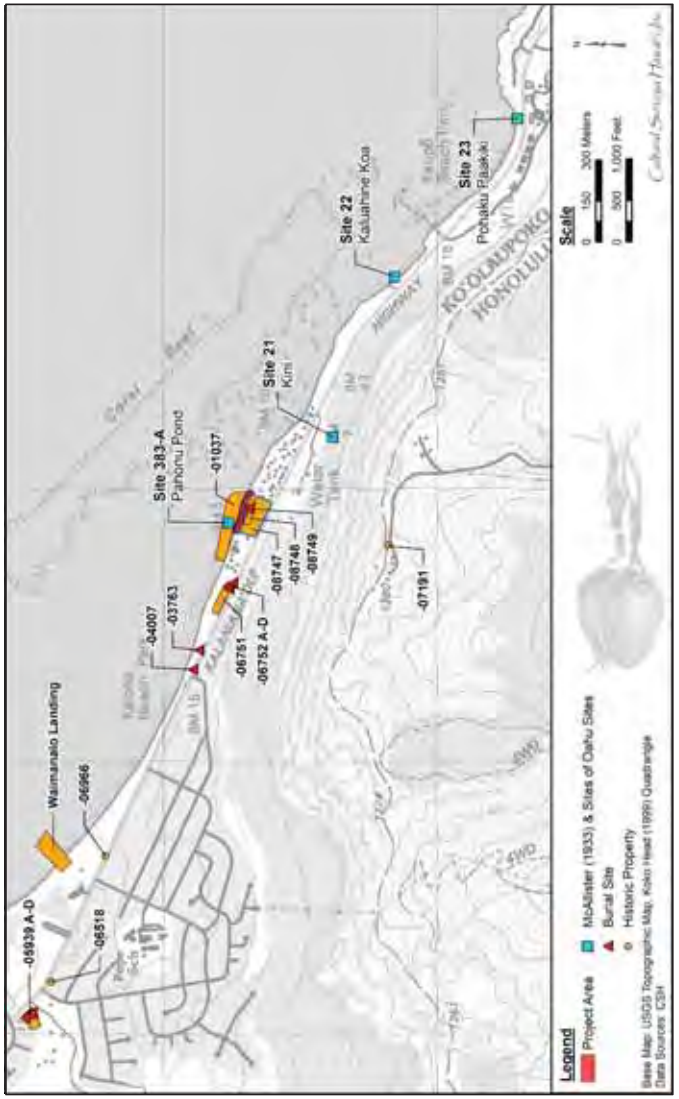

Figure 32. Previously identified historic properties in the vicinity of the project area (Sites of O‘ahu Sites 21–23 do not have designated SIHP #s)

3.3.7 Perzinski et al. 2002

CSH conducted archaeological monitoring during the construction of a *kupuna* (elderly) housing project, *mauka* of Kalaniana‘ole Highway (Perzinski et al. 2002). Three human burials and a cultural layer (SIHP # 50-80-15-5939) were encountered during construction activities within Jaucas sand.

3.3.8 Cleghorn and Hamano 2003

Pacific Legacy conducted archaeological monitoring for the Sandwich Isles Communications Rural Fiber Optic Ductlines Project (TMK: [1] 4-1-037:001-003). One historic property identified consisting of a small charcoal pit and historic road bed (SIHP # 50-80-15-6518) and assessed as not significant.

3.3.9 Hammatt and Shideler 2006

CSH performed a literature review and field inspection (Hammatt and Shideler 2006) at six Department of Education (DOE) schools, including Blanche Pope Elementary in Waimānalo, in support of wastewater improvement projects at the schools. An archaeological monitoring program was recommended for the wastewater improvement project because of the presence of three human burials and a cultural layer at a site (SIHP # 50-80-15-5939) 500 m to the northwest of the school.

3.3.10 Borthwick 2007

CSH conducted an archaeological field inspection and surface survey (Borthwick 2007) of all accessible portions of a proposed communication project on the Ko‘olau Ridge summit at the top of Kamehame Ridge. The ridge-top site had been heavily modified through cutting, filling, and grading during the construction of the existing structures at the site. CSH recommended consultation with SHPD because of the presence of World War II and Cold War era military infrastructure and the potential for the interruption or barrier to access of the Ko‘olau Summit Ridgeline Trail.

3.3.11 Jones and Hammatt 2008

CSH conducted archaeological monitoring during wastewater system and utility upgrades at Kaiona Beach Park in coastal Waimānalo. Two subsurface cultural layers (SIHP # 50-80-15-6751 Features A and B) and four human burials (SIHP # 50-80-15-6752 Features A–D) were encountered during excavations in Jaucas sand.

3.3.12 McElroy 2008

Garcia and Associates (GANDA) completed archaeological monitoring (McElroy 2008) of the construction and installation of new fiber optic duct lines in the Kalaniana‘ole Highway ROW from Sandy Beach Park, along the southeast shore of O‘ahu, to Waimānalo Beach Park. Eight isolated artifacts were collected throughout the project corridor and included a basalt canoe breaker, a triangular stone, four glass bottles, and two shells with possible drilled holes. A disturbed cultural layer was identified near Muliwai‘olena Stream in Waimānalo and it was designated SIHP # 50-80-15-6696. SIHP # -6696 contained pre- and post-Contact cultural material as well as modern material and was interpreted as a temporary use marine exploitation area.

3.3.13 Runyon et al. 2008

CSH reported on archaeological monitoring of a wastewater improvement project at Blanch Pope Elementary in Waimānalo. Archaeological monitoring was carried out following the completion of a literature review and field inspection (Hammatt and Shideler 2006). No cultural materials were observed, and no historic properties were identified.

3.3.14 Simonson et al. 2008

CSH conducted an archaeological inventory survey (Simonson et al. 2008) at Waimānalo Beach Park for reconstruction of wastewater system. A pre-Contact subsurface cultural layer containing midden (marine shell, sea urchin, faunal bone, coral and mammal bone), fire-cracked rock, charcoal deposits, and lithic debitage (basalt flakes) was identified and designated SIHP # 50-80-15-7042.

3.3.15 Runyon and Hammatt 2009

CSH (Runyon and Hammatt 2009) reported on archaeological monitoring for a Makapu’u Beach Park reconstruction of wastewater systems project. Documentation associated with Kaupō Village, a Hawaiian fishing village established during the early 1850s, indicates the village was partially within today’s Makapu‘u Beach Park. No archaeological cultural deposits were identified during the monitoring.

3.3.16 Hazlett and Hammatt 2010

During archaeological monitoring of the Waimānalo Beach Park for reconstruction of wastewater system project area (Hazlett and Hammatt 2010) only sparse cultural material was observed (disarticulated animal bone, a soda bottle, and two pit features).

3.3.17 Runyon Shideler, and Hammatt 2011

CSH (Runyon, Shideler, and Hammatt 2011) prepared an archaeological literature review and field inspection report for a DAGS Radio Facilities project at a Kamehame Ridge location on the summit of the Ko‘olau Ridge overlooking the present project area. One historic property was designated (SIHP # 50-80-14-7191), consisting of two concrete foundations related to a former Nike military Oahu Defense Area (OA) facility, OA-32. According to background research, the facility was in operation from March 1961 through March 1970. As the existing structure remnants are 50 years or older, they were historic properties. This study developed substantial information on the Nike complex.

3.4 Project Parcel AIS (Crowell et al. 2019)

CSH conducted an AIS for the current project parcel (TMK: [1] 4-1-002:007) for the Waimānalo Paradise Subdivision project (Crowell et al. 2019). The AIS fieldwork originally consisted of ten test excavations (T-1 through T-10) completed between 9 and 13 July 2018. Following the completion of the initial ten test excavations, six additional test excavations were conducted (T-11 through T-16). Two additional test excavations (T-11 and T-12) were excavated east of T-6 within the footprint of the proposed new construction. Three additional excavations (T-13, T-14, and T-15) were excavated south and east of T-6 based on the results of the T-6 excavation and an additional 2.3 m (7.5 ft) extension of T-6 was excavated to the north. One additional test excavation (T-16) was excavated at the south end of the property, perpendicular to

the perimeter wall. CSH conducted additional fieldwork between 25 and 30 July 2018, providing archeological monitoring of geotechnical boring in the project area.

Three newly identified historic properties were documented including the Anderson Estate-Pahonu remnants (SIHP # 50-80-15-8747) distinguished by 12 features; a culturally expressed A horizon (SIHP # 50-80-15-8748) distinguished by 14 features; and a human burial (SIHP # 50-80-15-8749).

The boundaries of the historic property were determined to be the entire former estate property (TMK: [1] 4-1-002:007). A total of 12 extant features of the historic property (SIHP # 50-80-15-8747) were identified during the AIS. These are distributed throughout the project area and include two extant buildings consisting of a gate/guesthouse (Feature 1) and a pool/boathouse and boat ramp (Feature 2), four structures consisting of a perimeter wall on east, south, and west boundaries (Feature 3), landscape terraces/decorative feature on the south perimeter wall (Feature 4), seawall and stairs on the north boundary (Feature 5), and tennis court (Feature 6), and five structural remnants consisting of one large concrete pad and foundation of the former main house (Feature7), three partially demolished sidewalls (Feature 8 through Feature 10), one subsurface wall remnant (Feature 11), and a subsurface privy/cesspool remnant (Feature 12).

SIHP # -8748 was documented in nine test excavations (T-1, T-5, T-6, T-8, T-11, T-12, T-13, T-14, and T-15) (Figure 33) and dispersed midden. In the eight test excavations that contained features, the midden material observed and sampled from both the A horizon and the features were consistent: marine shells, turtle shell, faunal osseous remains (mainly pig, but also dog), fish bone, sea urchin, fire-affected rock (FAR), and charcoal. The distribution of the midden was not consistent, however, either within each test excavation or across the site, and no appreciable concentrations were observed in any of the test excavations. Midden materials were lightly and spottily distributed throughout the A horizon and in four test excavations (T-6, T-8, T-12, and T-13) were mixed with late-nineteenth/early twentieth century materials. Only a few traditional Hawaiian artifacts, or historic materials, were identified and collected from the A horizon in eight of 16 test excavations.

SIHP # -8749 consists of a single set of human remains in the north central portion of the project area. SIHP # -8749 is a primary, in situ sub-adult human burial documented in T-6 within the culturally enriched A horizon (SIHP # -8748) between 143-150 cmbs. SIHP # -8749 is designated as a separate site per consultation with the SHPD History & Culture Branch, but the burial is in a cultural/archaeological association with the SIHP # -8748 cultural layer.

A total of 31 artifacts were collected during the project. This includes seven traditional artifacts, 23 historic artifacts, and a *Conus* shell. The traditional artifacts consist of one hammerstone, three *‘ulu maika*, one stone sinker, one squid/octopus lure, and one canoe anchor/breaker. The historic artifacts include 14 glass bottle or bottle fragments, one milk glass jar, one pressed glass tumbler, one ceramic hollowware fragment, two ceramic tableware fragments, four metal fragments, one shell button, and five milled wood fragments.

Various faunal osseous materials were collected from ten test excavations (T-1, T-5, T-6, T-8, T-9, and T-11 through T-15). The identified faunal remains include cow (*Bos taurus*), pig (*Sus scrofa*), goat (*Capra hircus*), dog (*Canis lupus familiaris*), bird (Aves), turtle (Cheloniidae), fish

Figure 33. Aerial photo of the project area showing proposed new construction footprint and excavated archaeological test excavations

(Osteichthyes), shark (Selachimorpha), sea urchin (*Heterocentrotus mamillatus*), and rat (*Rattus rattus*), as well as various fragments belonging to medium mammals (inconsistent with human morphology).

3.5 Background Summary and Predictive Model

Background research indicates that during the pre-Contact period Waimānalo was an abundant agricultural and resource gathering area (both terrestrial and marine), but populations were relatively limited, compared to the neighboring areas of Kailua and Moanalua, because of the scarcity of fresh water away from Waimānalo Stream and other localized springs and the relative isolation and lack of overland transportation routes. Despite the limited land routes that accessed Waimānalo, its extensive sandy beach frontage was frequently used to land and launch canoes.

The presence of one LCA near the northwest portion of the current project area and two LCAs in the immediate vicinity indicate traditional Hawaiian habitation and subsistence activities, primarily focused on exploitation of marine resources (see 3.2.2). These three LCA were one of two *‘āpana* (house lots) awarded to three individuals, each *‘apana* focused on separate resources: traditional Hawaiian agriculture (taro *lo‘i*) and a house lot around Waimānalo Stream, and the coastal house lot for marine resources.

The large Cummins Estate, first a ranching operation and then the Waimanalo Sugar Company, dominated the land, economy, and society of Waimānalo from the time Thomas Cummins received a Royal Patent for 6,970 acres of crown lands in 1842 and 1850. By 1922, the cane fields covered nearly all the broad Waimānalo Valley, although they did not extend to the current project area (see Figure 19). The present-day layout and development of Waimānalo is very much based on the development and growth of the Waimanalo Sugar Company.

An early archaeological study (Finsch 1879) reported on human burials in sand deposits and associated artifacts in an area of present day MCTAB (Bellows). Other early archaeological investigations in Waimānalo Ahupua‘a documented two *heiau*, well inland and at a relatively far distance from the current project area (Thrum 1907). The McAllister survey in 1930 identified 384 sites in the Waimānalo and Makapu‘u area (see Table 1 and Figure 32), including Pāhonu, the turtle pond adjacent to the current project area. McAllister also documented other sites relevant to the project area: the Kealakīpapa Valley Road (Site 3) that led from Kealakīpapa Valley, down the Mokapu‘u *pali*, and along the coast to Waimānalo Village, which was centered around the sugar mill and Waimānalo Stream; and the Kaupō Village complex (Site 384), approximately 2.1 km (1.3 miles) to the southeast of the current project area. Three separate fishing shrines, southeast of the current project area, have also been documented (Sterling and Summers 1978).

The majority of archaeological investigations in the Waimānalo Ahupua‘a have focused on the MCTAB area. The work at MCTAB has documented human burials, lithic scatters, soil features and/or occupation layers almost everywhere archaeological investigations have taken place. The dune deposits at the mouth of Waimānalo Stream (SIHP # -018) are particularly important because they are considered to be among the oldest occupation sites in Hawai‘i, approximately 1,600-1,700 BP (Cordy and Tuggle 1976; Kirch 1985:71; Pearson et al. 1971). Waimānalo State Recreation Area, just south of MCTAB, has had over a dozen archaeological studies conducted there,

however, the results were much less robust and less significant than the sites documented at Bellows.

A smattering of archaeological investigations in Waimānalo, inland of Kalaniana‘ole Highway, have yielded sites and features of little to no significance (Barrera 1984; Dixon 1993; Sinoto and Pantaleo 1993), mainly plantation- era infrastructure (e.g., ditches, flumes, tunnels, reservoirs) in surveys of former cane lands (Hammatt and Borthwick 1988).

Archaeological investigations in the immediate vicinity of the current project have documented a range of historic properties, which are geographically distributed sparsely, and spanning in time from the pre-Contact to the Cold War period (see Table 2 and Figure 32). The historic properties most relevant in the vicinity of the project area include the following: SIHP # 50-80-15-5939, three human burials and a cultural layer documented in Jaucas sand deposits close to the coast (Perzinski et al. 2002); SIHP # 50-80-15-6751, two separate cultural layers, and SIHP # 50-80-15-6752, three separate burial events containing four individuals total (Jones and Hammatt 2005); and SIHP # 50-80-15-6696, a disturbed cultural layer that was a temporary use marine exploitation site that yielded a piece of cut bone (medium mammal), a coral rubbing stone fragment, basalt flakes and shatter, a coral abrader tip, a polished bone, an *Echinothrix diadema* (blue-black urchin) file, a tiny shard of modern glass, two pieces of volcanic glass, fire-cracked rock, an oven stone fragment, charcoal, and abundant midden (McElroy 2008:32–34).

The Waimānalo Paradise Subdivision project AIS (Crowell et al. 2019) within the current project’s parcel documented three historic properties. The historic properties include Anderson Estate-–Pahonu remnants (SIHP # -8747) distinguished by 12 features, a culturally expressed A horizon (SIHP # -8748) distinguished by 14 features and including a human burial (SIHP # -8749). This AIS targets the SIHP # -8747 Feature 5 seawall and may likely observe the intact SIHP # -8748 culturally expressed A horizon which has a high probability of exposing human skeletal remains.

Based on the coastal location, the presence of Pāhonu pond, anecdotal and documented evidence of Pāhonu as a gathering place, the occurrence of an LCA, and the previous archaeological investigations, subsurface, cultural layer(s) containing artifacts, midden, and/or human burials reflecting traditional Hawaiian occupation and marine resource exploitation within the current project area are anticipated. While remote, evidence of historic ranching could be present within the current project area, including subsurface cultural layers and features (postholes, walls), ranching artifacts, and/or faunal remains. No plantation period infrastructure is anticipated within the current project area because it is outside the extent of the former cane fields of the Waimanalo Sugar Company. Historic properties and features relating to the ca. 1900-1930 development of the area (utilities and infrastructure—water line and road, residential construction) are anticipated as are cultural materials reflecting the historic and modern occupation of the site (1930-2015).

Section 4 Results of Fieldwork

CSH archaeologists conducted fieldwork during 2 April 2019 and 3 April 2019 under the general supervision of Principal Investigator David Shideler, M.A. This work required approximately 7 person-days to complete. Fieldwork consisted of the historic property identification effort focused on a subsurface testing program where four test excavations were excavated, documented, and sampled. A 100%-coverage pedestrian inspection of the project area was undertaken for the purpose of historic property identification and documentation. The pedestrian survey was accomplished on both sides of the seawall.

Two previously identified historic properties were documented including the SIHP # -8747 Feature 5 seawall, observed throughout the northern portion of the project area; this AIS targets the assessment of the seawall for proposed repairs and portions of a culturally expressed A horizon (SIHP # -8748).

A 100% pedestrian inspection was completed for the entire project parcel during the Crowell et al. (2019) AIS investigation in which one historic property (SIHP # -8747) was observed. SIHP # -8747 consists of ten surface features that are either extant buildings and structures or remnants of the former Anderson Estate–Pahonu. These included a guest/guardhouse (Feature 1), a pool/boathouse and boat ramp (Feature 2), a perimeter wall on the west, south, and east boundaries of the property (Feature 3), landscaping terraces, a small decorative stone feature, stone steps and small retaining walls along the south perimeter wall and in the southeast corner of the property (Feature 4), a seawall and stairs (Feature 5), a tennis court (Feature 6), concrete pads, foundations and remnants of the demolished main house (Feature 7), and three sidewalls extending out from the east perimeter wall (Feature 8–10). This AIS targets SIHP # -8747 Feature 5, as proposed plans include the conceptual wall repair and replacement of the existing sea wall.

4.1 Subsurface Testing Results

Prior to subsurface excavation, CSH submitted a research design to the SHPD that included a 100% pedestrian inspection of the project area, subsurface testing of four test excavations (T-1 through T-4), GPS data collection, photographic documentation, and the recording of stratigraphic profiles and descriptions of the soils and sediments (Figure 34). T-1 through T-4 were excavated with a backhoe as designated locations on the *mauka* side of the seawall. All excavations extended between 160 and 295 cmbs upon reaching the water table except for one instance in T-4.

Based on the existing conditions in the project area and the size of the excavator bucket, the dimensions of the test excavations for T-1 and T-4 were smaller than originally planned; dimensions for T-2 and T-3 were larger than originally planned. T-1’s original dimensions were 2.44 m (8 ft) by 1.22 m (4 ft), located 7.6 m (25 ft) east of the boat ramp. The excavated portion of T-1 measured 2.3 m (7.54 ft) by 2.25 m (7.38 ft). T-2’s original dimensions were 3.66 m (12 ft) by 2.44 m (8 ft) located 7.6 m (25 ft) west of concrete steps. The excavated portion of T-2 measured 4.0 m (13.1 ft) by 2.4 m (7.8 ft). T-3’s original dimensions were 3.66 m (12 ft) by 3.66 m (12 ft) located 30.5 m (100 ft) east of concrete steps. The excavated portion of T-3 measured 4.25 m (13.9 ft) by 2.4 m (7.8 ft). T-4’s original dimensions were 3.66 m (12 ft) by 3.66 m (12 ft) located 18.3 m (60 ft) west of southeast property boundary. The excavated portion of T-4 measured 3.5 m (11.4 ft) by 2.4 m (8.5 ft).Due to the abundance of fine sand fills in conjunction with a large excavator bucket, the trench walls were very unstable. Additionally, the trench walls were deemed too wide

Figure 34. Aerial photo of the project area showing the project parcel and excavated archaeological test excavations T-1 through T-4

to accommodate proper shoring, therefore trench entrance after 4.5 ftbs was not feasible due to safety precautions. In the northeastern portion of the project area within T-3 and T-4, the abundance of loose basalt cobbles and boulders was an added contributing factor to unstable trench walls. The sand and abundant basalt cobbles and boulders created wall collapse on the east and west walls of T-2 through T-4. T-1 and T-2 contained coconut tree root balls which aided in stability for the loose sandy sidewalls.

In a letter dated 29 March 2019 (A. Downer to K. Sokugawa and S. Nishiura) (see Appendix A) SHPD had two requests:

1) An AIS be conducted for the current project as specified by Stipulation 28 in the Grand of Non-Exclusive Easement S-6083 between the State of Hawaii, Board of Land and Natural Resources (Grantor) and Waimanalo Paradise LLC (Grantee), dated October 29, 2015. Stipulation 28 states “The Grantee shall conduct an archaeological inventory survey, including assessment of the seawall, prior to the issuance of any future permit involving ground-disturbing activities.”
2) The seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian who meets the qualifications set forth in HAR 13-824-4 or HAR 13-381-5; the assessment included in the AIS (Crowell et al. 2019) was completed by an archaeologist. The AIS identifies the seawall (Site 50-80-15-8747, Feature 5) as a component of the former Anderson Estate–Pahonu, which was completed in 1933. Most of the estate (including the seawall) were assessed as lacking sufficient integrity of design, setting, materials, workmanship, feeling, and association and, thus, Site 50-80-15-8747 was evaluated as not being a significant historic property.

4.1.1 Summary of Stratigraphy

The majority of the project area contained fill deposits likely from the construction of the sea wall, previously designated as SIHP # -8747 Feature 5 (Crowell et al. 2019). Natural deposits were observed in one test excavation (T-4) in the northeastern portion of the project consistent with the soil survey data gathered by Foote et al. (1972). In general, stratigraphy in project area consists of multiple fill layers including imported and locally procured sands overlying natural marine sand near the water table. A buried A horizon that developed on naturally deposited Jaucas sand was observed in the southern (*mauka*) portions of two test excavations (T-3 and T-4).

Across the northern (*makai*) portion of the parcel within the project area, the observed mixed fills below the topsoil consists of multiple layers of fill deposits (clay loam, silty clay loam, and sand fills) that showed evidence of repeated disturbance, redeposition, and grading from the historic and episodic construction of the seawall and the Pahonu Estate (later termed Anderson Estate). The fills overlie naturally deposited marine sand.

The buried A horizon represents the former land surface prior to the construction of the seawall in the 1920s, and the subsequent construction of the Anderson Estate completed in 1933. The A horizon was previously designated as SIHP # -8748 in the Waimānalo Paradise Subdivision AIS (Crowell et al. 2019). The historic property is defined as a discontinuous, culturally expressed A horizon that contained midden deposits and artifacts indicative of both traditional Hawaiian and historic use. SIHP # -8748 is distinguished by 14 features (including SIHP # -8749) and dispersed midden within the A horizon of nine test excavations (Crowell et al. 2019). While a buried

A horizon was observed in two of the four test excavations (T-3 and T-4), only one of the test excavations (T-4) had an A horizon that exhibited evidence of cultural material including charcoal flecking. SIHP # -8748 was observed in the *mauka* portion of T-4 and continued southeast for an undetermined length, likely representing the north boundary. No new features were observed during the current AIS.

The SIHP # -8747 Feature 5 seawall was observed throughout the northern portion of the project area; this AIS targets the assessment of the seawall for proposed repairs. The northwestern portion of the project area within T-1 contained concrete masonry unit (CMU) blocks stacked three rows high above the existing concrete seawall. Unarranged basalt boulders were present at the base of the concrete seawall that likely represent the remnant of the original construction of the seawall. T-2 through T-4 contained concrete seawalls measuring approximately 60 cm above the ground surface and 80 cm wide extending between 150 to 180 cmbs. The northeastern portion of the project area within T-3 and T-4 contained portions of the original seawall directly below the concrete seawall consisting of basalt and mortar cobbles stacked two to three rows high. Abundant, loose basalt cobbles and boulders were observed beneath the basalt and mortared walls to the base of excavation.

4.1.2 Test Excavation Descriptions

4.1.2.1 Test Excavation 1 (T-1)

T-1 is in the northwest portion of the project area (see Figure 34). T-1 is oriented east/west and measures 2.3 m (7.54 ft) by 2.25 m (7.38 ft) (Figure 35). The base of excavation (BOE) extended to a maximum depth of 2.25 mbs (7.38 ft) and was determined upon reaching water table at 2.28 mbs (7.48 ft). Stratigraphy of T-1 consists of sandy loam fill (Stratum Ia), gravelly sandy clay loam fill (Stratum Ib), loamy sand fill (Stratum Ic), sandy clay loam fill (Stratum Id), gravelly fine sand fill (Stratum Ie), overlying natural medium marine sand (Stratum II) (Figure 38, Figure 37, and Table 3).

The majority of T-1 consists of imported and locally procured fill deposits accumulated from the construction of the SIHP # -8747, Feature 5 seawall. A polyvinyl chloride (PVC) irrigation pipe was observed within the east and west walls of T-1 within Stratum Ib at 15 cmbs. Faunal material including cow and bird bone fragments were collected at approximately 50 cmbs from Stratum Ic. Modern bottle glass fragments were observed in Stratum Ic, but not collected. No intact sterile deposits or a culturally enriched A horizon was observed except for natural marine sand at the base of excavation.

The north wall consists of a portion of SIHP # -8747, Feature 5. The observed portion contains concrete reinforced CMU blocks stacked three rows high, measuring approximately 2.3 m long, and 0.63 m high. Each CMU block measures approximately 10 by 40 cm. A portion of the north wall was documented to 1.37 mbs (4.5 ftbs) and was then cleared to expose the concrete seawall. A metal fence is present along the top of the CMU wall extending east and west. A metal fence post was observed near the center of T-1 in the northern wall extending approximately 20 to 90 cmbs. A concrete wall is directly below the CMU wall and extends approximately 2.55 m long and extends 2.25 m into the water table and BOE. Scattered basalt cobbles and boulders were observed at the base of the wall likely representing the remnant of the original seawall constructed in the 1920s.

Figure 35. T-1 general view, view to north

Figure 36. T-1 north wall at 125 cmbs and SIHP # 50-80-15-8747 Feature 5 before exposing sea wall

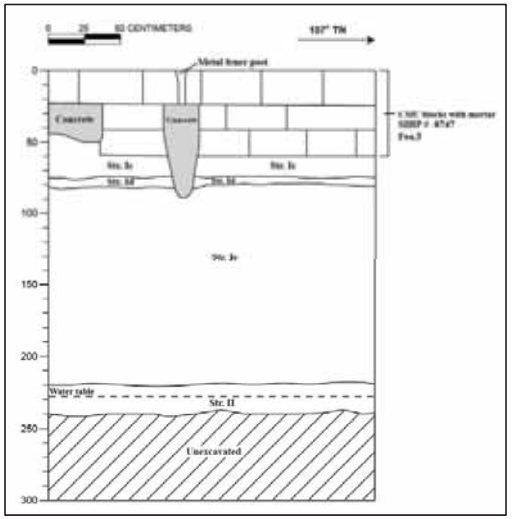

Figure 37. T-1, north sidewall

Figure 38. Portion of T-1 west sidewall and SIHP # 50-80-15-8747 Feature 5 at BOE, view to northwest

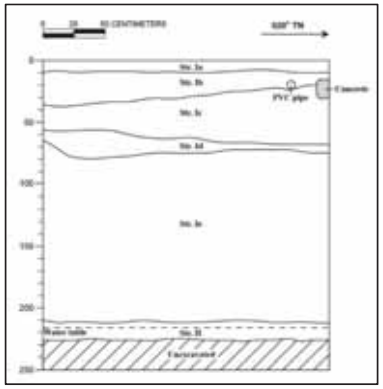

Figure 39. T-1, west wall

Table 3. T-1 stratigraphic description

Stratum	Depth (cmbs)	Description
Ia	0–9	A horizon; 10YR 4/6, dark yellowish brown; sandy loam; weak, fine, granular structure; moist, friable consistence; no cementation; slightly plastic; mixed origin; clear, smooth lower boundary; fine roots common
Ib	6–35	Fill; 5YR 4/6, yellowish red; gravelly sandy clay loam; weak, fine, granular structure; moist, friable consistence; no cementation; slightly plastic; terrigenous origin; clear, wavy lower boundary; few fine to medium roots observed; contains PVC irrigation pipe
Ic	14–68	Fill; 10YR 7/8, yellow; loamy sand; structureless (single-grain); moist, friable consistence; no cementation; non-plastic; mixed origin; clear, wavy lower boundary; few fine to medium roots observed
Id	55–73	Fill; 10YR 4/1, dark gray; sandy clay loam; weak, fine, granular structure; moist, friable consistence; no cementation; slightly plastic; mixed origin; clear, wavy lower boundary; many fine to medium roots observed
Ie	67–212	Fill; 10YR 8/3, very pale brown; gravelly fine sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; clear, smooth lower boundary; few fine to medium roots observed
II	212–225 (BOE)	Natural; 10YR 7/2, light gray; medium sand; structureless (single-grain); wet, non-sticky consistence; no cementation; non-plastic; marine origin; lower boundary not visible; few fine roots observed; marine sand

4.1.2.2 Test Excavation 2 (T-2)

T-2 is in the northwest portion of the project area (see Figure 34). T-2 is oriented east/west measuring 4.0 m (13.1 ft) by 2.4 m (7.8 ft) (Figure 40). T-2 extended to a maximum depth of 2.22 mbd (7.28 ft) and the BOE was determined upon reaching the water table at 2.00 mbd (6.56 ft). Stratigraphy of T-2 consists of gravelly sandy loam top soil fill (Stratum Ia), gravelly sandy clay loam fill (Stratum Ib), fine sand fill (Stratum Ic), gravelly sandy clay loam fill (Stratum Id), fine sand fills (Strata Ie and If), and sandy clay loam fill (Stratum Ig) (Figure 43, Figure 44, and Table 4).

T-2 consists entirely of imported and locally procured fill deposits accumulated from the construction of the SIHP # -8747, Feature 5 seawall. No intact sterile deposits or a culturally enriched A horizon were observed. Prior to excavation of T-2, a large coconut tree stump with an extensive root system was in the central portion of T-2. Excavation of the tree stump removed almost all the sediment. Faunal material including a pig bone fragment was collected from the spoils pile of the tree stump. The ground slopes steeply from *mauka* to *makai*, with a prominent void observed to the north along the seawall.

The north wall consists of a portion of SIHP # -8747, Feature 5. The observed portion contains a concrete wall measuring approximately 4.0 m long, 0.80 m wide, and 1.5 m high extending into the water table and BOE. Scattered basalt cobbles and boulders were observed at the base of the wall likely representing the remnant of the original seawall constructed in the 1920s.

Figure 40. T-2 pre-excavation; view to north

Figure 41. T-2 coconut tree stump; view to north

Figure 42. T-2 north wall showing SIHP # 50-80-15-8747 Feature 5

Figure 43. Portion of T-2 west sidewall, view to north

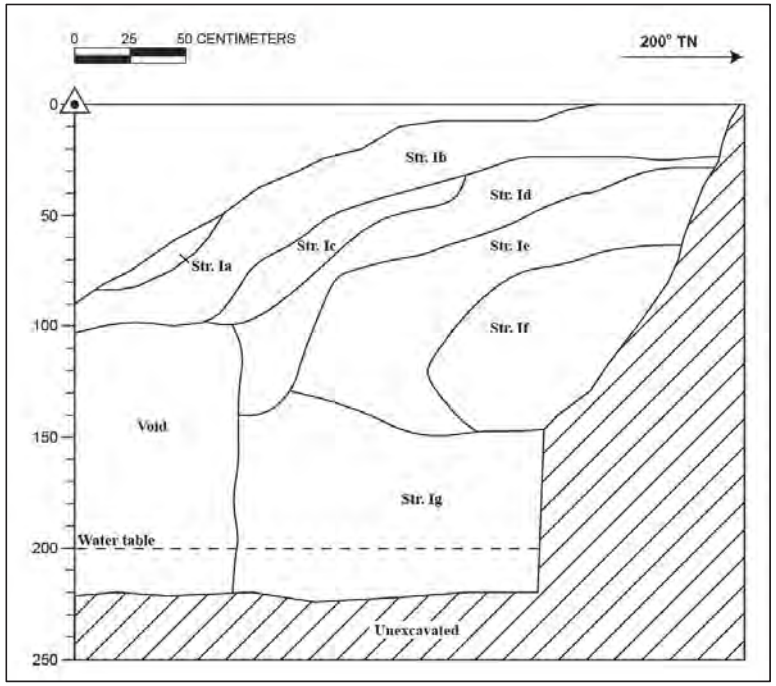

Figure 44. Profile of T-2 west sidewall

Table 4. T-2 stratigraphic description

Stratum	Depth (cmbd)	Description
Ia	45–87	A horizon; 10YR 3/6, dark yellowish brown; gravelly sandy loam; weak, fine, granular structure; moist, friable consistence; no cementation; slightly plastic; mixed origin; abrupt, discontinuous lower boundary; many fine to medium roots
Ib	0–100	Fill; 5YR 4/6, yellowish red; gravelly sandy clay loam; weak, fine, granular structure; moist, friable consistence; no cementation; slightly plastic; terrigenous origin; clear, wavy lower boundary; few fine to medium roots observed
Ic	35–100	Fill; 10YR 7/4, very pale brown; fine sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; abrupt, discontinuous lower boundary; many fine to medium roots observed
Id	25–140	Fill; 10YR 2/2, very dark brown; gravelly sandy clay loam; weak, fine, granular structure; moist, friable consistence; no cementation; slightly plastic; mixed origin; abrupt, wavy lower boundary; many fine to medium roots observed
Ie	25–145	Fill; 10YR 8/1, white; fine sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; clear, discontinuous lower boundary; many fine to medium roots observed
If	67–140	Fill; 10YR 8/2, very pale brown; sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; clear, discontinuous lower boundary; many fine to medium roots observed
Ig	140–222 (BOE)	Fill; 10YR 4/3, brown; gravelly sandy clay loam; weak, fine, granular structure; moist, friable consistence; slightly plastic; mixed origin; lower boundary not visible; many fine to medium roots observed

4.1.2.3 Test Excavation 3 (T-3)

T-3 is in the northeastern portion of the project area (see Figure 34). T-3 is oriented east/west and measures 4.25 m (13.9 ft) by 2.4 m (7.8 ft) (Figure 45). The BOE extended to a maximum depth of 295 cmbs (9.6 ft) and was determined upon reaching the water table at 290 cmbs (9.5 ft). Stratigraphy of T-3 consists of a sandy loam A horizon associated with SIHP # -8748 (Stratum I), gravelly sandy clay loam fill (Stratum IIa), sandy clay loam fill (Stratum IIb), fine sand fill (Stratum IIc), cobbly silty clay loam fill (Stratum IId), overlying natural medium marine sand (Stratum III) (Figure 47, Figure 48, and Table 5).

The majority of T-3 consists of imported and locally procured fill deposits accumulated from the construction of the SIHP # -8747, Feature 5 seawall. A PVC irrigation pipe was observed within the east and west walls of T-3 within Stratum IIb at approximately 22 cmbs. Faunal material including a saw cut cow bone fragment was collected from Stratum Ic. No intact sterile deposits were observed except for natural marine sand at the base of excavation. A portion of the SIHP # -8748 A horizon (Stratum I) was observed in the *mauka* portion of T-3 extending inland suggesting the boundary of ground disturbance related to the construction of the seawall. Minimal charcoal flecking was observed, but no other cultural materials were observed deeming the observed portion of SIHP # -8748 culturally sterile.

The north wall consists of a portion of SIHP # -8747, Feature 5. The observed portion contains concrete wall measuring approximately 4.25 m long, 0.80 m wide, extends 0.60 m above the ground surface, and extends 1.75 mbs from ground surface to base. A metal fence is present along the top of the concrete wall extending east and west. A basalt cobble and mortar wall stacked one to two rows high overlying abundant loose basalt cobbles and boulders is directly below the concrete wall and measures approximately 4.25 m long and extends 1.75 to 2.95 m into the water table and BOE. The lower portion of the seawall likely represents the remnant of the original seawall constructed in the 1920s.

Figure 45. T-3 pre-excavation with SIHP # 50-80-15-8747 Feature 5

Figure 46. T-3 north wall with SIHP # 50-80-15-8747 Feature 5 and original sea wall

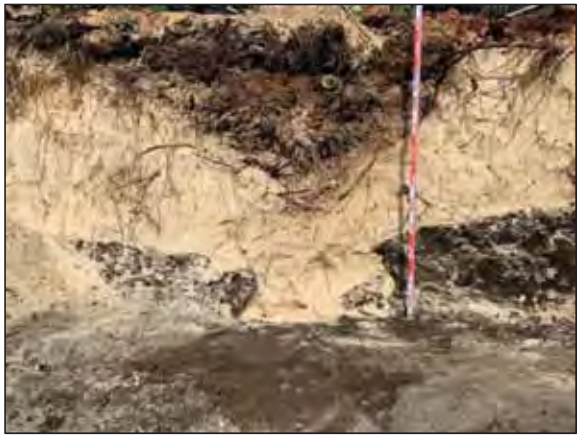

Figure 47. Portion of T-3 west sidewall, view to west

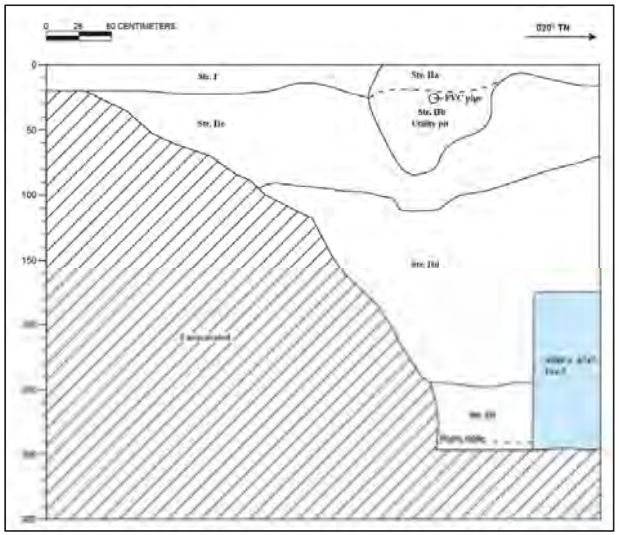

Figure 48. Profile of T-3 west sidewall

Table 5. T-3 stratigraphic description

Stratum	Depth (cmbs)	Description
I SIHP # -8748	0–20	A horizon; 10YR 3/1, very dark gray; sandy loam; weak, fine, granular structure; moist, friable consistence; no cementation; non-plastic; mixed origin; clear, discontinuous lower boundary; few fine roots observed
IIa	0–16	Fill; 5YR 4/4, reddish brown; gravelly sandy clay loam; weak, fine, granular structure; moist, friable consistence; no cementation; slightly plastic; terrigenous origin; clear, discontinuous lower boundary; fine roots common
IIb	20–85	Fill; 2.5Y 4/2, dark grayish brown; sandy clay loam; weak, fine, granular structure; moist, friable consistence; no cementation; non-plastic; mixed origin; clear, discontinuous lower boundary; few fine to medium roots; utility pit for PVC irrigation pipe
IIc	7–112	Fill; 10YR 8/2, very pale brown; fine sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; clear, wavy lower boundary; fine roots common
IId	70–246	Fill; 10YR 3/2, very dark grayish brown; cobbly silty clay loam; weak, medium, blocky structure; moist, friable consistence; no cementation; slightly plastic; terrigenous origin; clear, wavy lower boundary; few fine roots observed
III	245–295 (BOE)	Natural; 10YR 7/2, light gray; medium sand; structureless (single-grain); wet, non-sticky consistence; no cementation; non-plastic; marine origin; lower boundary not visible; few fine roots observed; marine sand

4.1.2.4 Test Excavation 4 (T-4)

T-4 is in the northeastern portion of the project area (see Figure 34). T-4 is oriented in east/west and measures 3.5 m (11.4 ft) by 2.4 m (8.5ft) (Figure 49). The BOE extended to a maximum depth of 250 cmbs (8.2 ft) and was determined upon trench instability due to abundant basalt cobbles and boulders. The water table was not observed. Stratigraphy of T-4 consists of a gravelly sandy clay loam fill (Stratum Ia), fine sand fill (Stratum Ib), cobbly silty clay loam fill (Stratum Ic), stony sandy loam fill (Stratum Id), overlying a sandy loam A horizon associated with SIHP # -8747 (Stratum II), and natural Jaucas sand (Stratum III) (Figure 50 through Figure 52, and Table 6).

The majority of T-4 consists of imported and locally procured fill deposits accumulated from the construction of the SIHP # -8747, Feature 5 seawall. No intact sterile deposits were observed except for Jaucas sand in the *mauka* portion of the project area and natural marine sand at the base of excavation. Faunal material including small mammal, fish, and possible turtle bone fragments were collected from Stratum Ic. A portion of the SIHP # -8748 A horizon (Stratum II) was observed in the *mauka* portion of T-4 extending inland suggesting the boundary of ground disturbance related to the construction of the seawall. A 1-gallon sediment sample of Stratum II was taken from the west wall from 30 to 45 cmbs and screened in the field yielding charcoal, burnt *kukui*, fish scales, fish bone, *Heterocentrotus mammilatus*, *Turbo sandwicensis*, *Echinodermata mathaei*, and FAR.

The north wall consists of a portion of SIHP # -8747, Feature 5. The observed portion contains concrete wall measuring approximately 3.5 m long, 0.80 m wide, and extends 0.60 m above the ground surface, and extends 0.75 mbs from ground surface to base. A metal fence is present along the top of the concrete wall extending east and west. A basalt cobble and mortar wall stacked one to two rows high overlying abundant loose basalt cobbles and boulders is directly below the concrete wall and measures approximately 3.5 m long and extends from 0.75 to 2.60 mbs into the BOE. The water table was not observed due to the abundance of loose basalt cobbles and boulders causing wall collapse. The lower portion of the seawall likely represents the remnant of the original seawall constructed in the 1920s.

Figure 49. T-4 pre-excavation with SIHP # 50-80-15-8747 Feature 5

Figure 50. T-4 north wall with SIHP # 50-80-15-8747 Feature 5 at BOE

Figure 51. T-4 east wall; view to east

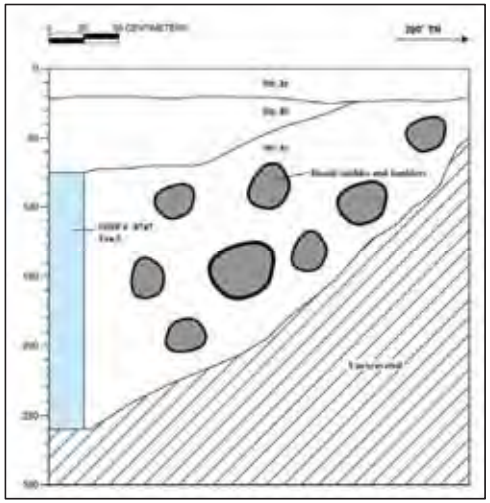

Figure 52. T-4 east sidewall

Figure 53. T-4 west wall; view to southwest

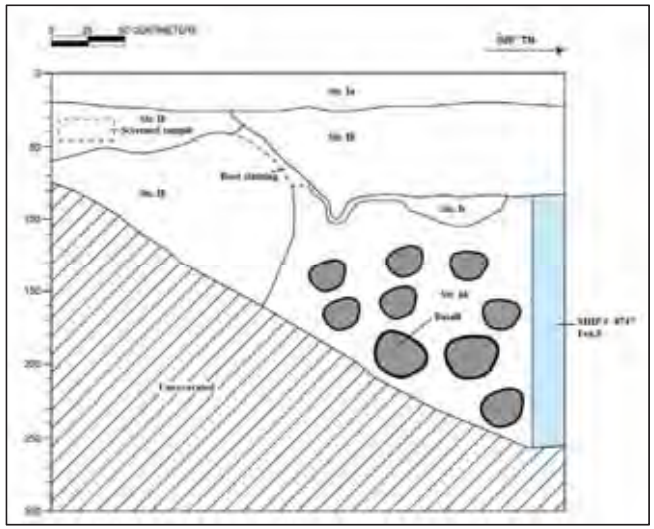

Figure 54. T-4 west wall

Table 6. T-4 stratigraphic description

Stratum	Depth (cmbs)	Description
Ia	0–27	Fill; 10YR 3/4, dark yellowish brown; gravelly sandy clay loam; weak, fine granular structure; moist, friable consistence; no cementation; slightly plastic; terrigenous origin; clear, wavy lower boundary; fine to medium roots common
Ib	20–100	Fill; 10YR 8/2, very pale brown; fine sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; clear, wavy lower boundary; fine roots common
Ic	87–105	Fill; 10YR 3/2, very dark grayish brown; cobbly silty clay loam; weak, medium, blocky structure; moist, friable consistence; no cementation; slightly plastic; terrigenous origin; clear, wavy lower boundary; few fine roots observed
Id	75–250 (BOE)	Fill; 10YR 7/3, very pale brown; stony sandy loam; weak, fine, granular structure; moist, loose consistence; no cementation; non-plastic; mixed origin; lower boundary not visible; few fine roots observed
II SIHP # -8748	20–54	A horizon; 10YR 3/1, very dark gray; sandy loam; weak, fine, granular structure; moist, friable consistence; no cementation; non-plastic; mixed origin; clear, discontinuous lower boundary; few fine roots observed; moderate charcoal flecking
III	40–160	Natural; 10YR 8/2, very pale brown; fine sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; clear, wavy lower boundary; few fine roots observed; Jaucas sand

Section 5 Results of Laboratory Analysis

Materials collected in the field were curated and analyzed by CSH personnel as described in Section 2.2. Laboratory analyses include faunal analysis conducted by Alison Welser, M.A. No traditional or historic artifacts were collected during this AIS. Modern historic artifacts including metal, modern glass, and plastic were observed in upper fill layers, but not collected as they are not older than 50 years old.

5.1 Sediment Sample Content Analysis

One bulk sample was screened in the field during the current AIS, and its contents were collected for lab analysis. The bulk sample was collected from T-4, SIHP # -8748, Stratum II, from 30 to 45 cmbs. The sample was screened through a 1/8 inch screen in the field and contents were sorted at the CSH laboratory located in Waimānalo for cultural material.

Table 7. Summary of field screened sample from T-4, SIHP # 50-80-15-8748

Provenience	Depth (cmbs)	Description
T-4, SIHP # -8748, Str. II	30–45	Charcoal (0.6g), burnt *kukui* (0.3 g), fish scales (<0.1 g), fish bone (<0.1 g), *Heterocentrotus mammilatus* (0.3 g), *Turbo sandwicensis* (<0.1 g), *Echinodermata mathaei* (<0.1 g), and FAR (210.8 g)

5.2 Faunal Analysis

Archaeologists encountered various faunal osseous materials throughout the AIS investigation and collected samples from all four test excavations (Acc. #s 1 through 3) within fill deposits. The identified faunal remains (Table 8) include cow (*Bos taurus*), pig (*Sus scrofa*), bird (Aves), turtle (Cheloniidae), and fish (Osteichthyes), as well as various fragments belonging to medium mammals (inconsistent with human morphology).

The majority of these faunal materials are consistent with food refuse, encountered within stratigraphic layers composed of fill. Most of the cow remains showed evidence of modern butchering methods, identified by the uniform saw mark striations left behind on the cortical bone.

Most of the faunal remains were widely distributed across the central northern portion of the project area within fill material. The fish material was not diagnostic and thus identifiable for specific species. Other marine faunal remains noted include marine turtle (Cheloniidae) none of which displayed evidence of modification.

Table 8. Faunal remains identified during the AIS

Acc. #	Provenience	Species; Mass	Description
1	T-1; Str. Ic, 50 cmbs	Cow (*Bos taurus*); 40.8 g	Rib and humerus fragment
		Bird (Aves); 0.9 g	Long bone fragment
2	T-2; tree stump fill	Pig (*Sus scrofa*); 13.6 g	Subadult humerus portion
3	T-3; Str. Ic spoils pile	Cow (*Bos taurus*); 83.8 g	Saw cut long bone portion
		Small mammal; < 0.1	Unidentifiable fragment
		Fish (Osteichthyes); 0.1 g	Unidentifiable fragments
		Turtle (Cheloniidae); 0.1 g	One small fragment

Section 6 Historic Property Descriptions

Two previously identified historic properties were documented within the current project area during this AIS. They are summarized in Table 9, their distributions are depicted on Figure 55, and each is described below, in accordance with HAR §13-276-5.

Table 9. Historic properties identified within the current project area

SIHP #	Formal Type	Function
50-80-15-8747	Anderson Estate–Pahonu remnants	Habitation
50-80-15-8748	Subsurface cultural deposit	Habitation

6.1 SIHP # 50-80-15-8747

FORMAL TYPE:	Anderson Estate–Pahonu remnants
FUNCTION:	Habitation
NUMBER OF FEATURES:	12
AGE:	Post-Contact; 1930s
TEST EXCAVATIONS:	T-1 through T-4
TAX MAP KEY:	[1] 4-1-002:007
LAND JURISDICTION:	Private
PREVIOUS DOCUMENTATION:	Crowell et al. 2019

SIHP # 50-80-15-8747 is a previously identified historic property consisting of the remnants of the former Anderson Estate–Pahonu. (Figure 55 and Figure 56). SIHP # -8747 was documented during the project area’s parcel AIS, TMK: [1] 4-1-002:007, for the Proposed Waimānalo Paradise Seawall project (Crowell et al. 2019). Construction of the estate was completed in 1933. The estate was the home of an affluent family and played a prominent role in social and fundraising events, as well as its role as a site location for television and film production, primarily the television show *Magnum P.I.* (1980-1989) in which the exterior and grounds of Pahonu were used as the setting of the fictional “Robin’s Nest” estate. Other productions shot at Pahonu included the original *Hawaii Five-O* television series. The estate was mostly demolished in 2018.

The boundaries of the historic property were determined to be the entire former estate property (TMK: [1] 4-1-002:007). A total of 12 extant features of the historic property were identified during the AIS (Figure 57 through Figure 72). These are distributed throughout the project area and include two extant buildings consisting of a gate/guesthouse (Feature 1) and a pool/boathouse and boat ramp (Feature 2), four structures consisting of a perimeter wall on the east, south, west boundaries (Feature 3), landscape terraces/decorative feature on the south perimeter wall (Feature 4), seawall and stairs on the north boundary (Feature 5), tennis court (Feature 6), and five structural remnants consisting of one large concrete pad and foundation of the former main house (Feature 7), three partially demolished sidewalls (Feature 8 through Feature 10), one subsurface wall remnant (Feature 11), and a subsurface privy/cesspool remnant (Feature 12). A full description can be found in Crowell et al. 2019.

Figure 55. Portion of the 1999 Koko Head USGS 7.5-minute topographic quadrangle showing historic properties, SIHP #s 50-80-15-8747 and 50-80-15-8748, identified during the AIS

Figure 56. Aerial photograph of the project area showing SIHP # 50-80-15-8747 and component features (Google Earth 2013)

Figure 57. SIHP # 50-80-15-8747 Feature 1, guesthouse, view to south

Figure 58. SIHP # 50-80-15-8747 Feature 2, boathouse, view to southwest

Figure 59. SIHP # 50-80-15-8747 Feature 2, boat ramp, view to north

Figure 60. SIHP # 50-80-15-8747 Feature 3, south perimeter wall, view to southeast

Figure 61. SIHP # 50-80-15-8747 Feature 3, east perimeter wall, view to east

Figure 62. SIHP # 50-80-15-8747 Feature 4, terraces, view to southwest

Figure 63. SIHP # 50-80-15-8747 Feature 5, concrete stairs, view to southeast

Figure 64. SIHP # 50-80-15-8747 Feature 5, sea wall, view to northeast

Figure 65. SIHP # 50-80-15-8747 Feature 6, tennis court, view to southwest

Figure 66. SIHP # 50-80-15-8747 Feature 7, remnants of former main house, view to north

Figure 67. SIHP # 50-80-15-8747 Feature 7, remnants of former main house, view to northeast

Figure 68. SIHP # 50-80-15-8747 Feature 7, remnants of former main house, view to southwest

Figure 69. SIHP # 50-80-15-8747 Feature 8, southern wing wall, view to northeast

Figure 70. SIHP # 50-80-15-8747 Features 9 and 10, northern wing walls, view to southeast

Figure 71. SIHP # 50-80-15-8747 Feature 11, wall remnants, view to northeast

Figure 72. SIHP # 50-80-15-8748 Feature 12, view to north

6.1.1 Current study

During the current AIS additional components of SIHP # 50-80-15-8747 Feature 5 were documented (see Figure 56). SIHP # -8747 Feature 5 is within the entire northern portion of the project area observed in the north wall of all four test excavations. SIHP # -8747 Feature 5 was observed 0.60 m above the ground surface and extending to 2.95 mbs, overlying natural marine sand. A metal fence is present along the top of the seawall extending east and west.

SIHP # -8747 Feature 5 was identified during the AIS for the Waimānalo Paradise Subdivision project within the entire northern border of TMK: [1] 4-1-002:007 (Crowell et al. 2019). Crowell et al. (2019) describe SIHP # -8747 Feature 5 as follows:

> A sea wall fronts the *makai* (north) side of the property (see Figure 56, Figure 63, and Figure 64). There are cement stairs, approximately 4 m wide (east to west), leading directly into the ocean at the approximate midpoint of the wall. They are surrounded by a locked chain link fence. The sea wall appears to be composed of basalt boulders encased in concrete, with the basalt more visible in the lower portions of the wall, where wave action has eroded the concrete. Maximum height of the sea wall is 3.9 m at the east end. A chain-link fence tops the sea wall from the west end to just east of the stairs. [Crowell et al. 2019:162]

The observed portion of SIHP # 50-80-15-8747 Feature 5 within T-1 contains concrete reinforced CMU blocks stacked three rows high, measuring approximately 2.3 m long, and 0.63 m high. Each CMU block measures approximately 10 by 40 cm. A metal fence is present along the top of the CMU wall extending east and west. A concrete wall is directly below the CMU wall and extends approximately 2.55 m long, 2.25 m wide into the water table and BOE. Scattered basalt cobbles and boulders were observed at the base of the wall likely representing the remnant of the original seawall constructed in the 1920s.

The observed portion of SIHP # 50-80-15-8747 Feature 5 within T-2 contains a concrete wall measuring approximately 4.0 m long, and 1.5 m high extending into the water table and BOE. Scattered basalt cobbles and boulders were observed at the base of the wall likely representing the remnant of the original seawall constructed in the 1920s.

The observed portion of SIHP # 50-80-15-8747 Feature 5 within T-3 contains a concrete wall measuring approximately 4.25 m long, 0.80 m wide, and extends 0.60 m above the ground surface, and extends 1.75 mbs from ground surface to base. A basalt cobble and mortar wall stacked one to two rows high overlying abundant loose basalt cobbles and boulders is directly below the concrete wall and measures approximately 4.25 m long and extends 1.75 to 2.95 mbs into the water table and BOE. The lower portion of the seawall likely represents the remnant of the original seawall constructed in the 1920s.

The observed portion of SIHP # 50-80-15-8747 Feature 5 within T-4 contains a concrete wall measuring approximately 3.5 m long, 0.80 m wide, and extends 0.60 m above the ground surface, and extends 0.75 mbs from ground surface to base. A basalt cobble and mortar wall stacked one to two rows high overlying abundant loose basalt cobbles and boulders is directly below the concrete wall and measures approximately 3.5 m long and extends from 0.75 to 2.60 mbs into the BOE. The lower portion of the seawall likely represents the remnant of the original seawall constructed in the 1920s.

SIHP # 50-80-15-8747 is the remnants of the former Anderson–Pahonu estate, now mostly demolished. SIHP # -8747 most likely would have been assessed as significant under Hawai‘i State historic property significance Criteria b and c had it remained standing; however, most of the property was demolished in April 2018. The consideration of former significance under Criterion b is based on the historic property’s association with the prominent local family (Wall-Glover-Anderson) who owned and built the estate and the consideration of former significance under Criterion c is because it was one of architect Louis Davis’ signature Spanish Colonial Revival properties on O‘ahu. However, as a result of the extensive demolition, the historic property retains only integrity of location because it remains on the same site where it was built. Most of the historic property has been demolished and only a few extant buildings and structures remain; most of the historic property is partial remnants and it does not retain sufficient integrity of design, setting, materials, workmanship, feeling, and association. SIHP # -8747 is not significant under any of the Hawai‘i State historic property criteria because it lacks integrity. No architectural evaluation was undertaken by CSH of the individual buildings and structures that remain, but their import is suggested to be diminished by the loss of the character-defining primary features of the Anderson–Pahonu estate.

6.2 SIHP # 50-80-15-8748

FORMAL TYPE:	Subsurface cultural deposit
FUNCTION:	Habitation–temporary and burial
NUMBER OF FEATURES:	14 (including SIHP # -8749)
AGE:	Pre-Contact; post-Contact (late 1800s, early 1900s)
TEST EXCAVATIONS:	T-3 and T-4
TAX MAP KEY:	[1] 4-1-002:007
LAND JURISDICTION:	Private
PREVIOUS DOCUMENTATION:	Crowell et al. 2019

SIHP # 50-80-15-8748 (see Figure 55 and Figure 73) is a culturally expressed A horizon documented during the project area’s parcel AIS, TMK: [1] 4-1-002:007, for the Proposed Waimānalo Paradise Seawall project (Crowell et al. 2019). During the Crowell et al. (2019) AIS, SIHP # -8748 was identified in nine test excavations (T-1, T-5, T-6, T-8, T-11, T-12, T-13, T-14, and T-15) (Figure 74 through Figure 88) and recorded as 14 associated features (Features 1–12, and SIHP # -8749) as described below and in Table 10:

> These pit features include at least one human burial (designated as SIHP -8749 in consultation with the SHPD History & Cultural Branch) and thus the site has both a habitation and burial function. The A horizon across the *makai* half of the project area, where SIHP # -8748 is located, undulated considerably and was buried under layers of fill that varied in both material and thickness. At the west end of the project area there was a very thin layer of fill, as little as 20-30 cm in some areas, whereas the central portion and east end of the project area had relatively thick fills (60-100+ cm) overlying the A horizon. In the eight test excavations that contained features, the midden material observed and sampled from the A horizon was remarkably consistent and includes marine shells, turtle shell, faunal osseous remains (mainly pig, but also dog), fish bone, sea urchin, FAR, and charcoal. However, the distribution of cultural material was not at all consistent, neither within each test excavation nor across the historic property. Midden materials were relatively light and sparsely distributed throughout the A horizon; in four test excavations (T-6, T-8, T-12, and T-13) these were mixed with late-nineteenth, early twentieth century materials. Both traditional Hawaiian artifacts and historic materials were identified and collected from the A horizon. The boundary of the historic property was interpolated to include all A horizons with definitive cultural material and/or features. The A horizon extended into the sidewalls of the excavation suggesting the historic property extends beyond the exposures. Therefore, the areas between the exposed A horizons designated as SIHP # -8748 were included within the boundaries. It is possible the historic property is not extant between exposures. [Crowell et al. 2019:173]

Figure 73. Aerial photograph of the project area showing SIHP # -8748 and component features (including SIHP # 50-80-15-8749) as well as the excavations that identified A horizons not considered components of SIHP # 50-80-15-8748 (Google Earth 2013)

Table 10. SIHP # 50-80-15-8748 Features Identified during Crowell et al. (2019) (see Figure 73)

Feature #	Max. length/width (cm)	Vertical Extent (cmbs)	Description	Cultural Material
1	105	40–84	Hearth	Midden material including marine shell, pig bone, and charcoal
2	170	80–108	Indeterminate	Minimal charcoal and marine shell, fish bone, sea urchin, and a modified vesicular basalt sinker
3	35	88–93	Indeterminate	Minimal charcoal
4	28	76–90	Indeterminate	Minimal charcoal
5	294	79–108	Indeterminate	Charcoal, fire affected rock, dog and pig bone, marine shell midden, and sea urchin
6	30	110–135	Possible post mold	No cultural material
7	247	60–81	Charcoal lens	Charcoal, ceramic, metal fragments (nail, spike), and osseous faunal material
8	75	128–168	Historic trash pit	Glass bottles and fragments, ceramic fragments, wire nails, a pickaxe head, metal cooking pot, and other indeterminate metal fragments
9	55	130–170	Indeterminate	No cultural material
10	20	135–145	Charcoal lens	Charcoal
11	105	110–155	Charcoal stain	Charcoal and an *‘ulu maika*
12	~105	185–197	Indeterminate	Charcoal, fish bone, and a crab claw
13	15	95–130	Fire pit	Marine shell, pig bone, fire affected rock, charcoal, and two charcoal lenses

Figure 74. SIHP # 50-80-15-8748 Feature 1, hearth, plan view

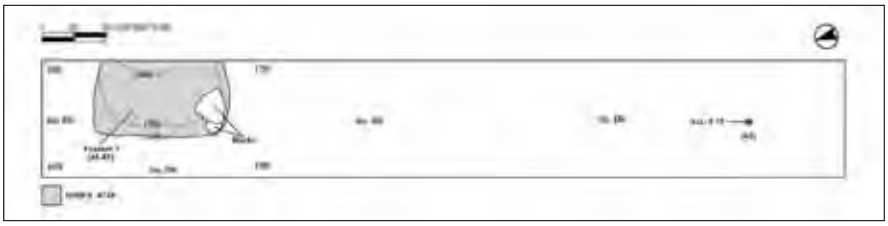

Figure 75. SIHP # 50-80-15-8748 Feature 1 plan view

Figure 76. SIHP # 50-80-15-8748 Features 2, 3, and 4 plan view

Figure 77. SIHP # 50-80-15-8748 Feature 5 plan view

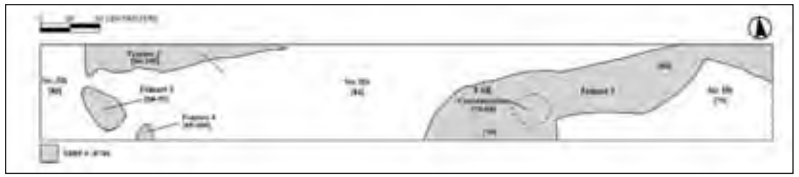

Figure 78. Plan view T-5 showing SIHP # 50-80-15-8748 Features 2 through 5

Figure 79. SIHP # 50-80-15-8748 Feature 5 FAR concentration, plan view

Figure 80. SIHP # 50-80-15-8748 Feature 6 plan view

Figure 81. SIHP # 50-80-15-8748 Feature 6, north end wall profile prior to extension, view to north

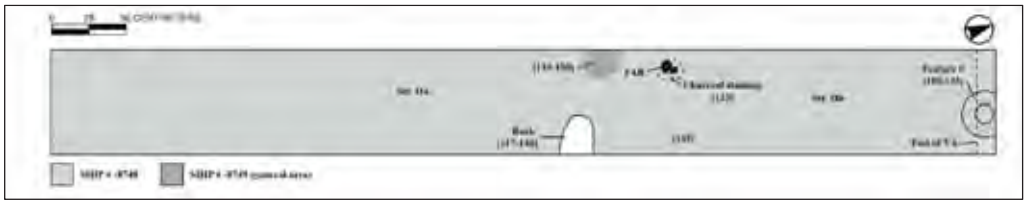

Figure 82. T-6 plan view showing SIHP # 50-80-15-8748 Feature 6

Figure 83. SIHP # 50-80-15-8748 Feature 7, close-up of northwest corner of T-6, view to north

Figure 84. SIHP # 50-80-15-8748 Feature 8 (center), view to north

Figure 85. SIHP # 50-80-15-8748 Feature 9, close-up of east wall of T-13, view to east

Figure 86. SIHP # 50-80-15-8748 Feature 10, close-up of east wall of T-13, view to east

Figure 87. SIHP # 50-80-15-8748 Feature 11, close-up of the east wall of T-13, view to east

Figure 88. SIHP # 50-80-15-8748 Feature 13 plan view

6.2.1 Current Study

During the current AIS, SIHP # 50-80-15-8748 was observed in two (T-3 and T-4) of four test excavations located in the northwestern portion of the project area. SIHP # -8748 was observed in the *mauka* portions of T-3 and T-4 and likely represents the boundary of disturbance between the construction of the seawall and an intact subsurface cultural deposit. The observed portions of SIHP # -8748 were recorded 20–40 cm thick near the ground surface overlying natural Jaucas sand with abundant charcoal flecking. No newly identified features were observed.

A 2.55-m portion of the SIHP # 50-80-15-8748 A horizon (Stratum I) was observed in the *mauka* portion of T-3 extending inland suggesting the boundary of ground disturbance related to the construction of the seawall. SIHP # -8748 is described as a very dark gray sandy loam with a few roots. Minimal charcoal flecking was observed, but no other cultural materials were identified deeming the observed portion of SIHP # -8748 culturally sterile.

A 1.25-m portion of the SIHP # 50-80-15-8748 A horizon (Stratum II) was observed in the *mauka* portion of T-4 extending inland suggesting the boundary of ground disturbance related to the construction of the seawall. SIHP # -8748 is described as a very dark gray sandy loam with a few roots beneath top soil material and overlying Jaucas sand. A 1-gallon sediment sample of Stratum II was taken from the west wall from 30 to 45 cmbs and screened in the field yielding charcoal, fish scales, and FAR.

SIHP # 50-80-15-8748, a pre- to post-Contact subsurface cultural deposit, is assessed as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history). This is based on the historic property’s potential to yield additional information related to traditional Hawaiian and historic land use and activities in the Waimānalo area. The historic property retains sufficient integrity of location, design, and materials but does not retain integrity of setting, workmanship, feeling, and association due to layers of fill over the top of the historic property and the historic and modern disturbance from the construction of the seawall and the Anderson–Pahonu estate.

Section 7 Summary and Interpretation

In a letter dated 29 March 2019 (A. Downer to K. Sokugawa and S. Nishiura) (Log No.:2018.01746, Doc. No.:1903SL06) (see Appendix A) SHPD had two requests: 1) that an AIS for the Waimānalo Paradise Seawall project be conducted (present study) and 2) that the seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian. SHPD architecture branch confirmed (April 17, 2019) that David M. Crowell, M.S., who described and evaluated the significance and integrity of the seawall (State Inventory of Historic Places (SIHP) # 50-80-15-8747 Feature 5) is a qualified Architectural Historian and that nothing further is needed to address architecture branch concerns for this feature.

SHPD architecture branch confirmed (April 17, 2019) that David M. Crowell, M.S. who described and evaluated the significance and integrity of the seawall (State Inventory of Historic Places (SIHP) # 50-80-15-8747 Feature 5) is a qualified Architectural Historian and that nothing further is needed to address architecture branch concerns for this feature. This concludes the second point of the SHPD review of 29 March 2019.

At the request of Waimanalo Paradise LLC, CSH has prepared this AISR for the proposed Waimānalo Paradise Seawall project, located in the northern portion of 41-505 Kalaniana‘ole Highway Waimānalo Ahupua‘a, Ko‘olaupoko District, O‘ahu, TMK: [1] 4-1-002:007. This AISR was a condition

SEI is proposing to conduct subsurface investigations to confirm the wall dimensions (i.e., profiles, widths, and heights) and geotechnical soil parameters to accurately determine the feasibility and cost estimates for conceptual wall repair and replacement options. An AIS is required to obtain permits to repair or modify the seawall. The trenches were located against the *mauka* side of the wall and sloped back into the property. The plan included excavating four trenches approximately 10 to 20 ft long, and 12 ft wide on the taller section of the wall and 5 ft wide at the short section.

Prior to subsurface excavation, CSH submitted a research design to the SHPD which included a 100% pedestrian inspection of the project area, subsurface testing of four test excavations (T-1 through T-4), GPS data collection, photographic documentation, and the recording of stratigraphic profiles and descriptions of the soils and sediments. T-1 through T-4 were excavated with a backhoe at designated locations on the *mauka* side of the seawall. All excavations extended between 160 and 295 cmbs upon reaching the water table except for T-4.

Based on the existing conditions in the project area and the size of the excavator bucket, the dimensions of the test excavations for T-1 and T-4 were smaller than originally planned; dimensions for T-2 and T-3 were larger than originally planned. T-1’s original dimensions were 2.44 m (8 ft) by 1.22 m (4 ft), located 7.6 m (25 ft) east of the boat ramp. The excavated portion of T-1 measured 2.3 m (7.54 ft) by 2.25 m (7.38 ft). T-2’s original dimensions were 3.66 m (12 ft) by 2.44 m (8 ft) located 7.6 m (25 ft) west of concrete steps. The excavated portion of T-2 measured 4.0 m (13.1 ft) by 2.4 m (7.8 ft). T-3’s original dimensions were 3.66 m (12 ft) by 3.66 m (12 ft) located 30.5 m (100 ft) east of concrete steps. The excavated portion of T-3 measured 4.25 m (13.9 ft) by 2.4 m (7.8 ft). T-4’s original dimensions were 3.66 m (12 ft) by 3.66 m (12 ft) located 18.3 m (60 ft) west of southeast property boundary. The excavated portion of T-4 measured 3.5 m (11.4 ft) by 2.4 m (8.5 ft).

Due to the abundance of fine sand fills in conjunction with a large excavator bucket, the trench walls were very unstable. Additionally, the trench walls were deemed too wide to accommodate proper shoring, therefore trench entrance after 4.5 ftbs was not feasible due to safety precautions. In the northeastern portion of the project area within T-3 and T-4, the abundance of loose basalt cobbles and boulders was an added contributing factor to unstable trench walls. The sand and abundant basalt cobbles and boulders created wall collapse on the east and west walls of T-2 through T-4. T-1 and T-2 contained coconut tree root balls which aided in stability for the loose sandy sidewalls.

Two previously identified historic properties were documented including the SIHP # 50-80-15-8747 Feature 5 seawall—observed throughout the northern portion of the project area as this AIS targets the assessment of the seawall for proposed repairs—and portions of a culturally expressed A horizon (SIHP # 50-80-15-8748).

One sample of SIHP # 50-80-15-8748 between 30 and 45 cmbs was screened in the field. The sample was sorted in the CSH laboratory and yielded charcoal, burnt *kukui*, fish scales, fish bone, *Heterocentrotus mammilatus*, *Turbo sandwicensis*, *Echinodermata mathaei*, and FAR.

The majority of the project area contained fill deposits likely from the construction of the sea wall, previously designated as SIHP # 50-80-15-8747 Feature 5 (Crowell et al. 2019). Natural deposits were observed in one test excavation (T-4) in the northeastern portion of the project area consistent with the soil survey data gathered by Foote et al. (1972). In general, stratigraphy in the project area consists of multiple fill layers including imported and locally procured sands overlying natural marine sand near the water table. A buried A horizon that developed on naturally deposited Jaucas sand was observed in the southern (*mauka*) portions of two test excavations (T-3 and T-4).

Across the northern (*makai*) portion of the parcel within the project area, the observed mixed fills below the topsoil consist of multiple layers of fill deposits (clay loam, silty clay loam, and sand fills) that showed evidence of repeated disturbance, redeposition, and grading from the historic and episodic construction of the seawall and the Pahonu Estate (later termed Anderson Estate). The fills overlie naturally deposited marine sand.

Archaeologists encountered various faunal osseous materials throughout the AIS investigation and collected samples from all four test excavations. The identified faunal remains include cow (*Bos taurus*), pig (*Sus scrofa*), bird (Aves), turtle (Cheloniidae), and fish (Osteichthyes), as well as various fragments belonging to medium mammals (inconsistent with human morphology). The majority of these faunal materials are consistent with food refuse, encountered within stratigraphic layers composed of fill.

No traditional or historic artifacts were identified. Modern historic artifacts including metal, modern glass, and plastic were observed in upper fill layers, but not collected as they are not older than 50 years old.

In summary, the Waimānalo Paradise Seawall project AIS documented and exposed the previously identified SIHP # -8747 Feature 5 seawall located in the northern portion of the TMK: [1] 4-1-002:007 parcel. The majority of observed stratigraphy contained a series of imported and locally procured fills likely from the construction of the seawall in the 1920s. The northwestern portion of the project area exposed the original construction of the SIHP # 50-80-15-8747 Feature 5 seawall consisting of a stacked basalt and mortar wall beneath the existing concrete seawall extending to the water table.

Section 8 Significance Assessments

Historic property significance is evaluated and assessed based on the five State of Hawai‘i historic property significance criteria. To be considered significant, a historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and/or association and meet one or more of the following broad cultural/historic significance criteria (in accordance with HAR §13-284-6):

a. Be associated with events that have made an important contribution to the broad patterns of our history;

b. Be associated with the lives of persons important in our past;

c. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;

d. Have yielded, or is likely to yield, information important for research on prehistory or history; or

e. Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

Integrity of a historic property, which is the ability of a property to convey its significance, was assessed based on the guidance provided in National Register Bulletin #15, *How to Apply the National Register Criteria for Evaluation* (NPS 1997) and *Assessing Site Significance: A Guide for Archaeologists and Historians* (Hardesty and Little 2000). The seven aspects of integrity and their descriptions are as follows:

- *Location* is the place where the historic property was constructed or the place where the historic event occurred
- *Design* is the combination of elements that create the form, plan, space, structure, and style of the property
- *Setting* is the physical environment of a historic property
- *Materials* are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property
- *Workmanship* is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory
- *Feeling* is a property’s expression of the aesthetic or historic sense of a particular period of time
- *Association* is the direct link between an important historic event or person and a historic property (NPS 1997; Hardesty and Little 2000)

Two previously identified historic properties were documented within the current project area. Table 11 lists the historic properties along with their significance/eligibility assessments and mitigation commitments.

Table 11. Historic property integrity, significance, and mitigation recommendations

SIHP # 50-80-15-	Test Excavation	Formal Type/ Description	Integrity						Significance	Mitigation commitments
			Location	Design	Setting	Materials	Workmanship	Feeling	Association		
-8747	T-1 through T-4	Anderson Estate–Pahonu remnants	Y	N	N	N	N	N	N	N/A*	N/A
-8748	T-3 and T-4	Subsurface cultural deposit	Y	Y	N	Y	N	N	N	d	Archaeological monitoring

*SIHP # -8747 was determined to have insufficient integrity to be considered a significant historic property

SIHP # 50-80-15-8747 is the remnants of the former Anderson–Pahonu estate, now mostly demolished. While SIHP # -8747 would most certainly have been assessed as significant under Hawai‘i State historic property significance Criteria b and c had it remained standing, most of the property was demolished in April 2018. This is based on the historic property’s association with the prominent local family (Wall-Glover-Anderson) who owned and built the estate and because it was one of architect Louis Davis’ signature Spanish Colonial Revival properties on O‘ahu. The historic property retains only sufficient integrity of location because it remains on the same site where it was built. Most of the historic property has been demolished and only a few extant buildings and structures remain; most of the historic property is partial remnants and it does not retain sufficient integrity of design, setting, materials, workmanship, feeling, and association and this report concurs this recommendation. SIHP # -8747 is not significant under any of the Hawai‘i State historic property criteria because it lacks integrity. SHPD architecture branch confirmed (April 17, 2019) that David M. Crowell, M.S. who described and evaluated the significance and integrity of the seawall (State Inventory of Historic Places (SIHP) # 50-80-15-8747 Feature 5) is a qualified Architectural Historian and that nothing further is needed to address architecture branch concerns for this feature.

SIHP # 50-80-15-8748, a pre- to post-Contact subsurface cultural deposit, is assessed as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history). This is based on the historic property’s potential to yield additional information related to traditional Hawaiian and historic land use and activities in the Waimānalo area. The historic property possesses sufficient integrity of location, design, and materials but does not retain integrity of setting, workmanship, feeling, and association due to layers of fill over the top of the historic property and the historic and modern disturbance from the construction of the seawall and the Anderson–Pahonu Estate.

Section 9 Project Effect and Mitigation Commitments

9.1 Project Effect

The proposed project will affect a significant historic property (SIHP # -8748) within the project area. The project specific effect determination is “effect, with agreed upon mitigation commitments” pursuant to HAR §13-284-7.

The mitigation commitments will mitigate the project’s effect on significant historic properties.

9.2 Mitigation Commitments

Mitigation commitments consist of archaeological monitoring (a form of data recovery) and burial treatment. The agreed upon mitigation commitments outlined below will mitigate the project’s effect on the significant historic properties.

Archaeological monitoring of all ground-disturbing activities is agreed upon for the entire project area. On-site archaeological monitoring will be conducted to identify and document any features associated with SIHP # 50-80-15-8747, including those already identified and those that may be newly identified, additional exposures of SIHP #s 50-80-15-8748, and any newly identified historic properties that may be identified during construction.

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Appendix A SHPD Correspondence

10.1.1 Crowell et al. (2019) acceptance letter

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCE 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
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

February 5, 2019

IN REPLY REFER TO:
Log No. 2018.02376
Doc. No. 1902SL02
Archaeology

Ms. Kathy K. Sokugawa, Acting Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813
c/o wearvalle@honolulu.gov

Ms. Sharon Nishiura, Planner
Subdivision Branch
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, HI 96813
c/o s.nishiura@honolulu.gov

Dear Ms. Sokugawa and Ms. Nisiura

SUBJECT: **Chapter 6E-42 Historic Preservation Review**
Subdivision Application No. 2018/SUB-112
Archaeological Inventory Survey Report for Proposed Waimānalo Paradise Subdivision Project
Waimānalo Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu
TMK: (1) 4-1-002:007

This letter provides the State Historic Preservation Division's (SHPD's) review of the archaeological inventory survey (AIS) conducted in support of the proposed subdivision and planned residential development. In a letter dated July 26, 2018 (Log No. 2018.01746, Doc. No. 1807AD02), our office stated that "SHPD has no comments or objection to the proposed subdivision" but strongly advised the Department of Planning and Permitting (DPP) submit to SHPD for HRS 6E-42 review any permit for development, construction, or ground disturbance on either of the subdivided properties. SHPD further indicated that an AIS was being conducted in support of the proposed development and that the AIS had already encountered a human burial. SHPD has received several drafts of the AIS report (Log No. 2018.1237, 5/24/2018, Log No. 2018.02376, 10/8/2018). SHPD provided a request for revisions via email on January 26, 2019 (Susan Lebo [SHPD] to David Shideler [Cultural Surveys Hawai'i, Inc. (CSH)]) and received the current revised draft via email on February 4, 2019 (David Shideler to Susan Lebo).

The proposed project is the subdivision of the property/project area (3.005 acres) into two separate lots comprised of approximately 1.344 acres and 1.659 acres, respectively; the cancellation of a storm drain easement; and the designation of easements for access and drainage purposes. Planned development of the project site includes retaining the two existing structures located on the western side of the site and constructing new residential buildings and structures with accessory uses such as service areas, lanai, decks, pools, driveway and parking areas, retaining walls, and landscaped areas. The two subdivided lots each will contain two dwellings. The project may involve future approval from State of Hawai'i Department of Transportation for driveway or utility line connection improvements extending into the adjacent Kalaniana'ole Highway right-of-way (ROW).

The AIS report is titled *Archaeological Inventory Survey Report for the Proposed Waimānalo Paradise Subdivision Project, Waimānalo Ahupuaa, Koolaupoko District, Oahu, TMK: [1] 4-1-002:007* (Crowell et al., February 2019). The AIS newly documented three historic properties: structures, structural remnants, and a pit feature associated with the former Anderson Estate-Pahonu (Site 50-80-15-8747); a pre- to late-post-Contact subsurface cultural layer and associated pit features (Site 50-80-15-8748); and human burial (Site 50-80-15-8749).

Ms. Sokugawa and Ms. Nishiura
February 5, 2019
Page 2

The primary residential structures associated with the former Anderson Estate-Pahonu were demolished prior to initiation of the current project. The remaining structures no longer convey the character-defining features of the estate. Due to the loss of integrity other than location for the remaining structures and structural remnants, Site 8747 was assessed as not significant. The remaining 12 features include a gate/guesthouse (Feature 1), a pool/bathhouse and boat ramp (Feature 2), four structures consisting of a perimeter wall on three sides of the property (Feature 4), seawall and stairs on the north boundary (Feature 5), a tennis court (Feature 6), and structural remnants (Features 8 through 11), and a subsurface privy/cesspool remnant (Feature 12).

Site 50-80-15-8748 subsurface cultural layer and associated charcoal stains and pit features (Features 1-13 and Site 8749 burial). The cultural layer included charcoal, vertebrate and invertebrate midden remains, traditional Hawaiian and historic-introduced artifacts. Site 8748 was assessed as retaining sufficient integrity of location, design, and materials, and as significant under HAR §13-284-6, Criterion d. The Site 50-80-15-8749 in situ sub-adult human burial was assessed as having integrity of location, design, materials, and workmanship, and as being significant under HAR §13-284-6, Criteria d and e. The burial context is associated with the Site 8748 cultural layer.

The AIS findings support an HRS 6E project effect determination of "Effect, with agreed upon mitigation commitments" pursuant to HAR §13-284-7. The proposed development will affect one or more significant historic properties (Sites 8748 and 8749), and the effects will potentially be harmful. The agreed upon mitigation commitments are burial treatment for Site 8749 and data recovery in the form of archaeological monitoring.

The revised AIS report reviews well the available environmental, historical, and cultural background information, and previous archaeological investigations. It provides a detailed discussion of the AIS field and laboratory methods and findings, and adequately assesses the integrity and significance of the historic properties identified. The revisions adequately address our earlier correspondence. This AIS report satisfies the requirements of HAR §13-276-5. **It is accepted**. Please send one hard copy of the document, clearly marked FINAL, along with a text-searchable PDF version, to the Kapolei SHPD office, attention SHPD Library.

Pursuant to HAR §13-284-3, Steps (1) through (4) of the historic preservation review process are complete. The SHPD concurs that the survey identification efforts were adequate, agrees with the significance assessments, agrees with the project effect determination, and accepts the agreed upon mitigation in the form of burial treatment for Site 8749 and data recovery in the form of archaeological monitoring for the project.

As stipulated in HAR §13-284-7, when SHPD comments that a project will result in "Effect with agreed upon mitigation commitments," then detailed mitigation plans shall be developed for SHPD review and acceptance, prior to project work commencing. Pursuant to HAR §13-284-3, Step 5, SHPD looks forward to receiving an archaeological monitoring plan (AMP) meeting the requirements of HAR §13-279-4 for review and acceptance. Additionally, per the mitigation commitments, the O'ahu Island Burial Council (OIBC) will receive a Burial Treatment Plan (BTP) for Site 8749 for the Council's determination of preservation in place or relocation.

SHPD shall notify the County when SHPD has reviewed and accepted the archaeological monitoring plan (AMP) and SHPD has verified that the interim protection measures for Site 8749 have been implemented.

Please contact Ms. Regina Hilo, O'ahu Burial Sites Specialist, at Regina.Hilo@hawaii.gov for questions regarding human burials and Dr. Susan Lebo, Archaeology Branch Chief, at Susan.A.Lebo@hawaii.gov for questions regarding archaeological resources or this letter.

Aloha,
Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Judy Grimmins, Waimānalo Paradise, Jgrimmins@vistria.com
Regina Hilo, SHPD Oahu Burial Sites Specialist, Regina.hilo@hawaii.gov
David Shideler, CSH, Dshideler@culturalsurveys.com
Chair Suzanne Case, DLNR, Suzanne.case@hawaii.gov
Deputy Robert Masuda, DLNR, Robert.k.masuda@hawaii.gov

10.1.2 SHPD requesting AIS for current project

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD., STE 555
KAPOLEI, HI 96707

March 29, 2019

IN REPLY REFER TO
Log No. 2018.01746
Doc. No. 1903SL06
Archaeology
Architecture

Ms. Kathy K. Sokugawa, Acting Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813
c/o wearvilho@honolulu.gov

Ms. Sharon Nishiura, Planner Subdivision Branch
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, HI 96813
c/o s.nishiura@honolulu.gov

Dear Ms. Sokugawa and Ms. Nishiura:

SUBJECT: **Chapter 6E-42 Historic Preservation Review –**
Subdivision Application No. 2018/SUB-112
Non-Exclusive Easement S-6083
Waimānalo Paradise Subdivision Project and Waimānalo Paradise Seawall Project
Waimānalo Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu
TMK: (1) 4-1-002:007 and Seaward

This letter provides the State Historic Preservation Division's (SHPD's) review of the proposed Waimānalo Paradise Seawall Project associated with the Waimānalo Paradise Subdivision Project. Based on the documentation provided below, SHPD requests that an archaeological inventory survey (AIS) be conducted and architectural documentation be completed for the seawall. Additionally, SHPD provides guidance regarding the archaeological and architectural documentation.

SHPD has received several submittals related to the proposed subdivision and planned residential development of the subject property (Log No. 2018.01237, received May 24, 2018, and Log No. 2018.01746, received July 23, 2018). SHPD also received a letter dated March 27, 2018, from City and County Department of Planning and Permitting (DPP), requesting the SHPD provide "possible SHPD requirements for this project and review of documents as appropriate to address SHPD historic preservation concerns."

In a letter dated July 26, 2018 (Log No. 2018.01746, Doc. No. 1807AD02), our office stated that "SHPD has no comments or objection to the proposed subdivision" but strongly advised the Department of Planning and Permitting (DPP) submit to SHPD for HRS 6E-42 review any permit for development, construction, or ground disturbance on either of the subdivided properties. SHPD further indicated that an archaeological inventory survey (AIS) was being conducted in support of the proposed development and that the AIS had already encountered a human burial.

The AIS (Crowell et al. 2019) conducted for the subdivision newly documented three historic properties: structures, structural remnants, and a pit feature associated with the former Anderson Estate-Pahonu (Site 50-80-15-8747); a pre- to late-post-Contact subsurface cultural layer and associated pit features (Site 50-80-15-8748, Features 1-13), and a human burial (Site 50-80-15-8749) associated with the cultural layer which yielded charcoal, vertebrate and invertebrate midden remains, traditional Hawaiian and historic-introduced artifacts. Site 50-80-15-8748 was

Ms. Sokugawa and Ms. Nishiura
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assessed as retaining sufficient integrity of location, design, and materials, and as significant under HAR §13-284-6, Criterion d. The Site 50-80-15-8749 in situ sub-adult human burial was assessed as having integrity of location, design, materials, and workmanship, and as being significant under HAR §13-284-6, Criteria d and e. The burial context is associated with the Site 50-80-15-8748 cultural layer.

The Crowell et al. (2019) AIS results supported an HRS 6E project effect determination of "Effect, with agreed upon mitigation commitments" pursuant to HAR §13-284-7. The proposed development will affect one or more significant historic properties (Sites 50-80-15-8748 and 50-80-15-8749), and the effects will potentially be harmful. The agreed upon mitigation commitments are burial treatment for Site 50-80-15-8749 and data recovery in the form of archaeological monitoring.

SHPD accepted the AIS report in a letter dated February 5, 2019 (Log No. 2018.02376, Doc. No. 1902SL02). A Burial Treatment Plan (BTP) was prepared for Site 50-80-15-8749. SHPD indicated in a letter dated February 11, 2019 (Log No. 2018.02538, Doc. No. 1902RKH08), that the plan was in compliance with HAR §13-300-33 and that the plan was placed on the agenda for the OIBC's February 13, 2019 meeting for discussion and for a determination as to Site 8749 of preserve-in-place or relocation. Following the OIBC's determination of preserve-in-place, SHPD accepted the BTP and requested a hard copy of the plan, retitled as *Burial Site Component for SIHP #50-80-15-8749*. Lastly, SHPD accepted the archaeological monitoring plan (Belloumini et al., February 2019) in a letter dated March 30, 2019 (Log No. 2019.00246, Doc. No. 1903SL08).

SHPD requests the following:

(1) An AIS be conducted for the Waimānalo Paradise Seawall Project as specified by Stipulation 28 in the Grant of Non-Exclusive Easement S-6083 between the State of Hawaii, Board of Land and Natural Resources (Grantor) and Waimanalo Paradise LLC (Grantee), dated October 29, 2015. Stipulation 28 states "The Grantee shall conduct an archaeological inventory survey, including assessment of the seawall, prior to the issuance of any future permit involving ground-disturbing activities."

(2) The seawall be documented and evaluated for significance by a qualified historian, architect, or architectural historian who meets the qualifications set forth in HAR §13-281-4 or HAR §13-281-5; the assessment included in the AIS (Crowell et al. 2019) was completed by an archaeologist. The AIS identifies the seawall (Site 50-80-15-8747, Feature 5) as a component of the former Anderson Estate-Pahonu, which was completed in 1933. Most of the estate was demolished in April 2018. Largely due to this demolition, the remaining structural remnants of the estate (including the seawall) were assessed as lacking sufficient integrity of design, setting, materials, workmanship, feeling, and association and, thus, Site 50-80-15-8747 was evaluated as not being a significant historic property.

In support of the AIS, SHPD received a research design which indicates the AIS fieldwork will include a 100% pedestrian inspection of the project area, subsurface testing (Test Excavations 1-4), GPS data collection, photographic documentation, and the recording of stratigraphic profiles and descriptions of the soils and sediments using USDA soil description attributes and terminology and Munsell soil colors. If any cultural deposits or features are identified, they will be documented, mapped, and sampled, as appropriate, and assessed for integrity and significance.

Test Excavations 1-4 will be excavated with a backhoe at designated locations on the makai side of the seawall (Figure 1). The excavations may extend greater than 3 m below surface and shoring will be installed after reaching a depth of 1.5 m below surface. Backhoe excavation will cease at the upper boundary of the A horizon, if present, with subsequent excavation involving shoveling thin layers of material by hand to enhance the potential of identifying and documenting any in situ cultural deposits and features. The seawall will be further documented as a component of Site 50-80-15-8747, Anderson Estate-Pahonu structural remnants. If human remains are encountered, work will immediately cease in the area of the find, the find will be secured, and SHPD will be immediately notified, along with the OIBC moku representative. Treatment will be conducted in accordance with HRS 6E-43.6, HAR §13-300, and SHPD directives.

The SHPD approves the AIS research design. SHPD looks forward to the opportunity to conduct a site visit and, following completion of the AIS field and laboratory work, to receiving an AIS report meeting the requirements of HAR §13-276-5 for review and acceptance.

Ms. Sokugawa and Ms. Nishiura
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The SHPD shall notify the County when the AIS and any requested mitigation plans have been reviewed and accepted, and permit issuance for seawall restoration/stabilization work may continue.

Please contact Ms. Tanya Gumapac-McGuire, Acting Architecture Branch Chief, at (808) 692-8046 or at Tanya.Gumapac-Mcguire@hawaii.gov for any questions regarding architectural resources; Ms. Regina Hilo, Oahu Island Burial Sites Specialist, at (808) 692-8026 or at Regina.Hilo@hawaii.gov for any concerns regarding burial resources; and Dr. Susan A. Lebo, Archaeology Branch Chief, at Susan.A.Lebo@hawaii.gov or at (808) 692-8019 for any questions regarding archaeological resources or this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Chair Suzanne Case, DLNR, suzanne.case@hawaii.gov
Deputy Robert Masuda, DLNR, robert.k.masuda@hawaii.gov
Ian C. Hirokawa, DLNR, ian.c.hirokawa@hawaii.gov
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APPENDIX D

Cultural Impact Assessment

Prepared by Cultural Surveys Hawai‘i

Draft
Cultural Impact Assessment for the Waimānalo Paradise Seawall Project, Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu TMK: [1] 4-1-002:007

Prepared for
HHF Planners

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January 2020

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Management Summary

Reference	Cultural Impact Assessment for the Waimānalo Paradise Seawall Project, Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu Island TMK: [1] 4-1-002:007
Date	December 2019
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: WAIMANALO 37
Agencies	State of Hawaii, Department of Health, Office of Environmental Quality Control
Land Jurisdiction	Waimanalo Paradise, LLC (Private)
Project Proponent	Waimanalo Paradise, LLC
Project Location	The project area is located at the northern boundary of 41-505 Kalanianaʻole Highway in Waimānalo Ahupuaʻa, Koʻolaupoko District, Oʻahu, TMK: [1] 4-1-002:007. The project area is between the coast and Kalanianaʻole Highway and is approximately 160 m southwest of Kaiona Beach Park and 1,100 m northeast of Kaupō Beach Park and the Makai Range pier. The project area is depicted on a portion of the 1999 Koko Head U.S. Geological Survey (USGS) topographic quadrangle map
Project Description	Waimanalo Paradise LLC is the owner of two residential oceanfront parcels in Waimānalo, adjacent to the historical Pāhonu (turtle pond). The property was recently subdivided into two (2) parcels. The two contiguous parcels are boarded by Kalanianaʻole Highway to the south, residential parcels to the east, the Shriners Beach Club to the west, and the Pacific Ocean to the north. The properties are fronted by a seawall constructed of stone and concrete grout that was built between 1911 and 1928. The seawall is 585 feet long with a crest elevation that ranges from +11.0 feet mean sea level (msl) to +5.0 feet (msl). The seawall can be categorized into seven (7) segments (1, 2, 3A, 3B, 3C, 4, and 5) based on observed differences in height and profile along the wall length. A structural analysis of the seawall identified various damages and structural deficiencies including cracks, delamination, spalling, abrasion, undermining, and sinkholes. Portions of the wall have inadequate resistance to design soil and design wave loads. An engineering alternatives analysis was conducted to evaluate options to repair, retrofit, or replace the seawall. The retrofit option was selected as the preferred alternative. The following repairs will be performed for all wall sections: • Repair delamination and spalls from isolated small steel connections and random embedded steel at the front surface of the wall.

	• Patch vertical and diagonal cracks to mitigate potential loss of fines through cracks • Repoint and parge shallow and more deeply abraded and missing front surface mortar. • Fill undermined areas at the toe of the wall with tremie concrete, remove material susceptible to scour at the toe of the wall as is feasible and fill the void with tremie concrete to increase scour resistance at the wall base. • Replace missing, settled and spalled concrete masonry unit (CMU) wall extensions with new reinforced concrete wall extensions The following additional repairs will be performed by individual wall section: • Wall 1 – Delaminated areas of the top cap of the splash guard will be removed and replaced. • Wall 2 – Delaminated areas of the top cap of the splash guard will be removed and replaced. • Wall 3A – Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. • Wall 3B – Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. • Wall 3C – Remove and replace delaminated areas of the top cap of the splash guard. Increase wall crest elevation from +7.0 feet (msl) to +9.0 feet (msl). • Wall 4 – Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl). • Wall 5 – Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. Reconstruct a 15-foot section of wall that was previously removed. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl).

Project Acreage	The parcel size is 3.005 acres. The project area is 0.17 acres.
Document Purpose	The purpose of this cultural impact assessment (CIA) is to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts on cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*), which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and§13-284-6). The document will likely also support the project’s historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS §6E-8 and HAR §13-284.
Results of Community Consultation	CSH attempted to contact 43 Native Hawaiian Organizations (NHOs), agencies, and community members. Of the 7 people that responded, 5 participated in formal interviews, and 2 gave recommendations. Below is a list of individuals who shared their *mana‘o* and *‘ike* about the project area and Waimānalo Ahupua‘a. *CSH is still awaiting approval of consultations.* 1. Waimānalo Limu Hui, Community Group 2. Kamuela Kala‘i, *Kama‘āina* 3. Alu Like, Inc., Waimānalo Kūpuna Program; 4. Harold Ahuna Jr. and Cheryl Ahuna, *Kama‘āina* 5. Kalani Kalima and his father, *Kama‘āina*
Results of Background Research	Background research for this study yielded the following results which are presented in approximate chronological order: 1. Ko‘olaupoko, the traditional name for the *moku* (district) encompassing Waimānalo, translates literally as “the short windward” in contrast to the northern half of this coastline known as Ko‘olauloa, “the long windward.” This may reflect the relative short distance from the sea to the great *pali* (cliff) of the

	Ko‘olau Mountains, which seem to loom directly over much of this district. 2. Towering above the northern *mauka* (inland) section of Waimānalo Ahupua‘a are the peaks of Lanipō and Pu‘u o Kona, while the peaks of Makapu‘u and Pu‘u o Moloka‘i characterize the southern *makai* (seaward) section. 3. The overall wind name for Waimānalo is Limulīpu‘upu‘u. Pāhonu has a specific wind called Alopali (Nakuina 1992). 4. Waimānalo, Puhā, and Muliwai‘ōlena are streams found in this *ahupua‘a* (land division from mountain to sea). A *mauka* spring called Waikupanaha can also be found. Two companion springs, one *mauka*, Kupunakāne, and one *makai* called Kupunawahine, were reported to cry out to each other in soft voices on sunny days (Sterling and Summers 1978:247). 5. Pāhonu Pond was built for an *ali‘i* (chief) who was fond of turtle. Turtle was *kapu* (forbidden) and only the *ali‘i* was allowed to eat the turtle. (Sterling and Summer, 1978:249) 6. At the time that Kamehameha became the sole ruler of O‘ahu, Moloka‘i, Lāna‘i, Hawai‘i, and Maui, he retained the *ahupua‘a* of Waimānalo as his own personal property when he divided the conquered lands of O‘ahu among his warrior chiefs and counselors (‘Ī‘ī 1959:69-70). His sons Liholiho and Kauikeaouli—Kamehameha II and Kamehameha III, respectively—inherited most of Waimānalo Ahupua‘a (Commissioner of Public Lands 1929:28). 7. As a result of the Kuleana Act of 1850, the *ahupua‘a* of Waimānalo was awarded to Victoria Kamāmalu and subject to the *kuleana* (land holding of the tenant) claims of the commoners, and 113 *kuleana* land claims were awarded in Waimānalo (Barrère 1994; Kame‘eleihiwa 1992). There were three Land Commission Awards found around the project area with one being on the project site. 8. John A. Cummins saw the potential of sugar production at Waimānalo and in 1880 he organized the Waimanalo Sugar Company and began construction of a sugar mill. As the plantation grew, former ranch lands were converted to cane fields, new irrigation ditches and railroad lines were constructed, and improvements were made to the mill and Waimānalo Landing. 9. By the 1920s, plantation sugarcane fields stretched across the floor of Waimānalo Valley to the base of the Ko‘olau Range (Bartholomew and Associates 1959:14–15). 10. The intense cultivation of sugar in Waimānalo led to diverse forms of agriculture that continue today. The Waimanalo Sugar Company sold its fee-simple land holdings and the remaining

	years of its lease of government-owned lands to the Waimanalo Agricultural Development Company in 1947. 11. There were piers along the shore line, with Waimānalo Landing being the main pier for shipping sugar cane and other goods in and out of Waimānalo.
Impacts and Recommendations	Based on information gathered from the cultural and historical background and community consultations, CSH identified potential impacts and makes the following recommendations based on approved community consultations. *CSH is still awaiting approval of consultations.* 1. Previous archaeological studies have indicated the presence of three State Inventory of Historic Properties (SIHP # 50-80-15-8747, the former Anderson Estate Pāhonu remnants, SIHP # -8748, pre- to late post-Contact subsurface cultural layer, and SIHP # -8749, a human burial) within the project area. 2. Ms. Kala‘i, though she is not a federally recognized lineal descendant, claimed *iwi kupuna* found on the project area via cultural descendancy. 3. Ms. Kala‘i expressed that there are burial caves towards the mountain side of the project area and that if one set of *iwi kupuna* were found, then others may be around. 4. The Waimānalo Limu Hui expressed some concerns on how the proposed project will impact the mission and goal of their organization. There are two fresh water underground flows that were discovered. Fresh water is needed to create a more conducive environment for sea life to flourish. 5. The Waimānalo Limu Hui utilize the loose *pōhaku* (rock) that are found along the property seawall. 6. The Waimānalo Limu Hui produced the following concerns regarding the proposed project: a. Access to Pāhonu. How/if/will construction of the sea wall will affect access to the pond? b. Use of loose *pōhaku*. Will the developers be utilizing or moving the loose rocks along the sea wall. The Waimānalo Limu Hui use the loose rocks around the area to help rebuild the Pāhonu wall. c. Depth of the wall and how far it will go into the ground. Because there are two underground water flows, the depth of the sea wall may potentially impact the water flow. d. The Waimānalo Limu Hui President (Ikaika Rogerson) and Vice-President (Kaleo Puana) are willing to collaborate with developers on how they (Waimānalo Limu Hui and the developers) can work together. For

	example, if the developer/construction will be needing access to the Pāhonu or utilize any of the loose rocks, will the developers/construction be willing to help dig up other *pōhaku* for the Pāhonu wall? 7. Many *kūpuna* (elders) and community members reflected on family gatherings and quality time being spent at Kaiona and Pāhonu. a. Will the sea wall development project affect access to Pāhonu or Kaiona? 8. Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended. 9. In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance

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Section 1 Introduction

1.1 Project Background

At the request of HHF Planners, on behalf of Waimanalo Paradise LLC, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this cultural impact assessment (CIA) for the Waimānalo Paradise Seawall Repair Project, Waimānalo Ahupua‘a, Ko‘olaupoko District, O‘ahu, TMKs: [1] 4-1-002:021 & 022. The project area is depicted on a portion of the 1999 Koko Head U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

Waimanalo Paradise LLC is the owner of two residential oceanfront parcels in Waimānalo, adjacent to the historical Pāhonu (turtle pond). The property was recently subdivided into two (2) parcels. The two contiguous parcels are boarded by Kalaniana‘ole Highway to the south, residential parcels to the east, the Shriners Beach Club to the west, and the Pacific Ocean to the north. The properties are fronted by a seawall constructed of stone and concrete grout that was built between 1911 and 1928.

The seawall is 585 feet long with a crest elevation that ranges from +11.0 feet mean sea level (msl) to +5.0 feet (msl). The seawall can be categorized into seven (7) segments (1, 2, 3A, 3B, 3C, 4, and 5) based on observed differences in height and profile along the wall length.

Wall	Lot	Length	Crest Elevation
1	021	65	+11.0 feet (msl)
2	021	65	+11.0 feet (msl)
3A	021	95	+11.0 feet (msl)
3B	021	30	+8.0 feet (msl)
3C	021	75	+7.0 feet (msl)
4	022	135	+5.0 feet (msl)
5	022	120	+5.0 feet (msl)

A structural analysis of the seawall identified various damages and structural deficiencies including cracks, delamination, spalling, abrasion, undermining, and sinkholes. Portions of the wall have inadequate resistance to design soil and design wave loads. An engineering alternatives analysis was conducted to evaluate options to repair, retrofit, or replace the seawall. The retrofit option was selected as the preferred alternative.

The following repairs will be performed for all wall sections:

- Repair delamination and spalls from isolated small steel connections and random embedded steel at the front surface of the wall.
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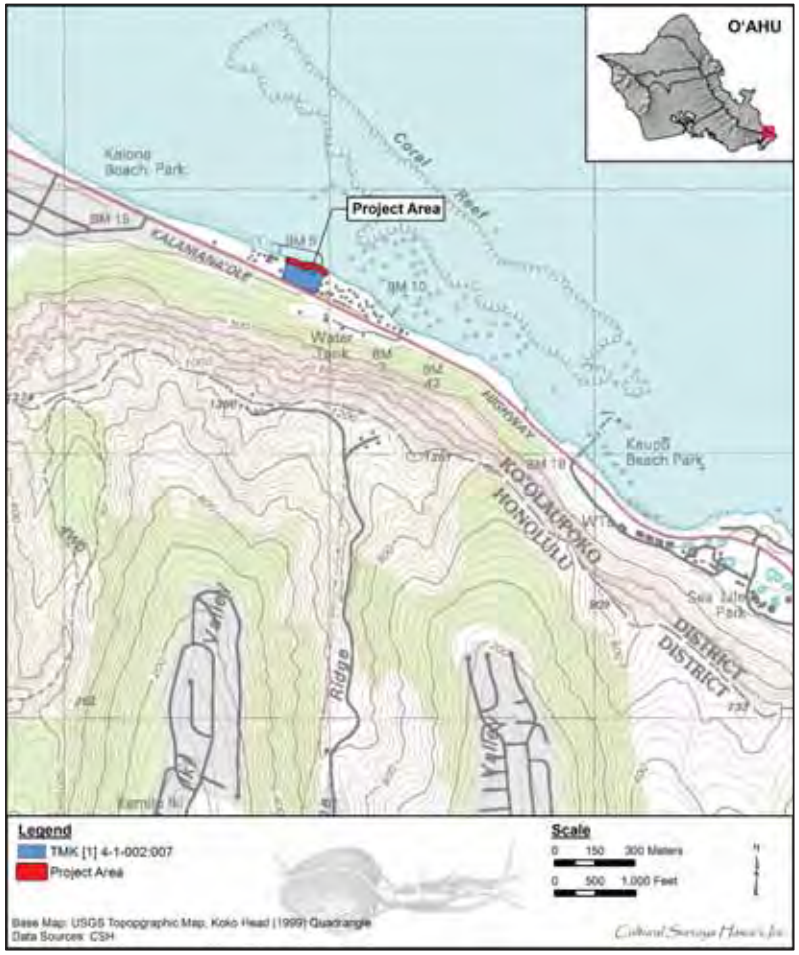

Figure 1. Portion of the 1999 Koko Head USGS 7.5-minute topographic quadrangles showing the project area

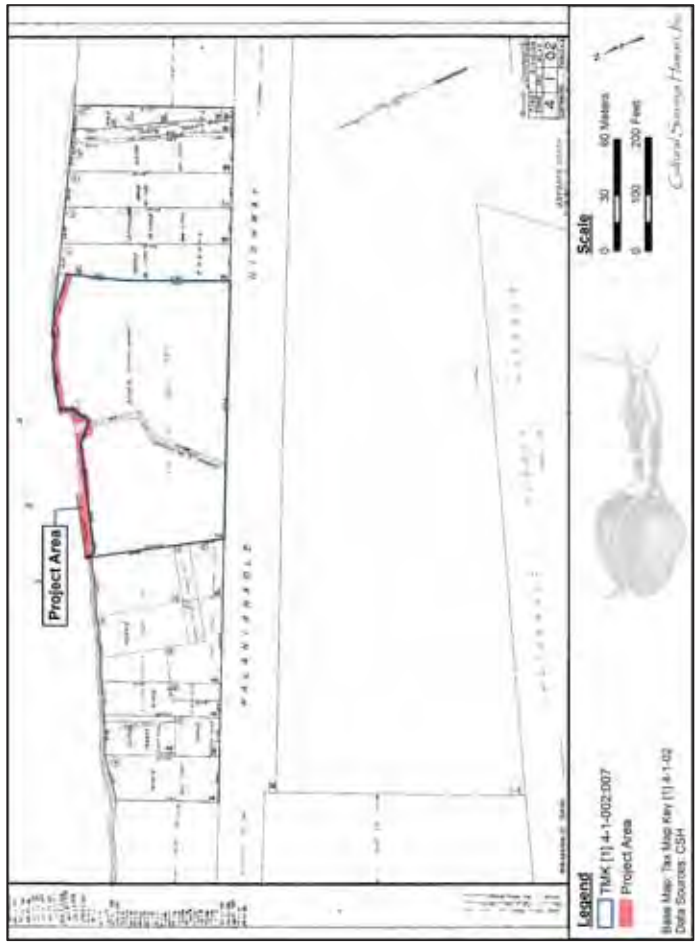

Figure 2. Tax Map Key (TMK) [1] 4-1-02 showing the project area (Hawai‘i TMK Service 2014)

Figure 3. Aerial photograph of the project area (Google Earth 2013)

- Repoint and parge shallow and more deeply abraded and missing front surface mortar.
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1.2 Document Purpose

The purpose of this CIA is to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts on cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*), which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6). The document will likely also support the project’s historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project’s environmental

review and may also serve to support the project’s historic preservation review under HRS §6E-8 and HAR §13-284.

1.3 Scope of Work

The scope of work for this CIA includes the following:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices in or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Natural Environment

Waimānalo is a relatively large *ahupua‘a* that extends from the peaks of the Ko‘olau Mountains to the coast of Waimānalo Bay. The boundaries of Waimānalo runs from Makapu‘u to Wailea. However, past boundaries of Waimānalo once included the area of Maunalua (Hawai‘i Kai).

The project area is relatively level and flat land with a moderate drainage swale bisecting the property. This part of Waimānalo is rather circumscribed with the *pali,* or sea cliffs rising dramatically just 200 m from the shoreline, leaving only thin strip of somewhat flat land between the sea and the mountain. *Makai* of the project area is Pāhonu or turtle pond. This pond was added to the Hawaii Register of Historic Places in 1978.

The in-depth knowledge of *kūpuna* can be seen in their awareness and connection to their surroundings. As explained by Collette Akana and Kiele Gonzalez (2015:XV), “Our kūpuna had an intimate relationship with the elements. They were keen observers of their environment, with all of its life-giving and life-taking forces.” It is the understanding of these elemental forms that allowed Native Hawaiians to bond, connect, and relate to the environment that surrounds them.

1.4.1 *Ka Lepo* (Soil)

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area’s soil consists of Jaucas sand, 0 to 15% slopes (JaC) and (Figure 4).

Soils of the Jaucas Series are described as follows:

> This series consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean. These soils occur on all the islands of this survey area. They developed in wind- and water- deposited sand from coral and seashells. They are nearly level to strongly sloping. Elevations range from sea level to 100 feet […] These soils are used for pasture, sugarcane, truck crops,

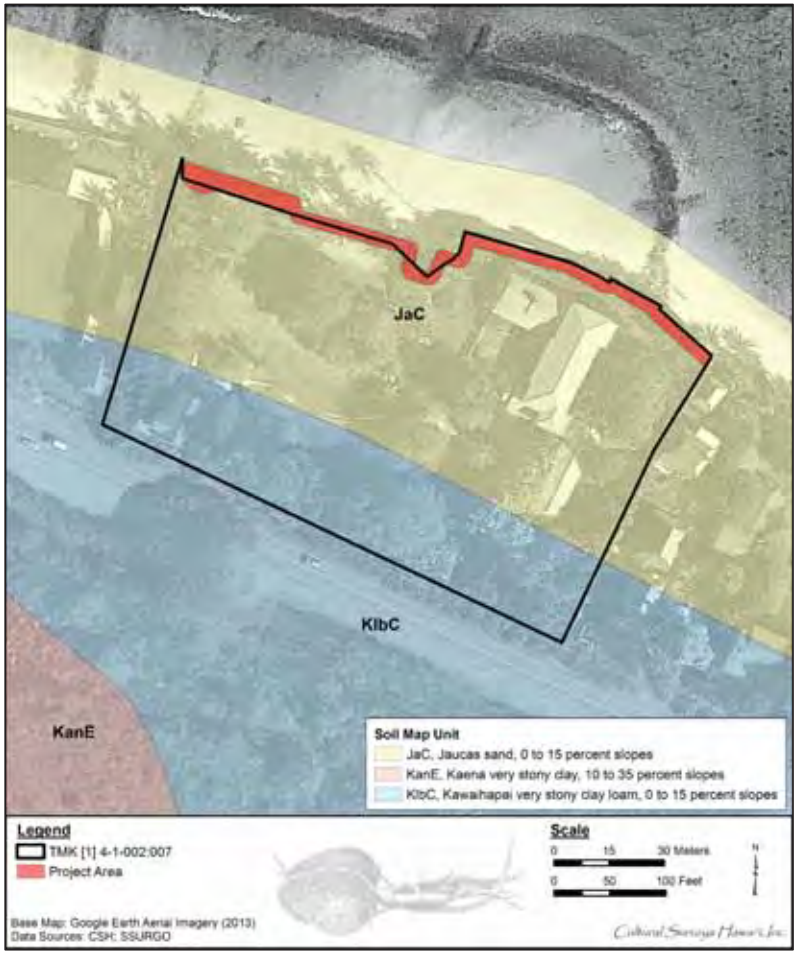

Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972; USDA SSURGO 2001), indicating soil types within and surrounding the project area (base map: Google Earth 2013)

> alfalfa, recreational areas, wildlife habitat, and urban development. The natural vegetation consists of kiawe, koa haole, bristly foxtail, bermudagrass, fingergrass, and Australian saltbush. [Foote et al. 1972:48]

1.4.2 *Ka Makani* (Wind)

Winds were named for various reasons such as describing the type of wind, relating the wind to a story, or even relating the wind to the landscape. David Malo, a Native Hawaiian historian explains some general terms related to wind:

> …There was the *kona*, a wind from the south, of great violence and of wide extent. It affected all sides of an island, east, west, north, and south, and continued for many days…The *kona* wind often brings rain, though sometimes it is rainless….The *hoolua*, a wind that blows from the north, sometimes brings rain and sometimes is rainless…The *hau* is a wind from the mountains, and they are thought to be the cause of it, because this wind invariably blows from the mountains outwards towards the circumference of the island. [Malo 1898:14]

There is an abundance of wind names in stories and chants. The *mo‘olelo* (story) The Wind Gourd of La‘amaomao tells the story of Pāka‘a and his son Kūapāka‘a who are descendants of the wind goddess La‘amaomao. With their possession of a special wind gourd, Pāka‘a and Kūapāka‘a could control and call forth the winds of Hawai‘i. In one part of the *mo‘olelo*, Pāka‘a chants the winds of O‘ahu in the *moku* of Ko‘olaupoko.

He Kiliua ko Waikane,	Kiliua is of Waikāne,
He Mololani ko Kuaahoe,	Mololani is of Kua‘a‘ohe,
He Ulumano ko Kaneohe,	Ulumano is of Kāne‘ohe,
No Kaholoakeahole ka makani,	The wind is for Kaholoakeāhole,
Puahiohio uka o Nuuanu,	Puahiohio is the upland wind of Nu‘uanu
He Malanai ko Kailua,	Malanai is of Kailua,
Pae i Waimanalo ka limu-li-puupuu,	Limu līpu‘upu‘u come ashore at Waimānalo,
He Alopali ko Pahonu,	Alopali is of Pāhonu,
A Makapuu, huli ka makani,	At Makapu‘u, the winds turn,
Huli na Kona, huli na Koolau...	The Kona winds turn, the Ko‘olau winds turn

[Nakuina 1902: 57;1992:51]

In this portion of the chant, there are two winds that pertain to Waimānalo. One line that is mentioned is “*Pae i Waimanalo ka limu-li-puupuu.*” This line of the chant is referencing a wind name of Waimānalo. According to Pukui and Elbert (1986), *limu lipuupuu* (*valonia utricularis)* is

“an edible green seaweed…with turgid joints and short branches” (Pukui and Elbert 1986:208). *Kūpuna* of this area have mentioned that when *limu* (seaweed) is in abundance in Waimānalo waters, the wind will carry its fragrance as it blows throughout Waimānalo.

Pāka‘a further chants, “*He Alopali ko Pahonu*.” or “Alopali is of Pāhonu”. This line is referring the area of Pāhonu in Waimānalo. In this particular area, the wind is called Alopali or front/face of the cliff. This type of wind travels along the cliffs adjacent to Pāhonu and to the sea.

1.4.3 *Ka Ua* (Rain)

Precipitation is a major component of the water cycle accountable for depositing fresh water on local flora. *Kānaka* have recognized two distinct annual seasons. The first, known as *kau* (period of time, especially summer), lasts typically from May to October and is a season marked by a high-sun period corresponding to warmer temperatures and steady trade winds. The second season, *ho‘oilo* (winter, rainy season), continues through the end of the year from November to April and is a much cooler period when trade winds are less frequent, and widespread storms and rainfall become more prevalent (Giambelluca et al. 1986:17). Typically, the maximum rainfall occurs in January and the minimum in June (Giambelluca et al. 1986:17). Handy and Pukui describe this seasonal change as follows:

> The season of storm and rain was termed Ho‘oilo, including roughly the period of November through March. It commenced with ‘Ikuwa (October-November) whose name means “Loud-voice,” when Lono’s thunder resounds over uplands and plain. Now the long drought of summer, when the intense heat of radiation of sun on black lava combined with the steady tradewinds made the *kula kai* [sea] seared and dry as a black tropical desert and the *kula uka* [upland] brown and arid, gives way to moisture-laden southern warm fronts pressing inshore, as tradewinds lapse. November is a noisy month with variable strong winds; and with the winds comes the roaring and pounding surf […] Commencing now, and continuing through the rainy months until March, there was and is little deep-sea fishing, and inshore fishing depended on those occasions when the sea was not too rough. [Handy and Pukui 1977:23]

Rains were named to show their action toward plants or the supposed effects on people or their possessions (Pukui and Elbert 1986:361). Each small geographic area on O‘ahu had a Hawaiian name for its own rains. Akana and Gonzalez (2015) elaborate on naming practice by *kūpuna*:

> They knew that one place could have several different rains, and that each distinguishable from another. They knew when a particular rain would fall, its color, its duration, intensity, the path it would take, the sound it made on trees, the scent it carried, and the effect it had on people [...] Rain names are a treasure of cultural, historical, and environmental information. [Akana and Gonzalez 2015:XV]

In the days of old, a *kilo* or reader of omens knew simply by the shape and color of clouds if whether it promised rain and prosperity or warn of disaster (Pukui 1983:7). There are many rains associated with the *moku* of Ko‘olaupoko, which includes the *ahupua‘a* of Waimānalo. These rains include Hā‘ao, Mololani, and Nāulu.

1.4.3.1 Ka Ua Hā‘ao

The Hā‘ao rain, most popular in the *moku* of Ka‘ū in Hawai‘i, is mentioned in a *mele* (song) that speaks of a woman named Lea. Lea is the name of the goddess of canoe makers and also the name of a fish god who “stands on Wailea (“Water of Lea”) Point between Ka‘ōhao in Kailua and Waimānalo” (Akana and Gonzalez 2015:28).

> E nanā iho ana i Waipu‘ilani
>
> E noho iho ana i Ka‘anaokāhinahina
>
> Eia au i **ka ua a ka Hā‘ao**
>
> I walea ai i ke kui pua ‘āhihi
>
> He lei no Lea, wahine i ke kuahiwi

Translation:

> *Gazing down on Waipu‘ilani*
>
> *Residing there at Ka‘anaokāhinahine*
>
> *Here am I in the Hā‘ao rain*
>
> *Delightedly stringing lehua ‘āhihi blossoms*
>
> *As a lei for Lea, woman of the mountain*
>
> [Akana and Gonzalez 2015:27-28]

1.4.3.2 Ka Ua Mololani

The Mololani rain of Ko‘olaupoko, also the name of a wind and crater in Kāne‘ohe (Akana and Gonzalez 2015:177), is mentioned in the following *mele kanikau* (lament).

> Ku‘u kane mai **ka ua Mololani**
>
> E hehi mai ana iā Olomana me Ahiki

Translation:

> *My dear husband from the Mololani rain*
>
> *Treading on Olomana and Ahiki*
>
> [Akana and Gonzalez 2015: 179]

1.4.3.3 Ka Ua Nāulu

Lastly, the Nāulu rain is mentioned in a *mele inoa* (name chant) for Kaumakaokane. The *mele* mentions Pu‘uokona which is a *pu‘u* (hill) that is accesible through the Kuli‘ou‘ou Ridge, Kuli‘ou‘ou is an *‘ili* (smaller land division within an *ahupua‘a*) in Waimānalo.

> ‘O Pu‘uokona kai kupu kele i ka makani
>
> Kupu kela ke po‘o wai a **ka Nāulu**

Translation:

Pu‘uokona rises high in the wind

The water source of the Nāulu grows profusely

[Akana and Gonzalez 2015:197]

1.5 Built Environment

The project area is in a residential area and is within the northern portion of the site of the former Anderson Estate–Pahonu. Only two buildings and a few structures remain from the estate, which was completed in 1933 and largely demolished in 2018. A mortared basalt rock wall borders the property on the east, south, and west sides, and a mortared basalt seawall with concrete stucco runs along the north edge of the property (current project area). There are several other residences adjacent to and near the project area that also front Kalaniana‘ole Highway. The Pāhonu fishpond wall extends out into the ocean from the northeast project area boundary.

Section 2 Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli*, *mele* (songs), traditional *mo‘olelo* (stories), traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH library. CSH cultural researchers also gather information at other archives and libraries including the Hawai‘i State Archives, the Bishop Museum Archives, the University of Hawai‘i at Mānoa’s Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau.org 2014), the State Historic Preservation Division (SHPD) Library, the State of Hawai‘i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives. Information on Land Commission Awards (LCAs) were accessed via Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2015). Community Consultation

2.1.1 Scoping for Participants

We begin consultation efforts by utilizing our previous contact list to facilitate the interview process. We then review an in-house database of *kūpuna*, *kama‘āina*, cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior’s NHO list), and community groups. We also contact agencies such as SHPD, OHA, and the appropriate Island Burial Council where the proposed project is located for their response on the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts.

2.1.2 “Talk Story” Sessions

Prior to the interview, CSH cultural researchers explain the role of a CIA, how the consent process works, the project purpose, the intent of the study, and how their *‘ike* (knowledge) and *mana‘o* (thought, opinion) will be used in the report. The interviewee is given an Authorization and Release Form to read and sign.

“Talk Story” sessions range from the formal (e.g., sit down and *kūkā* [consultation, discussion] in the participant’s place of choice over set interview questions) to the informal (e.g., hiking to cultural sites near the study area and asking questions based on findings during the field outing). In some cases, interviews are recorded and transcribed.

CSH also conducts group interviews, which range in size. Group interviews usually begin with set, formal questions. As the group interview progresses, questions are based on interviewees’ answers. Group interviews may be transcribed and notes are taken. Recorded interviews assist the

cultural researcher in 1) conveying accurate information for interview summaries, 2) reducing misinterpretation, and 3) adding missing details to *mo‘olelo*.

CSH seeks *kōkua* (assistance) and guidance in identifying past and current traditional cultural practices of the study area. Those aspects include general history of the *ahupua‘a*; past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana*, archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*ka‘ao* and *mo‘olelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area.

2.1.3 Interview Completion

After an interview, CSH cultural researchers may transcribe and/or create an interview summary based on information provided by the interviewee(s). Cultural researchers give a copy of the transcription (if applicable) and interview summary to the interviewee for review and ask that they make any necessary edits. Once the interviewee has made those edits, we incorporate their *‘ike* and *mana‘o* into the report. When the draft report is submitted to the client, cultural researchers then prepare a finalized packet of the participant's transcription, interview summary, and any photos that were taken during the interview. We also include a thank you card and honoraria. This is for the interviewee's records.

It is important that CSH cultural researchers cultivate and maintain community relationships. The CIA report may be completed, but CSH researchers continuously keep in touch with the community and interviewees throughout the year—such as checking in to say hello via email or by phone, volunteering with past interviewees on community service projects, and sending holiday cards to them and their *‘ohana* (family). CSH researchers feel this is an important component to building relationships and being part of an *‘ohana* and community.

"*I ulu no ka lālā i ke kumu*—the branches grow because of the trunk," is an *‘ōlelo no‘eau* (#1261) shared by Mary Kawena Pukui with the simple explanation: "Without our ancestors we would not be here" (Pukui 1983:137). As cultural researchers, we often lose our *kūpuna* but we do not lose their wisdom and words. We routinely check obituaries and gather information from other informants if we have lost our *kūpuna*. CSH makes it a point to reach out to the *‘ohana* of our fallen *kūpuna* and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have for genealogical and historical reference

Section 3 Traditional Accounts

3.1 *Ka‘ao* and *Mo‘olelo*

Hawaiian storytellers of old were greatly honored; they were a major source of entertainment and their stories contained teachings while interweaving elements of Hawaiian lifestyles, genealogy, history, relationships, arts, and the natural environment (Pukui and Green 1995:IX). According to Pukui and Green (1995), storytelling is better heard rather than read for much becomes lost in the transfer from the spoken to the written word and *ka‘ao* are often full of *kaona* or double meanings.

Ka‘ao are defined by Pukui and Elbert (1986:108) as a "legend, tale […], romance, [and/or], fiction." *Ka‘ao* may be thought of as oral literature or legends, often fictional or mythic in origin, and have been "consciously composed to tickle the fancy rather than to inform the mind as to supposed events" (Beckwith 1970:1). Conversely, Pukui and Elbert (1986:254) define *mo‘olelo* as a "story, tale, myth, history, [and/or] tradition." The *mo‘olelo* are generally traditional stories about the gods, historic figures or stories which cover historic events and locate the events with known places. *Mo‘olelo* are often intimately connected to a tangible place or space.

In differentiating *ka‘ao* and *mo‘olelo* it may be useful to think of *ka‘ao* as expressly delving into the *wao akua* (realm of the gods), discussing the exploits of *akua* (gods) in a primordial time. *Mo‘olelo* on the other hand, reference a host of characters from *ali‘i* (royalty), to *akua* and *kupua* (supernatural beings), to finally *maka‘āinana* (commoners), and discuss their varied and complex interactions within the *wao kānaka* (realm of man). Beckwith elaborates, "In reality, the distinction between *ka‘ao* as fiction and *mo‘olelo* as fact cannot be pressed too closely. It is rather in the intention than in the fact" (Beckwith 1970:1). Thus a so-called *mo‘olelo*, which may be enlivened by fantastic adventures of *kupua*, "nevertheless corresponds with the Hawaiian view of the relation between nature and man" (Beckwith 1970:1).

Both *ka‘ao* and *mo‘olelo* provide important insight into a specific geographical area, adding to a rich fabric of traditional knowledge. The preservation and passing on of these stories through oration remains a highly valued tradition. Additionally, oral traditions associated with the study area communicate the intrinsic value and meaning of a place, specifically its meaning to both *kama‘āina* as well as others who also value that place.

The following section presents traditional accounts of ancient Hawaiians living in the vicinity of the project area. Many relate an age of mythical characters whose epic adventures inadvertently lead to the Hawaiian race of *ali‘i* and *maka‘āinana*. The *ka‘ao* in and around the project area shared below are some of the oldest Hawaiian stories that have survived; they still speak to the characteristics and environment of the area and its people.

3.1.1 Hi‘iaka Travels to Waimānalo

The *Epic Tale of Hi‘iakaikapoliopele* is a story that follows a woman, Hi‘iakaikapoliopele (Hi‘iaka) throughout her travels, adventures, and tribulations. Hi‘iaka is the youngest sister of Pele, who lived with Pele and her other sisters on Hawai‘i island. One day, Hi‘iaka was tasked by her sister Pele to fetch Lohi‘auipo from Kaua‘i and bring him to Hawai‘i. Throughout her journey, Hi‘iaka encounters many phenomenal moments with the elements and people of the islands. The

examples below are experiences that Hi‘iaka faced while traveling through Waimānalo and the surrounding area.

In one particular section of the story, Hi‘iaka leaves Moloka‘i by way of canoe with her companions. They land at Makapu‘u where Hi‘iaka questions whether to continue her journey of the island through Ko‘olau or the Kona side of the island. She decided on the Ko‘olau route as she would have the opportunity to catch a glimpse of her Pele family

3.1.1.1 Hi‘iaka and ‘Āpuakeanui

Continuing on their journey, Hi‘iaka and her companions approach Kailua where they come across Muliwai‘ōlena and her daughter, ‘Āpuakeanui. The story is told as follows:

> *A ‘o ko lākou hele maila nō ia a hō‘ea i Kailua; ‘ike maila kekahi wahine iā lākou nei e hele ana, a ‘ike pū maila nō ho‘i ia i ka lamalama aku o ka u‘i o Hi‘iaka, ‘o ia nō ‘oe ka mālamalama pi‘opi‘o o ka lā puka kakahiaka.*
>
> *‘A‘ole na‘e kēia wahine i ‘ike mai ‘o Hi‘iaka kēia e hele aku nei. Iā ia i ‘ike mai ai i kēia nani kamaha‘o e hele aku nei, ‘ōlelo a‘ela ia i kāna kaikamahine, iā ‘Āpuakeanui, ke po‘okela o nā kaikamāhine u‘i o Kailua, “Ē! He keu ho‘i kēia a nā wāhine u‘i e hele mai nei. Ho‘okahi nō na‘e oi o lākou. Ua like loa nō kou u‘i me kou nani me ko kēia wahine.”*
>
> *Ua lohe akula na‘e ‘o Hi‘iaka i kēia mau ‘ōlelo a ua wahine nei i ‘ōlelo a‘e ai i ke kaikamahine, a i ia wā i paeaea aku ai ‘o Hi‘iaka i kēia kau.*
>
> *‘Āpuakea, wahine maika‘i*
>
> *I ho‘ohālikelike ai ‘o kāu maika‘i*
>
> *A he maika‘i*
>
> *A he maika‘i nō.*
>
> *He ‘oia‘i‘o, ‘o kēia kaikamahine, ‘o ‘Āpuakea, he kaikamahine u‘i maoli ‘i‘o nō ia no Kailua. ‘O ia paha ka helu ‘ekahi o ka u‘i ma waena o nā kaikamāhine o ia kalana ‘āina, akā na‘e, ‘a‘ole nō i helu ‘ia kona nani e ka u‘i o Hi‘iaka, a he mea ‘oia‘i‘o kā ka makuahine o ua kaikamahine lā i ‘ōlelo a‘e ai, ua like ka u‘i o Hi‘iaka me ka mālamalama o ka lā i ke kakahiaka.* [Ho‘oulumāhiehie 2006b:145-146]

Translation:

> They went ahead and arrived at Kailua, where a woman saw them traveling, and noticed the glowing beauty of Hi‘iaka, like the arching brilliance of the morning sun.
>
> But this woman did not recognize that this was Hi‘iaka traveling along. As she saw this amazing beauty moving on her way, she said to her daughter, ‘Āpuakeanui, the foremost beauty of Kailua, “Say! These women coming this way are extraordinarily lovely. One of them, though, surpasses the others. Your comeliness and charm are just like that woman’s.”
>
> Hi‘iaka heard this woman’s words to her daughter, and she offered up this chant.

> ‘Āpuakeanui, woman of beauty
>
> Whose loveliness is held up in comparison
>
> And it is excellent
>
> Fine indeed.
>
> Truly, this young woman, ‘Āpuakeanui, was one of Kailua’s finest. She was perhaps the foremost beauty among the girls of that entire district, however, her good looks could not be rated against those of Hi‘iaka, for what the girl’s mother said was true; the beauty of Hi‘iaka was like the brilliance of the morning sun. [Ho‘oulumāhiehie 2006a:137]

A fuller account is given in a rendition of this same story in the Hawaiian language newspaper *Ka Leo o Ka Lāhui.* The story continues on after Hi‘iaka presents her chant:

> […] *lohe mai la no o Hiiakaikapoliopele ia hoohalikelike ana a Apuakea. oli mai ana o Hiiakaikapoliopele, penei:*
>
> *O Apuakea nui wahine maikai,*
>
> *I hoohalikelike ai o Kau maikai*
>
> *A he maikai, a he maikai no - e*
>
> *Kahea aku o Muliwaiolena, e kipa, eia ka ai, eia ka ia ai a maona alaila hele, he oki loa ka hele ma ka alaloa Aka aole nae i maliu aku laua nei, no ka mea, ua loaa ke kee ia laua nei, no ka hoohalikelike ana o Apuakea kana kaikamahine Ia hele ana mai no a laua nei, make mai no o Muliwaiolena ma hope mai.*
>
> *A ua Apuakea, Kualau ma ka moana*
>
> *Kiola ae la po na kuahiwi*
>
> *Nalo ha ka luna o Pakui*
>
> *Lulu au ia makalae*
>
> *Kauna aka li – e*
>
> *O Makalae hoi – e*
>
> *Ia hele ana mai no a laua nei, o ka make akula no ia o Apuakea ma hope, e like me ka makemake o Hiiakaikapoliopele.*

Translation:

> Hi‘iaka overheard the words of the woman comparing her to ‘Āpuakea, Hi‘iakaikapoliopele chanted like this:
>
> O ‘Āpuakea-nui, you beautiful woman
>
> Comparisons have been made of your charms
>
> You are beautiful, beautiful indeed.

Muliwaiolena then called out, come, here is food, here is fish, and when you are full, you can finish you long journey but the travelers did not give any attention as they found fault, in being compard to Apuakea, this little girl. As they [Hi‘iaka and her companions] went off, Muliwaiolena suddenly died.

As they were ready to go, Hi‘iakaikapoliopele turned once again to look back to share her thoughts to Apuakea to die for her harsh words of comparison, the chants went like this:

The ‘Āpuakea rain, shower of the ocean

Thrown atop the mountain

Pāku‘i has vanished

Calm has reached to Makalae

Four shadowy chills

Makalae

As they [Hiiaka and companions] continue on, Apuakea suddenly died, just as Hi‘iakaikapoliopele wanted.

[Ka Leo o Ka Lāhui 15 March 1893.]

Another story of ‘Āpuakea cited by Sterling and Summers (1978) sets its location in the village of Kapu‘a, the same area as the Muliwai‘ōlena Stream:

Eia kekahi mea e akaka ai o MULIWAIOLENA i Waimanalo, I ka wa i pae mai ai o Kauholokahiki, ke kaikuahine o Kanehunamoku, mai Ulukaa mai a pae ma Ulupau i Mokapu, a kukulu ae la i ko-a kaumaha pule nana, a loaa iho la i na wahine hele ako limu o ia kakahai, lawe aikane ia ae la keia, mahalo aku la na wahine kamaaaina i ka wahine maikai o keia wahine malihini, o ka limu palahalaha ke kapa o kona hoe e uhi ana, a wehe ae la kekahi wahine kamaaina i ke kapa a uhi alu la i ka hope o ka malihini, a koi aku la e hoi i ka hale, a hiki i kauhale, kukui aku la ka wahine maika o ia nei a puni kauhale, a nui kamaaina I hele mai e makaikai me na waiwai ke kapa, pau, ilio, puaa , a me ka ai. A i kekahi la ae, hiki mai la ke ‘Lii o Ilauhoe, o ka hoe a Kalaihuiianamoku, o ke keiki muli mai a Kakuihewa, ke‘Lii nui o Oahu ne; a lawe ae la ia Kauholokahiki ka wahine malihi I wahine nana, no kona maikai loa ole ma ka nanaina, ku I ka poho lima ua mea he wahine maikai.

I ka hoao ana o ke Lii Ilauhoe me Kauholokahiki, makemake iho la ke ‘Liikane e hele laua I ka auau wai, olelo aku la ua wahine nei “He kapu au, aole e auau i na wai e ae, e kii ponoi no oe I wai wauau no‘u iloko o Muliwaiolena.” I mai la ke kane, “aia paha ia wai I Tahiti, he loihi loa, aole I ike pono ia kahi o ia wai e makou.” Olelo aku la ka wahine, “Ina he aloha kou iau e ke ‘Lii, nau ponoi no e kii I kuu wai auau a‘u e olelo aku nei ia oe, ei ae no la i Waimanalo, o MULIWAIOLENA, aia la i Kapua, ke kulanakauhale i ke ‘Lii o Lupe, kahi muliwai olenalena o ka wai e lana la no ia, oia no”. Ma ia wa no ua ‘Lii nei i kukini aku ai

me ka ipu wai, he manawa ole ia, ukuhi ana keia ia wai a hoi mai, he wai olenalena io no, akahi no a ikeia kela wai o MULIWAIOLENA, a hiki i keia la.”

Translation:

[Here is a story about MULIWAIOLENA in Waimanalo.] When Kauholokahiki, sister of Kanehunamoku, came ashore from Ulukaa she landed at Ulupau in Mokapu. There she built a shrine on which to lay her offerings, and there she was found by some women who went to gather sea weeds on the shore and made friends with her. The native women admired the beauty of the stranger who was covered only by a skirt of green pahapaha sea weeds. One of the women removed her own body covering and draped it around the hips of the stranger and invited her to her home. Her beauty glowed like a light in the house and many people came with gifts of tapas, skirts, dogs, hogs and poi. One day the chief Ilauhoe took Kauholokahiki, the stranger, to be his wife. She was so beautiful that even the palms of her hands were lovely.

When the chief Ilauhoe married her, the chief wanted her to go bathing with him but she answered, “I am kapu and can bathe in no other water unless you go yourself and fetch my bathing water from Muliwaiolena.” The husband said, “It may be in Kahiki and is too far. We do not know where this water is.” She replied, “If you love me, O Chief, go yourself for my bathing water that I mentioned. It is in Waimanalo, Muliwaiolena, at Kapua, a village belonging to the chief Lupe. It is the stream with the yellow water that runs quietly. That is the one. “The chief ran at once with a container and in no time he dipped up the water and returned. It was indeed yellowish color and that was the first time that it was known that this was Muliwaiolena. It is there to this day. [Uaua 1870, Ke Au Okoa 8 December 1870 cited in Sterling and Summers 1978:248]

3.1.2 Puna‘aikoa‘e (Puna Tropic-Bird Eater)

Puna‘aikoa‘e was a chief of O‘ahu who married a goddess of Moloka‘i, Kalamainu‘u (also called Kihawahine). Though their initial meeting was one full of desire, upon marrying he was kept captive on Moloka‘i and lived in a cave with his wife. The story continues to describe Puna‘aikoa‘e’s successful return to O‘ahu and his reunion with his former wife, Walinu‘u. The reference to Waimānalo is described below:

Once in traveling around with several of his fellows they arrived at Waimanalo, from Waikiki, at a time when the rolling of the surf at a certain surfing place there was very attractive, and so the chief and his companions swam out to share in the sport. [Thrum 1923:185]

3.1.3 Lonoikamakahiki

In a canoe paddling race, Lonoikamakahiki was able to win O‘ahu from the ruling chief Kākuhihewa in part through a stratagem of paddling to Kailua inside of the Waimānalo reef (Fornander 1917:300-302).

After the bets had been made, Lonoikamakahiki said to Kakuhihewa: “You had better go on ahead.” When Lauahuimihaku and his companion heard of

> Lonoikamakahiki ask of Kakuhihewa to proceed on ahead, they urged Kakuhihewa to order the rowers to go ahead. The order was therefore given and they started off.
>
> After Kakuhihewa and his companions had started Lonoikamakahiki ordered his rowers to partake of some food. The men then took some food. By this time Kakuhihewa and his companions were almost out of sight. When they finished their meal Lonoikamakahiki ordered his rowers, Kaiehu and Kapahi, to row away. At the order, the men began to row taking the Koolauloa way and by way of Kona and on in toward Waimanalo. After going for some time Kakuhihewa and his men laid to and awaited for the approach of Lonoikamakahiki, thinking that when they came up nearer they would then make land.
>
> While they were waiting, Lonoikamakahiki, on the other hand, was coming inside of the Waimanalo reef and was almost at Kailua. When Lonoikamakahiki and his men were about to get to the landing place Kakuhihewa for the first time caught sight of them, so he said to Lanahuimihaku and his companion: “I want you two to look and see what double canoe that is that is entering the landing place.” Lanahuimihaku and his companion then looked and said: “That canoe is Lonoikamakahiki’s. We are beaten.” Kakuhihewa then said to Lauahuimihaku and his companion: “Where did they come from?” Lanahuimihaku and his companion replied: “They must have come by way of Koolau, then by way of Waianae and Kona.” Kakuhihewa said: “I thought you said that we were to win this race; but here it is we are beaten. You two are indeed strange. Here the whole of the island is gone, all through your advice, which I have always obeyed. Now my kingdom is lost to Lonoikamakahiki.” [Fornander 1917:300]

3.1.4 Luhia

This *‘ōlelo no‘eau* (proverb) describes the action of a person when he/she gets away from troubles or problems without consequences. This *‘ōlelo no‘eau* is based off a *mo‘olelo* of Luhia, a *mo‘okāne* (male lizard) of Waimānalo. Found in Sites of Oahu, it states:

> Luhia was a mo‘o kane who lived in Waimanalo, not far from a stream. He used to visit around while people were eating and ask what they were having. One day he found some people who had cooked ‘o‘opu in ti leaf bundles. He called to his people, these ‘o‘opu (kino of mo‘o), and they came streaming out of the bundles in the form of live lizards.
>
> Hence the saying, ‘Puka ma ka apua” – “out of the handle of the ti-leaf bundle” when a person gets away scot free from pilikia. [Mary Kawena Pukui in Sterling and Summer, 1978:256]

3.2 *Wahi Pana* (Legendary or Storied Places)

Wahi pana are legendary or storied places of an area. These legendary or storied places may include a variety of natural or human-made structures. Oftentimes dating to the pre-Contact period, most *wahi pan*a are in some way connected to a particular *mo‘olelo*, however, a *wahi pana* may exist without a connection to any particular story. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

> Natural places have mana, and are sacred because of the presence of the gods, the akua, and the ancestral guardian spirits, the ‘aumakua. Human-made structures for the Hawaiian religion and family religious practices are also sacred. These structures and places include temples, and shrines, or heiau, for war, peace, agriculture, fishing, healing, and the like; pu‘uhonua, places of refuge and sanctuaries for healing and rebirth; agricultural sites and sites of food production such as the lo‘i pond fields and terraces slopes, ‘auwai irrigation ditches, and the fishponds; and special function sites such as trails, salt pans, holua slides, quarries, petroglyphs, gaming sites, and canoe landings [McGregor 1996:22].

Through *wahi pana*, people are able to ground themselves in the foundation of land. And, it is through learning *mo‘olelo*, *mele* (song) and *oli* (chant) that the connection to land is strengthened. As Gregory Cajete states:

> It is the landscape that contains the memories, the bones of the ancestors, the earth, air, fire, water, and spirit from which a Native culture has come and tow with it continually returns. It is the land that ultimately defines native peoples. [Cajete 2000: 205]

This section presents the different *wahi pana* of Waimānalo. Where definitions are included for place names, they are taken either from Pukui et al. (1974) or Sterling and Summers (1978). *Wahi Pana* are mapped out below in Figure 5.

3.2.1 Sources of Water

Samuel Manaiakalani Kamakau accounts for the travels of the *akua* (god, diety), Kāne and Kanaloa. They are accredited for the waters which flow from *wailele* (waterfalls), *kahawai* (streams, creeks, rivers, gulches), *‘auwai* (ditches, canals), *pūnāwai* (springs), *paniwai* (dams), *muliwai* (pools), *luawai* (wells), *loko* (lake), and so on. In the hydrologic process this would be considered the “runoff stage.” Kamakau has recorded a short synopsis of Kāne and Kanaloa’s adventures translated by Pukui:

> *O ka moolelo o Kane a me Kanaloa, a o laua paha na kahu akua mua i hiki mai i Hawaii nei, a no ko laua mana, ua kapaia laua he mau akua… na laua ka wai o Kou ma Kaupo…a na laua i wahi i ka pohaku a puai mai ka wai, he wai kahe momona, aia ma Waihee ma Kahakuloa, a ma Lanai, aia ma Waiakane ma Punakou ma Molokai, aia ma Kawaihoa i Oahu. Pela no a puni keia pae aina, aia ma Kapua i Hawaii ke ana i Kahoupo o Kane, a me Keonelauena a Kane.* [Kamakau 1867]
>
> According to the *mo‘olelo* of Kāne and Kanaloa, they were perhaps the first who cared for the gods and brought them here to Hawaii, and because of their *mana* they were called gods… and to them belong the waters of Kou from Kaupō… They broke open rocks so that water would gush forth-sweet flowing water- at Wai-he‘e in Kahakuloa [on Maui], on Lāna‘i, at Waikāne in Punakou on Moloka‘i, there at Kawaihoa in O‘ahu. This they did throughout the islands. At Kapu‘a in [Kona] on Hawai‘i is the cave called Kahoupo-a-Kāne and [in Puna] was Kāne’s stretch of sand called Ke-one-lau‘ena-a-Kāne. [Kamakau 1991:112]

Figure 5. Traditional Hawaiian place names in Waimānalo in relation to the project area

Several streams flow through the *ahupua'a* of Waimānalo. These streams are presented in the following subsections.

3.2.1.1 Waimānalo Stream

Waimānalo Stream contributed water for the mostly spring-fed irrigated lowland agricultural terraces (Handy and Handy 1972:458).

3.2.1.2 Puhā Stream

Puhā Stream (a hollow) is another flow of water where Hawaiians once practiced the sport of *pu'e wai* (agitated water). They dug an opening twenty feet wide through the sand that dammed the stream near the ocean. The water flowed out at a speed of thirty knots to meet the incoming waves, and the players were tossed around in the agitated water (Landgraf 1994:148).

> …This bar or dam had accumulated for some years and much water was backed up. I had seen this opened on a former occasion, and the sports of the natives in swimming the raging waters, and determined to give Her Majesty (Queen Emma) and party a view of this ancient sport…this water surf called Pue-Wai." [John A. Cummins in Sterling and Summer, 1978:245]

3.2.1.3 Muliwai'ōlena

Muliwai'ōlena (turmeric river or yellow river) is a small stream that was the location of a two-day battle between an *ali'i* from Moloka'i named Ka'eo and O'ahu forces during which Ka'eo's foreign gunner, Mare Amara, shot the O'ahu commander (Fornander 1878, Vol. II:262). Like in the stories of Hi'iakaikapoliopele. Muilwai'ōlena is also the mother of 'Āpuakeanui. It has been said that:

> At the little white bridge we gazed into the yellowish green water of Muliwai-olena…The water never has dreid up and is not fed from the mountains expect when it rains heavily. [Charles Alona 1939, Oahu Place Names ms, cited in Sterling and Summers 1978:248].

3.2.1.4 Waikupanaha

Waikupanaha is a *mauka* spring which supported taro, banana trees, and white ginger (Charles Alona cited in Sterling and Summers 1978:246).

3.2.1.5 Kupunakāne and Kupunawahine

Kupunakāne (grandfather), a *mauka* spring**,** and Kupunawahine (grandmother), a *makai* spring, were reported to cry out to each other in soft feminine voices on sunny days.

> There are two peculiar springs at Waimanalo … The one called Kupunakane [Grandfather] is away up in the mountains. The spring called Kupunahine [Grandmother] is a spring way down on the level land. The strange, strange thing about these ponds was that on calm, sunny days they begin to cry out to each other. Their voices were soft and sounded very much like a woman mourning her husband. On days that were overcast with clouds in the sky, then the water of the mountain spring changed. The water of the mountain spring became warm and when you drank the water in the lowland spring it was cool, accord to their legend.

[*Ka Hoku o Hawaii* 1930, cited in Sterling and Summers 1978:247].

3.2.2 *Lihikai* and *Moana* (Seashore, Ocean)

3.2.2.1 Kaupō,

Kaupō or also known as Ko‘onāpou is an area in Waimānalo right across from Mānana. In one *mo‘olelo*, Kaupō was a fishing village. There are (were) many *ko‘a* (fishing shrine) around that area.

Kaupō, which is already set aside as a Territorial park, also contains well preserved platforms, a remnant of the old Royal road, and what are thought to be graves, as well as miles of stone walls of various heights and some clearly marked house sites. (Sterling and Summer, 1978:254-255)

3.2.3 *Loko i‘a* (Fishpond)

There were two types of *loko i‘a,* mentioned by Catherine Summers. One called a *loko kuapā* and the other a *loko ‘umeiki*. The *loko kuapā* was made by building a wall on a reef (Pukui & Elbert 1957: 157). *Kuapā* means wall, specifically for a fishpond which were entirely enclosed. The fishpond walls were usually built using coral or basalt. Within these types of fishponds, *mākāhā* or sluice gate (Pukui & Elbert 1957: 225) were built into the rock walls made of sticks and beams. The purpose of a *mākāhā* was to create a gate like contraption. This would allow gatekeepers to regulate the fishpond. The smaller fish were able to swim through the gate and dwell in the pond, while larger predators were kept outside of the barriers (Summers 1964: 8). These were exclusive to the Hawaiian Islands based on the physical features of its shores. As explained by Summers:

> Loko kuapa were owned by the kings and chiefs, and at their command, were built by the common people. The building of a pond was a communal project of the chiefs who, from their individual land sections (ahupua'a), furnished the large number of people required for this work [Summers 1964: 2, 6].

A *loko ‘umeiki* drastically differs from a *loko kuapā.* The walls of a *loko ‘umeiki* were much lower. Essentially functioning as a fish trap (Summers 1964:12). Emma Beckley mentioned that this type of shore pond was:

> surrounded by a low wall that is submerged at high tide and has openings, walled on each side like lanes, leading in or out of the pond... At night when the tide was coming in, a man or a woman waded out to the end of an inward lane. Here he, or she, sat on a raised stone platform which was situated at the end of one side of a lane. The fisherman held a net which was just wide and deep enough to cover the opening of the lane. The mouth of the net was faced toward the sea. [Beckley 1883:20]

Other ocean related structures include the inland freshwater fishponds *loko i‘a kalo/loko lo‘i kalo* (aquaponic system) or *loko wai*; brackish water shore fishponds are *loko pu‘uone* (as connected to the sea by a stream or ditch) or *hakuone* (inland pond); and small saltwater fishtraps or fish shelters called the *umu* (a heap of rocks placed in the sea for small fish such as the manini to hide in: this was surrounded by a net and the fish were caught) and *pā* (wall) (Project Kāhea Loko 2003:2). They also explain that both fishponds and fish traps were dictated by the topography of a place. There were no definite sizes to these structures as *kūpuna* carefully engineered each

loko (pond) to fit the needs of the *ahupua‘a.* During the time of Captain Cook in 1778, he had recorded 360 fishponds. While in 1990, the DHM Planners, Inc., surveyed 488 remnants of *loko.* The Project Kāhea Loko further describe the importance of these *loko* which “reflect the large human populations and the suitability of the landscape with its streams, estuaries, broad plains, and flat coastal reefs for the construction of fishponds.” (Project Kāhea Loko 2003: 4)

3.2.3.1.1 *Pāhonu*

Pāhonu (Turtle Pond) is a turtle enclosure within Waimānalo that in the past when honu (turtle) were caught, they were placed into Pāhonu and could only be eaten by *ali‘i* (Figure 6). This is a unique aspect to loko i‘a as most loko i‘a was used to harvest fish.

> *‘Elima haneli kapua‘i ka lōkihi a kanalima kapua‘i ka laulā o ka loko Pāhonu. I ke au kahiko, ua kapu nā honu a ‘o nā ali‘i wale nō kai hiki kē ‘ai ‘i‘o honu. No ho‘okahi ali‘i, no kāna ‘ono nui i ka ‘i‘o honu, i ho‘okūkulu i ka pā honu no kāna mau honu. ‘O nā honu āpau i ‘apo ‘ia mai i Waimānalo…ua ho‘okomo ‘ia i loko o ia loko. Ua ho‘oponopono ‘ia ka pā i nā 1960 paha.*
>
> Pāhonu pond measures five hundred feet long and fifty feet wide. Turtles were traditionally kapu, and only the ali‘i could eat them. One ali‘i was so fond of turtle meat, he had a sea wall built for his turtles. Every turtle caught in Waimānalo…was put into this pond. The pond wall was probably restored in the 1960s. [Landgraf, 1994:152]
>
> There was once a chief who was so fond of turtle meat that he ordered a sea wall built to keep captured turtles from escaping. Every turtle caught by a fisherman was put into this enclosure. No one else was allowed to partake of turtle meat under penalty of death. No one dared to eat turtle a long as the old chief lived. [Sterling and Summer, 1978:249]

3.2.4 *Heiau* (pre-Christian place of worship or shrine)

According to Pukui and Elbert (1986), there were several types of *heiau* used for various activities and forms of worship. The *akua* Lono was prayed to for fertility. These types of *heiau* were called *heiau ho‘oulu ‘ai* where the first fruits were offered to insure further growth (1986:212); *māpele* were thatched *heiau* for the worship of Lono and the increase of food (1986:241); *hale o Lono* were the houses where prayers to Lono were offered as for rain and food crops (1986:53); and *kūkoa‘e* temples were used for purification ceremonies for prayers for food (1986:177). Other *heiau* were utilized to promote fertility of the ocean. They were called *heiau ho‘oulu i‘a* or altars where fish were offered to ensure good fishing. These altars were known as *unu* an agricultural *heiau* for fisherman for Lono (1986: 372); or *ko‘a* as shrines to make fish multiply (1986:156); and *kū‘ula heiau* were near the sea for worship of fish gods (1986:187).

Additionally, *heiau* were used as places of healing. For instance, *heiau ho‘ōla* were used for treating sick (1986:64); *lonopūhā* a class of *heiau* probably for healing (1986:212); *loulu* a type of *heiau* said to be built for prevention of epidemics, famine, destruction (1986:212); and *koleamoku* were *heiau* built by a chief after recovering from serious sickness, named in honor of the first man who learned the use of the herbs in healing and who was deified after death (1986:162).

Figure 6. Pāhonu (CSH 2019)

Also, *heiau ho‘oulu ua* and *heiau kalua ua* where offerings were made to ensure rain or for stopping rain (1983:64). Counter to that of healing and fertility was death. These type of *heiau* were *haiau* or used for sacrifice (1986:47); *luakini* where ruling chiefs prayed and human sacrifices were offered (1986:213); *po‘o kanaka heiau* where human sacrifices were offered (1986: 46); and *wai kaua* or war temples (1986:378).

3.2.4.1 Pueo Heiau

Pueo Heiau is one of Waimānalo’s biggest heiau which is located by what is now known as Waikūpanaha Road.“Remains indicate that the heiau was probably 250 feet long and 130 feet wide, of two terraces…” (McAllister in Sterling and Summer, 1978:244)

3.2.4.2 Pōhakunui Heiau

Pōhakunui Heiau is a much smaller than Pueo heiau. Pōhakunui heiau is

> …approximately 50 by 90 feet in extent, built on the crown of a little hill, at the foot of the palis on the mountainward edge of the cane field just back of the Waimānalo hill. (McAllister in Sterling and Summer, 1978:246)

3.2.5 Pōhaku and Islets

Native Hawaiians utilized *pōhaku* based off their type and their need. Some usage include cooking, tool making, boundary markers, as well as shrine. There is a relationship of *pōhaku* to *kānaka*. In the *mele* “Kaulana Nā Pua” it states:

Ua lawa mākou i ka pōhaku,	We are satisfied with the stones
i ka ‘ai kamaha‘o o ka ‘āina.	Astonishing food of the land.

[Huapala, n.d]

These two lines indicate the strength of the relationship that Native Hawaiians had with their land and their environment. In Waimānalo, there are several culturally significant *pōhaku* within the area.

3.2.5.1 Wailea

Wailea (Water of Lea) is a natural shrine on the ridge dividing the *ahupua‘a* of Waimānalo from Kailua. This shrine is devoted to Lea, the goddess of canoe builders (Pukui et al. 1974:225) as well as a fish god that marked the best fishing grounds (Landgraf 1994:138).

3.2.5.2 Kaluahine

Kaluahine is a *ko‘a* (Site 22) that was most likely destroyed (Sterling and Summers 1978:251).

3.2.5.3 Kini

Kini is a *pōhaku* near Pāhonu Pond was connected to a fish god and it was a female *pōhaku* that attracted such fish as *akule* (*Trachurops crumenophthalmus*) and *‘ō‘io* (*Albula vulpes*) (Charles Alona 1939, Oahu Place Names ms, cited in Sterling and Summers 1978:250).

> It is a female rock that attracted the akule and oio fish to this place. It used to be lower down but when the road was put through, it was tossed up there…

> As a boy, I was taught to respect Kini, the fish god. We could play all about it without any harm but were taught not to be disrespectful.
>
> I regret very much that Kini lies up here. She belongs where she can face the sea that she and our ancestors loved. Here she lies on her side facing the hill that meant very little to her. [Charles Alona in Sterling and Summer, 1978:249-250]

3.2.5.4 Pōhaku Pa‘akikī

Pōhaku Pa‘akikī (unyielding stone; Landgraf 1994:156) is located in the water near the ancient village of Ko‘onāpou and is partially raised two feet high on a pile of stones (Landgraf 1994:156).

> Long ago, two sweet potato growers lived over there. (Alona pointed to a place just across the road.) They use to prepare awa daily and brought it to this stone where they would chant and call to Kamohoallii, their shark god, to come for this awa. He used to swim up to the spot , drink his awa and depart.
>
> Near Kalaekiona lived a man who liked to catch sharks and he annoyed Kamohoalii by chopping off the tails and bringing them to this spot to throw into the sea. He did it to annoy the two old sweet potato growers, but succeeded in rousing the ire not of the two old men but of their shark god, Kamohoalii. The shark god caught him at his feet. He kept on chewing all the way up to the buttocks. The smell of the excrement in his bowels nauseated Kamohoalii and so he swore an oath never again to hurt nor allow any other shark to hurt any person, from Makapuu to Kalaeokoia…
>
> From that time on, no shark has ever eaten human flesh at Waimanalo. [Charles Alona in Sterling and Summer, 1978:252]

3.2.5.5 Pōhakuokāne

Pōhakuokāne (stone of Kāne) is a *pōhaku* that is rooted at the edge of a cliff on a ridge of Makapu‘u overlooking the ocean according to Becket and Singer (1999:162)

3.2.5.6 Mānana, Kāohikaipu, Mokuhope, and Kākalaioa

Mānana (known as Rabbit Island), Kāohikaipu (to restrain the container), and Mokuhope (island behind), as well as a rock called Kākalaioa (gray knickers), are located across from Ko‘onāpou. Two *ko‘a* on Mānana were for *āholehole* (*Kuhila sandvicensis*) and *moi* (*Polydactulus sexfilis*) (Landgraf 1994:160).

3.2.6 The *Mauka* Region

The mountainous sections of the *ahupua‘a* of Waimānalo contain *wahi pana* connected to the landscape of the *pali*, with towering *pu‘u* (peaks) over the sheer rock faces overlooking the forested foothills, as well as smaller hills toward the coast. Towering above the northern *mauka* section of Waimānalo Ahupua‘a are the peaks of Lanipō (dense) and Pu‘u o Kona (hill of leeward), while the peaks of Makapu‘u (hill beginning or bulging eye) and Pu‘u o Moloka‘i (hill of Moloka‘i) characterize the southern *makai* section. People from Moloka‘i came to this latter hill near the coast to live until they eventually married into the residents of Waimānalo (Landgraf 1994:150).

3.2.6.1 Pu‘u o Moloka‘i

Pu‘u o Moloka‘i is on the *makai* section of Waimānalo which was once surrounded by sugar cane. (Sterling and Summer, 1978:247)

> Long ago a Molokai man came here and went to live on a low hill not far from Muiliwai-olena. The reason for his coming from Molokai to Oahu was forgotten long ago but others followed and dwelt him. The new comers made their homes on the hill itself and kept very much to themselves. [Charles Alona cited in Sterling and Summers 1978:247].

3.2.6.2 Kaulanaaka‘iole

Kaulanaaka‘iole derives from Pikoiaka‘alalā, a famous archer who saw a rat on the cliffs and shot at it (Landgraf 1994:154).

> *A hiki lakou mawaho ae o ka anemoku o Mokapu, ike hou aku la o Pikoiakalala i ka iole e kau ana i ka pali o Waimanalo, pana aku la keia i ka pua a ku ua ile la a holo aku la kekahi kanaka e nana i ua iole la a ike iho la ia ua ku ka iole e like me ka Pikoiakaalala mea i olelo mua ai ia lakou a o Kaulanaakaiole ka inoa a ia iole, a o ka ino no hoi ia o ia wahi e kapa ia nei a hiki i keia la.* [Ke Au Okoa, 1 Ianuali 1866]

Translation:

> When they (Pikoi and others) passed outside of the islet of Mokapu, Pikoiakaalala again saw a rat on the cliff at Waimanalo. He shot at it and a man ran to see. He saw the rat struck just as Pikoiakaalala told them. The name of the rat was Kaulana-a-ka-iole and the place bears the name to this day. [Sterling and Summer, 1978:256]

3.2.6.3 Kalāwehekohe

Kalāwehekohe (the day of opening the vagina) is a hill in the *mauka* region of the valley. This hill was named after the location where a young chiefess lost her virginity to a young chief (Charles Alona cited in Sterling and Summers 1978:245).

3.2.6.4 Kaupokuhale

Kaupokuhale is a cliff where Hawaiians gathered *‘awa* (kava, *Piper methysticum*) that grew within the area. (Charles Alona cited in Sterling and Summers 1978:245).

3.2.6.5 Haununāniho or Hūnānāniho

Haununāniho (binding the teeth) or Hūnānāniho (hiding of teeth) is a hill that was deemed as a *pu‘uhonua* or a place a refuge. According to McAllister, it’s

> A small hill said to have been famous in olden days as a place of refuge. It is said that as soon as one side knew that there was no hope for victory in the battle being fought, the wisest course was to flee as rapidly as possible to Haununaniho, for all the chiefs recognized the sacredness of this hill and the lives of those who reached this elevation were spared. [McAllister cited in Sterling and Summers 1978:245].

3.2.6.6 Pu‘ukiloi‘a

Pu‘ukiloi‘a (hill [for] observing fish), a hill along the coast, was used to sight schools of fish and signal to the canoes where to surround the fish with a net (Charles Alona cited in Sterling and Summers 1978:244).

3.3 *‘Ōlelo No‘eau* (Proverb)

Hawaiian knowledge was shared by way of oral histories. Indeed, one’s *leo* (voice) is oftentimes presented as *ho‘okupu* (“to cause growth,” a gift given to convey appreciation, to strengthen bonds); the high valuation of the spoken word underscores the importance of the oral tradition (in this case, Hawaiian sayings or expressions), and its ability to impart traditional Hawaiian “aesthetic, historic, and educational values” (Pukui 1983:vii). Thus, in many ways these expressions may be understood as inspiring growth within the reader or between speaker and listener:

> They reveal with each new reading ever deeper layers of meaning, giving understanding not only of Hawai‘i and its people but of all humanity. Since the sayings carry the immediacy of the spoken word, considered to be the highest form of cultural expression in old Hawai‘i, they bring us closer to the everyday thoughts and lives of the Hawaiians who created them. Taken together, the sayings offer a basis for an understanding of the essence and origins of traditional Hawaiian values. The sayings may be categorized, in Western terms, as proverbs, aphorisms, didactic adages, jokes, riddles, epithets, lines from chants, etc., and they present a variety of literary techniques such as metaphor, analogy, allegory, personification, irony, pun, and repetition. It is worth noting, however, that the sayings were spoken, and that their meanings and purposes should not be assessed by the Western concepts of literary types and techniques. [Pukui 1983:vii]

Simply, *‘ōlelo no‘eau* may be understood as proverbs. The Webster dictionary notes it as “a phrase which is often repeated; especially, a sentence which briefly and forcibly expresses some practical truth, or the result of experience and observation.” It is a pithy or short form of folk wisdom. Pukui equates proverbs to a treasury of Hawaiian expressions (Pukui 1995:xii). Oftentimes within these Hawaiian expressions or proverbs are references to places. This section draws from the collection of author and historian Mary Kawena Pukui and her knowledge of Hawaiian proverbs describing *‘āina* (land), chiefs, plants, and places. The following proverbs are from Mary Kawena Pukui’s *‘Ōlelo No‘eau* (Pukui 1983) and describe the broader region of Ko‘olaupoko where information is not available on Waimānalo.

3.3.1 *‘Ōlelo No‘eau* #503

The following *‘ōlelo no‘eau* describes Kamehameha and his entourage on a visit to Kailua, O‘ahu:

> *Hawai‘i palu lā‘ī.*
>
> Ti-leaf lickers of Hawai‘i.
>
> This saying originated after Kamehameha conquered the island of O‘ahu. The people of Kailua, O‘ahu, gave a great feast for him, not expecting him to bring such a crowd of people. The first to arrive ate up the meat, so the second group had to be content with licking and nibbling at the bits of meat that adhered to the ti leaves. In derision, the people of O‘ahu called them “ti-leaf lickers”. [Pukui 1983:60]

3.3.2 *‘Ōlelo No‘eau* #550

The following *‘ōlelo no‘eau* references the typical weather of Ko‘olau.

> *He au Ko‘olau aku ia.*
>
> That is Ko‘olau weather.
>
> The Ko‘olau, or windward, side of an island is often storm-beaten. This expression was first used in a chant to Hi‘iaka by Wahine‘oma‘o, who pleaded with her not to let her wrath lead to destruction. Later used as a warning that headstrong willfulness leads to distress. [Pukui 1983:64]

3.3.3 *‘Ōlelo No‘eau* #1531

The following *‘ōlelo no‘eau* speaks of Makapu‘u:

> *Ka pali nānā uhu ka‘i o Makapu‘u.*
>
> The sea surround Makapu‘u Point, O‘ahu, is the favorite haunt of the *uhu* (parrotfish). [Pukui 1983:165]

3.3.4 *‘Ōlelo No‘eau* #2285

The following *‘ōlelo no‘eau* describes the Ko‘olau mountains:

> *Nā pali hāuliuli o ke Ko‘olau.*
>
> The dark hills of Ko‘olau.
>
> The hills and cliffs of the windward side of O‘ahu are always dark and beautiful with trees and shrubs. [Pukui 1983:249]

3.4 *Oli* (Chants)

Oli, according to Mary Kawena Pukui (Pukui 1995:xvi–xvii) are often grouped according to content. Chants often were imbued with *mana* (divine power); such *mana* was made manifest through the use of themes and *kaona* (hidden meaning). According to Pukui, chants for the gods (*pule*; prayers) came first, and chants for the *ali‘i*, “the descendants of the gods,” came second in significance. Chants “concerning the activities of the earth peopled by common humans,” were last in this hierarchy (Pukui 1995:xvi–xvii). Emerson conversely states:

> In its most familiar form the Hawaiians–many of whom [were lyrical masters]–used the oli not only for the songful expression of joy and affection, but as the vehicle of humorous or sarcastic narrative in the entertainment of their comrades. The dividing line, then, between the oli and those other weightier forms of the mele, the inoa, the kanikau (threnody), the pule, and that unnamed variety of mele in which the poet dealt with historic or mythologic subjects, is to be found almost wholly in the mood of the singer. [Emerson 1965:254]

While *oli* may vary thematically, subject to the perspective of the *ho‘opa‘a* (chanter), it was undoubtedly a valued art form used to preserve oral histories, genealogies, and traditions, to recall

special places and events, and to offer prayers to *akua* and *‘aumākua* (family gods) alike. Perhaps most importantly, as Alameida (1993:26) writes, “chants . . . created a mystic beauty . . . confirming the special feeling for the environment among Hawaiians: their *one hānau* (birthplace), their *kulaiwi* (land of their ancestors).”

3.4.1 Chants from Hi‘iakaikapoliopele

The chants below are from the *mo‘olelo* of Hi‘iakaikapoliopele while she was traveling through Waimānalo and the surrounding areas of Ko‘olaupoko.

3.4.1.1 Hi‘iaka’s Introduction to Mālei

Hi‘iaka and her companions continue through Waimānalo where they come across a woman named Mālei. Hi‘iaka offers this *oli* as an announcement for her arrival:

‘O au, e hele i nā lae ‘ino o Ko‘olau
I nā lae makakai o Moeau
Hele ka wahine ‘au hula‘ana o nā pali
Nānā uhu ka‘i o Makapu‘u
He i‘a ‘ai na Mālei
Na ka wahine e noho ana i ka ulu a ka makani
I Ko‘olau ke ola i ka huaka‘i malihini
Kānaenae i ka lau weuweu
Ola i ka pua mau‘u
E Mālei ē
Aloha mai
E uē kāua.

Translation:

I shall travel the stormy headlands of Ko‘olau
The sea-washed capes of Moeau Point
The woman who traverses the sea cliffs goes on
Guarding the parading uhu of Makapu‘u
A delectable fish for Mālei
The woman who dwells where the wind gusts
Ko‘olau holds salvation for the visitor’s quest
Offering chants of praise to the humble herbage
Surviving on the blossoms of the grasses
O Mālei

Offer your welcome
Let us share our tears
[Ho‘oulumāhiehie 2006b:144-145; Ho‘oulumāhiehie 2006a:136]

3.4.1.2 Hi‘iaka meets Ka‘anahau

Continuing on their journey through Waimānalo, Hi‘iaka and her companions are warmly greeted by a charming man named Ka‘anahau. He prepares for Hi‘iaka, as she requested, her favorite dish, cooked *lū‘au* (taro leaf). He is completely taken away by her beauty and wishes to fulfill her desires. Hi‘iaka presents this *oli* to him:

Kū a‘e Ahiki
Noho iho Pāku‘i
Hiki mai kō aloha
Kono i ku‘u waimaka
E hanini ē
E uē au ē

Translation:

Ahiki rises on high
While Pāku‘i sits below
Your affection comes to me
Inviting my tears to fall
To flow down, ah
To make me weep
[Ho‘oulumāhiehie 2006b:149; Ho‘oulumāhiehie 2006a:141]

3.4.1.3 Hi‘iaka Rests at Mahinui

After leaving the house of Ka‘anahau, Hi‘iaka and her entourage reach Kapoa where they climb up a steep ridge between Kailua and Kāne‘ohe before reaching Mahinui (Ho‘oulumāhiehie 2006a:144). Hi‘iaka turns to face the direction of Ka‘anahau’s place and remembers their night together. She composes these two chants in her loving remembrance of Ka‘anahau:

Ku‘u kāne i ka uhu ka‘i o Makapu‘u
Huki i luna ka lae ‘o Kalā‘au
Aloha ia pali makua ‘ole o laila
I laila au, ‘ike i ka nani a ke aloha
Aloha ku‘u kāne.

Translation:

My dear man of the parading uhu of Makapu‘u
Where Kalā‘au Point draws itself up
Beloved is the orphaned cliff of that place
Fore there I witnessed the wonder of love
Farewell my dear man.
[Ho‘oulumāhiehie 2006b:153; Ho‘oulumāhiehie 2006a:144]

Her second chant composed for Ka‘anahau is as follows:

Ku‘u kāne mai ke kai haku nu‘a o Ko‘olau
Me he kapa kea ala ka ‘ale i ka moana
Ka po‘o o ke kai i nā moku manu
Kū ke ‘ehu a ke kai i ke kula o Ka‘a‘awa
Ku‘u kāne mai ka uka anu o Kailua
‘Elua nō kāua i ka makemake like
Eia nō au ke noho aku nei
Ke kau aku nei ka ‘ōnohi iā ‘oe ā
He kāne ‘oe i ka lau ‘ai a ke aloha
Aloha mai, a hele a‘e au.

Translation:

My beloved man of the heaped breakers of Ko‘olau’s sea
Where the ocean billows are like a white blanket
The sea crashes upon the bird islets
And the spray spreads to the plains at Ka‘a‘awa
My dear man from the cold uplands of Kailua
We two shared our desires
Here am I, dwelling afar
My thoughts fixed upon you, ah
You are a man with an abundant sustenance of love
Bid me farewell, for on I go.
[Ho‘oulumāhiehie 2006b:153; Ho‘oulumāhiehie 2006a:144-145]

3.4.1.4 Hi‘iaka Chants for Ka‘anahau and Pele

Before her chanting and reminiscing seized, she offered one last *oli* but this one spoke of her sister, Pele. This chant references the peak of Mahinui and the shrine of Wailea.

Ku‘u kāne i ke ala pili o Mahinui
Mai ka ua kapua‘i kanaka i Pālāwai
Ka ua o Kailua i kai ē
Makani a‘ela ma ke kōā o Wailea
He le‘ale‘a maka wale nō kā ma waho
Aia nō ka ‘ino i loko
Ua noho lili wale a ‘ena me ku‘u akua
Ua ‘ena ‘oe i kahi hakina ‘ai o ke ala hele
I hele mai ho‘i au i kō makemake
A hili hewa ka‘u mānai i ‘ane‘i
Ua hili au iā ia, a hewa au lā
Hewa i ka ipo ahi pāpala a ke hoa
Ku‘u hoa a‘u i ‘ano‘i aku ai
A he mau makemake lua nō ē

Translation:

My man of the clinging path of Mahinui
From the rain of Pālāwai that follows like footsteps
The rain of Kailua by the sea
Wind blows through the pass of Wailea
There is a display of pleasure outside
The wickedness is within
My beloved goddess harbors jealousy that blazes
You are angry at a scrap found on the road
That I tread so as to fulfill your wishes
My needle has strayed here
I strayed with him, and I erred
Erred with a lover, a friend whose passion flamed
The friend that I came to desire
And the desires were mutual indeed, ah.
[Ho‘oulumāhiehie 2006b:154; Ho‘oulumāhiehie 2006a:145]

3.5 *Mele* (Song)

Mele or songs, like *oli*, can take on various styles, various meanings, and be interconnected all the while being pleasant to the ear. Some styles of *mele* include *mele aloha* (a love song), *mele ho‘ohanohano* (an honorific chant), *mele wahi pana* (song honoring storied places), and etc. The beauty and style of *mele Hawai‘i* or Hawaiian songs is the ability to have layers of multiple facets. For example, many *mele aloha* can include the aspects of *wahi pana*. Therefore, these *mele* can be classified as a *mele aloha* and a *mele wahi pana*.

> Through mele and kaona [hidden meanings], kupa o ka ‘āina [natives of the land] described the beauty of the mountains, the sound of the ocean, and the flow of the sunset…Inspired by their intimate knowledge of the landscape, haku mele (musical composers) masterfully enumerated the ‘ōlelo no‘eau, winds, rainds, and place names associate with the places glorified in their compositions’ [Oliveria 2014:67]

Therefore, just like *mo‘olelo* and *‘ōlelo no‘eau*, *oli* and *mele* are just another style of language in which native peoples are able to establish and strengthen the relationship and connection to one’s land. The more it is spoken, the deeper the connection. As Kahikina de Silva states:

> Therefore, our continued singing of…mele connects us as kama‘āina to the specific nature of our one hānau, keeps the mo‘o sequences strong, and educates new generations of kānaka in the language of cultural continuity. [de Silva 2005:32]

3.5.1 Hi‘iaka Reaches Makapu‘u

This *mele* was composed by Hi‘iaka upon her initial arrival to Waimānalo as she neared the landing of Makapu‘u. From the ocean Hi‘iaka and her companions could see Ulumawao, a hill near Makapu‘u. In the version of Hi‘iakaikapoliopele by Ho‘oulumāhiehie (2006b:145), the hill is called Ulamawao.

Ku‘u kane i ka pali kauhuhu,

Kahi o Makapu‘u (a) huki i ka lani

Ka Lae o Ka-laau, (b)

Kela pali Makua-ole (c) olaila:

Anu ka ua i ka pali o Ulu-ma-wao, (d) e;

E mao wale ana I ka lani kela pali:

Ku‘i, ha-ina i ke kai.

I ke kai ho‘i ke Akua,

A pololi a moe au, e-e!

Ku‘u la pololi, a ola i kou aloha:

Ina‘i pu me ka waimaka, e-e!

A e u‘wè kaua, e-e!

(a) Maka-pu‘u, a headland at the eastern extremity of Oahu, on which a lighthouse of the first class has been established within three years.

(b) Lae o Ka-laau, the south-western cape of Moloka‘i, on which is a lighthouse of the first class.

(c) Makua-ole, literally, fatherless or parentless; seemingly a reference to the lonely inhospitable character of the place.

(d) Ulu-ma-wao, a hill in the same region as Maka-pu‘u point. The name is said to mean a place having a very thin soil.

Translation:

O fellow mine on the stair-like cliff,

Where Maka-pu‘u climbs to the sky,

Companioned by Cape-of-the-woods,

That fatherless bluff over yonder:

Cold cheer rain on Ulu-ma-wao;

That lone steep faints away in the sky,

While Ocean pounds and breaks at its base--

The sea is the home of the gods.

I lay in swoon from hunger

What time I awoke from love’s dream,

Love, salt with brine of our tears.

Let us mingle our tears.

[Emerson 1915:86-87]

3.5.2 Kaulana ‘O Waimānalo

This *mele* was composed by Sam Naeole, who was from Waimānalo. Translator is unknown. (Huapala n.d)

Kaulana ‘o Waimānalo	Famous is Waimānalo
I ka pali o Makapu‘u	For the cliffs of Makapu‘u
I ke kai hāwanwana	For the whispering sea
Ho‘opuni ‘ia e nā pali	Surrounded by cliffs
Hiehie a‘o Mānana	Outstanding is Mānana
Kūkilakila i ke kai	Standing strong in the sea
Pō‘ai mau ‘ia ana	Encircled always
E ke kai hānupanupa	By the surging sea

‘Alawa iho ‘oe	Look quickly
I nā papa he‘enalu	At the surfboards
Hiehie ke kūlana	Outstanding the stance
I ka he‘e mālie mai	As they glide smoothly
U‘ii nā ‘āina home	Beautiful the yards and homes
A‘o Waimānalo	Of Waimānalo
Ua piha me ke aloha	Full of love
A me ka nui hau‘oli	And great happiness
Ha‘ina mai ka puana	The story is told
Kaulana ‘o Waimānalo	Famous is Waimānalo
I ka pali o Makapu‘u	For the cliffs of Makapu‘u
I ke kai hāwanwana	For the whispering sea
[Huapala n.d.].	

3.5.3 Waimānalo ‘Āina Kaulana

This *mele* describes the beauty of Waimānalo and honors Prince Jonah Kūhiō Kalaniana‘ole. He was responsible for spearheading the passage of the Hawaiian Homes Commission Act. In response to the rapidly increasing number of Native Hawaiian deaths, this Act would provide Native Hawaiians with land to live and prosper. A large portion of Waimānalo is designated as *‘āina ho‘opulapula* or homestead land.

Uluwehi Waimānalo ‘āina ho‘opulapula	Lush, Waimānalo, homestead land
Ipu ia like ala ona pua like ‘ole	Its fragrant flowers, incomparable
Ho‘okahi pu‘uwai ho‘okahi mana‘o	One heart, one thought
‘Āina aloha o ka lehulehu	Land of love for the population
Hanohano no ‘oe e Kalaniana‘ole	You are the glory of Kalaniana‘ole
Ho‘oko kauoha ‘oe nā ka hana pololei	You fulfilled the trust with righteous deeds

Ha‘awi ka mae ma‘i e ia Waimānalo	Waimānalo gives health
Kōkua like mai na mana Kahikolu	Help and power comes from Trinity
Kū kilakila nā home u‘i	Standing strong, the stalwart homes
Me ke kokua a nā mana lani	With help from the heavenly powers
Ha‘ina kēia mele no Waimānalo	Tell this song of Waimānalo
‘Āina ho‘opulapula no Kalaniana‘ole	Homestead land of Prince Kalaniana‘ole
[Huapala n.d]	

Section 4 Historical Accounts

4.1 Early Historic Period

Waimānalo was a frequent point of arrival and departure in late pre-Contact and early post-Contact times as in the following account of the loss of O‘ahu sovereignty.

> When King Kahekili of Maui heard of the death of the priest, Kaopulupulu, by Kahahana (a chief appointed by Kahekili to govern Oahu), he sent some of his men thither by canoe, who landed at Waimānalo, Ko‘olau, where as spies, they learned from the people respecting Kaopulupulu and his death, with that of his son; therefore they returned and told the King the truth of these reports, at which the affection of Kahekili welled up for the dead priest, and he condemned the King he had established. Coming with an army from Maui, he landed at Waikīkī without meeting Kahahana, and took back the government of O‘ahu under his own kingship. The chiefs and people of O‘ahu all joined under Kahekili for Kahahana had been a chief of wrong-doing. . . [Thrum 1907:212–213]

In 1875, Native Hawaiian historian Samuel Kamakau related the following: “The ahupua‘a of Waimanalo, including the fish pond at Maunalua and the traveling uhu of Makapu‘u belonged to Maui-mua (First Maui)” (*Kuokoa* 27 November 1875 in Sterling and Summers 1978:244).

4.1.1 Kamehameha’s Conquest of O‘ahu

During Kamehameha’s conquest of O‘ahu, part of his fleet landed near Makapu‘u and then joined with Kamehameha’s other forces, finally conquering O‘ahu. Prior to the invasion, Kamehameha sent a messenger to Kahekili:

> Ki-kane, Kamehameha’s messenger to Ka-hekili, threw down two *maika* stones, a black one and a white. Ka-hekili said when he saw these stone, ‘This stone (the white) brings life through farming and fishing, rearing men, and providing them with food; this other stone (the black) brings war. Let the reader ponder the meaning of this answer.’ Kahekili asked, Is Kamehameha coming to O‘ahu to fight? ‘Yes’ answered Ki-Kane. ‘What harbor will he choose?’ ‘It was Kiko‘o’s counsel to make Waimanalo the harbor and battle site.’ ‘It is too low there to cast sling stones to reach the heights. It is good only for food and fish. If stones are thrown from above nothing can save the battlefield [. . .] [Kamakau 1992:150]

The final stage of Kamehameha’s campaign took place at the Nu‘uanu Pali during the battle of Kaleleka‘anae, which means “leaping *‘anae* (mullet)” and refers to the way many O‘ahu armies and some of their families chose to or were forced to jump to their deaths from the *nuku* (mountain pass) of the steep *pali* rather than accept defeat from the warriors of Kamehameha (James 2004). After this battle at the Nu‘uanu Pali, Kamehameha became the sole ruler of O‘ahu, Moloka‘i, Lāna‘i, Hawai‘i, and Maui (Kamakau 1992:172–173). He retained the *ahupua‘a* of Waimānalo as his own personal property when he divided the conquered lands of O‘ahu to his warrior chiefs and counselors (‘Ī‘ī 1959:69–70). His sons Liholiho and Kauikeaouli—Kamehameha II and Kamehameha III, respectively—inherited most of Waimānalo Ahupua‘a (Commissioner of Public Lands 1929:28). Kauikeaouli, “inherited” Waimānalo “to be the private lands of his Majesty

Kamehameha III, to have and to hold to 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” (Commissioner of Public Lands 1929:28).

4.2 The Māhele and the Kuleana Act

The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—that introduced private property into Hawaiian society. In 1848, the Crown and the *ali‘i* received their land titles. *Kuleana* awards to commoners for individual parcels within the *ahupua‘a* were subsequently granted in 1850. The Crown Lands were considered the private lands of the monarch, and many lands were sold or mortgaged during the reigns of Kamehameha III and Kamehameha IV to settle debts to foreigners. To end this practice, the Crown Lands were made inalienable in 1865, and their dispensation was regulated by a Board of Commissioners of Crown Lands, which effectively put them under the administrative control of foreign-born residents (Kame‘eleihiwa 1992:310). Before the passage of the Act of 3 January 3, 1865, which made Crown Lands inalienable, Kamehameha III and his successors did as they pleased with the Crown Lands, selling, leasing, and mortgaging them at will (Chinen 1958:27).

In 1845, the Board of Commissioners to Quiet Land Titles, also called the Land Commission, was established “for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property” (Chinen 1958:8). This led to the Māhele, the division of lands among the king of Hawai‘i, the *ali‘i*, and the common people, which introduced the concept of private property into Hawaiian society. In 1848, Kamehameha III divided the land into four categories: Crown Lands reserved for himself and the royal house; Government Lands set aside to generate revenue for the government; Konohiki Lands claimed by *ali‘i* and their *konohiki* (supervisors); and *kuleana,* habitation and agricultural plots claimed by the common people (Chinen 1958:8–15). Ralph Kuykendall notes the concept of private land ownership was a radical departure from the local traditional land tenure system: “The old feudal arrangement of joint and undivided ownership had given place to the system of individual allodial tenures, and aliens had been admitted to the enjoyment of the same rights as Hawaiian subjects in the ownership and use of land” (Kuykendall 1967:298).

In 1850, the Privy Council passed resolutions that would affirm the rights of the commoners or native tenants. To apply for fee-simple title to their lands, native tenants were required to file their claim with the Land Commission within the specified time period of February 1846 and 14 February 1848. The Kuleana Act of 1850 confirmed and protected the rights of native tenants. Under this act, the claimant was required to have two witnesses who could testify they knew the claimant and the boundaries of the land, knew the claimant had lived on the land for a minimum of two years, and knew that no one had challenged the claim. The land also had to be surveyed.

Not everyone who was eligible to apply for *kuleana* lands did so and, likewise, not all claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. Out of the potential 2,500,000 acres of Crown and Government Lands, less than 30,000 acres of land were awarded to the Native-Hawaiian tenants (Chinen 1958:31).

The *ahupua‘a* of Waimānalo was awarded to Victoria Kamāmalu, subject to the *kuleana* claims of the commoners. She received the third largest share of lands among the *ali‘i nui* (high chiefs)

of the Kingdom of Hawai‘i, including 47 *ahupua‘a*-sized parcels in addition to Waimānalo. Approximately 113 *kuleana* land claims were awarded in Waimānalo. Nearly all of these Land Commission Awards (LCA) were located along Waimānalo Stream, or its upper tributaries, in the northwestern portion of the *ahupua‘a* (Figure 7). While the Hawaiian population of Waimānalo was likely much larger and more dispersed in pre-Contact times, it nevertheless appears that the traditional Hawaiian population of Waimānalo was always clustered along Waimānalo Stream and its upper tributaries, focused on wetland taro and sweet potato cultivation.

Land Commission Award data indicated it was common for *kuleana* awards to have a parcel along the coast as well as a parcel in the upland area. The following account describes the traditional utilization of both land and sea:

> A spring called Wai-kupanaha was pointed out to us, (in valley mauka of Mill), surrounded by tall taro plants, banana trees and fragrant white gingers. According to Mr. Alona, the Wai-kupanaha on the west side of Mr. Castle's place was a lele, or a part of this kuleana, so both were given the same name. The upland piece was for taro growing and the piece near the sea was for fishing. The former owners of Wai-kupanaha went inland to raise taro and then to their land by the shore to fish. Both places had water but today only the upland Wai-kupanaha has water. [Alona 1939 in Sterling and Summers 1978:246]

Additional *kuleana*, primarily consisting of house lots, were sparsely scattered along the coastal areas of central and southeastern Waimānalo. These *kuleana* awards were likely used to focus on the procurement of marine resources. One *kuleana*, LCA 234-I, awarded to Paahonua/Pahanua, was in the northeast corner of the project area (Figure 8 and Figure 9). There were also two other LCA parcels nearby: LCA 234-Y which was 209 m, or 686 ft, to the northwest and LCA 3265 which was 323 m, or 1,060 ft, to the southeast (see Figure 8 and Figure 9).

According to the Waihona ‘Aina database (2019), in the testimony for LCA 234-I, Paahonua/Pahanua claimed four *lo‘i* (taro patches) in the *‘ili* of Waikupanaha (‘Āpana 1) and one *kahua hale* (house lot) in the *‘ili* of Pāhonu (‘Āpana 2); which he claimed as "his land from Lono in the time of Kinau." According to the testimony, the house lot was bounded on the *mauka* side by a *pali,* the house of Piko on the Kāne‘ohe side, uplands on the *makai* side, and a plat of *lauhala (Pandanus odoratissimus)* on the Kona Makapu‘u side. LCA 234-I was awarded in 1850 (Ava Konohiki 2015).

In the testimony for the nearby LCA 234-Y, Kalawaia claimed five *lo‘i* in the *‘ili* of Iole (‘Āpana [lot] 1) and one *kahua hale* in the *‘ili* of Pāhonu (‘Āpana 2) and he also claimed that "he had his land from Kinau and has it in peace to that time" (Waihona ‘Aina 2019). According to the testimony, the house was bounded by the house lot of Kalawaia on the *mauka* side, the sea and beach on the Kāne‘ohe side, the house lot of Mahoe on the *makai* side, and a *pali* on road on the Kona Makapu‘u side. LCA 234-Y was awarded in 1850 (Ava Konohiki 2015).

In the testimony for the nearby LCA 3265, Laukeaiku claimed two *lo‘i* in the *‘ili* of Waikuphanaha (‘Āpana 1) and one *kahua hale* in the *‘ili* of Pāhonu (‘Āpana 2) and he also claimed that "had his land from Kaalehu in the time of Kinau and has had [it] in peace to the present time" (Waihona ‘Aina 2019). According to the testimony, the house was bounded by the uplands on the *mauka* side, the uplands on the Ko‘olauloa side, the house lot of Ihu on the *makai* side, and uplands on the Kona side. LCA 3265 was awarded in 1850 (Ava Konohiki 2015).

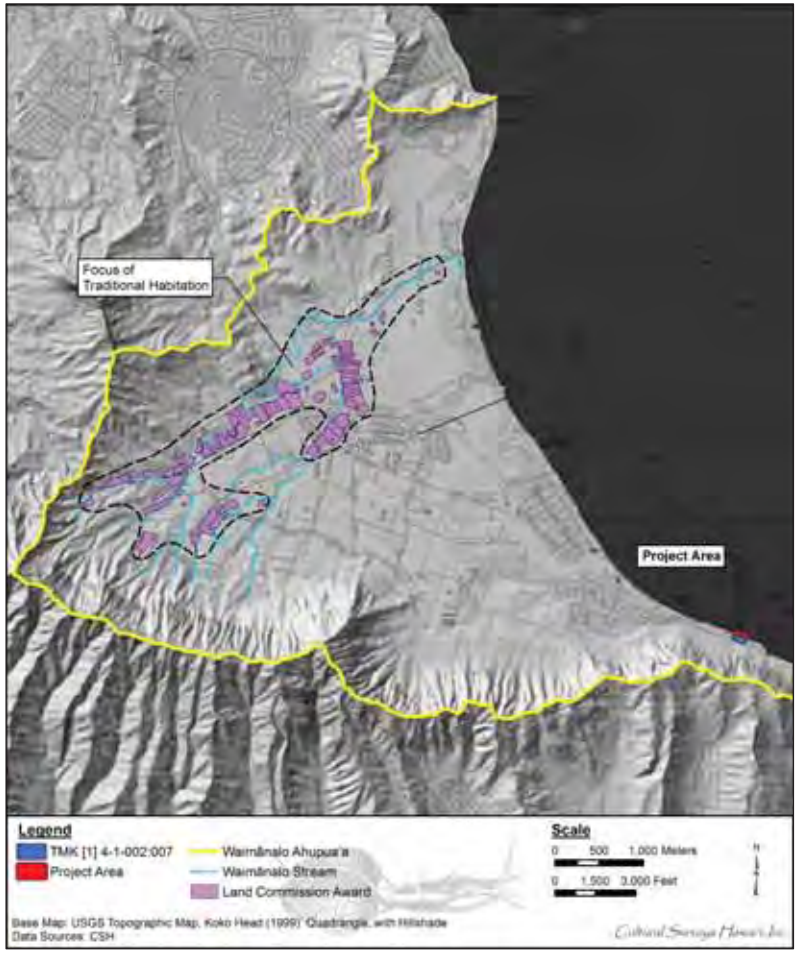

Figure 7. 1999 Koko Head USGS topographic quadrangle, indicating Hawaiian habitation based on Land Commission Awards in relation to the project area

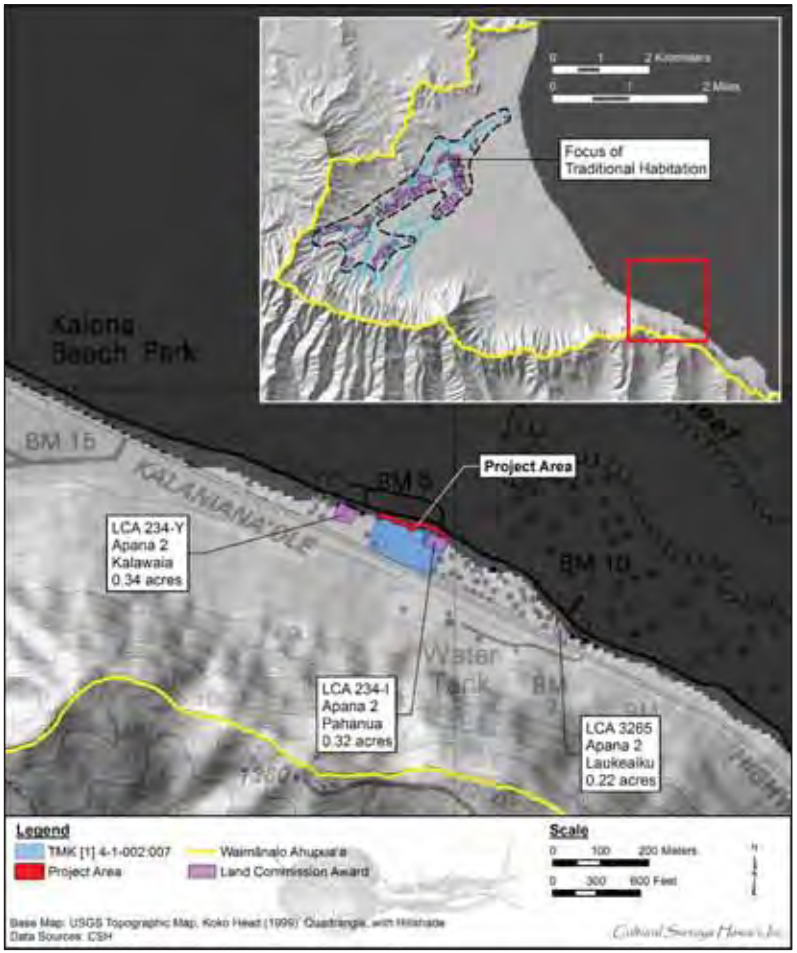

Figure 8. 1999 Koko Head USGS topographic quadrangle indicating specific Land Commission awards within the proximity of the project area.

Figure 9. Google Earth (2013) aerial image with overlay of Land Commission Awards within the proximity of the project area.

4.3 Mid- to Late 1800s

4.3.1 Ranching

In 1828, an Englishman, Thomas Cummins, arrived in Hawai‘i. Soon after his arrival, he married the High Chiefess Kaumakaokane, who was related to Kamehameha I. This marriage provided Cummins with connections to the throne. Cummins received a Royal Patent to an estate of crown lands in Waimānalo in 1842 (Dorrance 1998:19) and in 1850 Kamehameha III leased 970 acres, spanning “from Popo‘oka‘ala point to the hills of Ka‘iwa and Ka‘akaupu of the Ko‘olau district” to Thomas Cummins (Williams 1996:155). Thomas Cummins and his son, John A. Cummins, turned Waimānalo into a large cattle and horse ranch. They also constructed a landing at Waimānalo Bay, as access to the area from Honolulu, prior to the construction of the Nu‘uanu Pali road, was primarily by sea (Condé and Best 1973:364). The landing was east of the project area (Figure 10). A railroad line was also laid to connect the landing to the Cummins Estate for Kamehameha V (Thomas 1983:77).

> Kamehameha V often visited the [Cummins’] plantation. When he grew too heavy to make the trip over the Pali on horseback, he is said to have acquired a small steamboat to transport him around the southern tip of Oahu to Waimanalo. A railroad track was laid to carry the rotund monarch from the landing to the Cummins home. [Thomas 1983: 77]

The Cummins family later bought about 200 acres of *kuleana* lands. By the early 1870s, Chinese rice farmers were using some of these lands under agreement with John A. Cummins (Bartholomew and Associates 1959:14).

The Cummins Estate, “Mauna Rose,” was known for its lavish parties, commonly hosting the Kamehamehas, King Kalākaua, Queen Lili‘uokalani, and American, British, and Russian naval officers visiting O‘ahu (*Star-Bulletin* 22 June 1935:9 in Silva 1981:A-22). Following a celebration at the Cummins’ Estate, Lili‘uokalani composed “Aloha Oe” in memory of a Hawaiian couple she saw saying goodbye as she was traveling up the Maunawili Ridge toward the Pali (Bartholomew and Associates 1959:13–14).

The introduction of livestock to Hawai‘i had an exceedingly negative impact on the natural environment and contributed to the demise of traditional Hawaiian life. The absence of walls and fences to contain the vast herds of cattle, sheep, and horses resulted in the animals trampling the small scattered homesteads and stripping the land of native vegetation. In 1915, William A. Bryan discussed the relationship between cattle and the natural environment of Hawai‘i:

> Since the coming of the whites there have been many causes […] that have been at work bringing about a change in the natural conditions. Chief among the disturbing elements, however, have been the cattle. As early as 1815 they were recognized as a serious menace to the native forests. Roaming at will through the forests they and other animals, as goats and pigs, have done untold damage, and brought about conditions that have been most serious in many places. [Bryan 1915:226–227]

The damage to the natural landscape in Waimānalo caused by the development of the Cummins Ranch ca. 1847 is described in the following account:

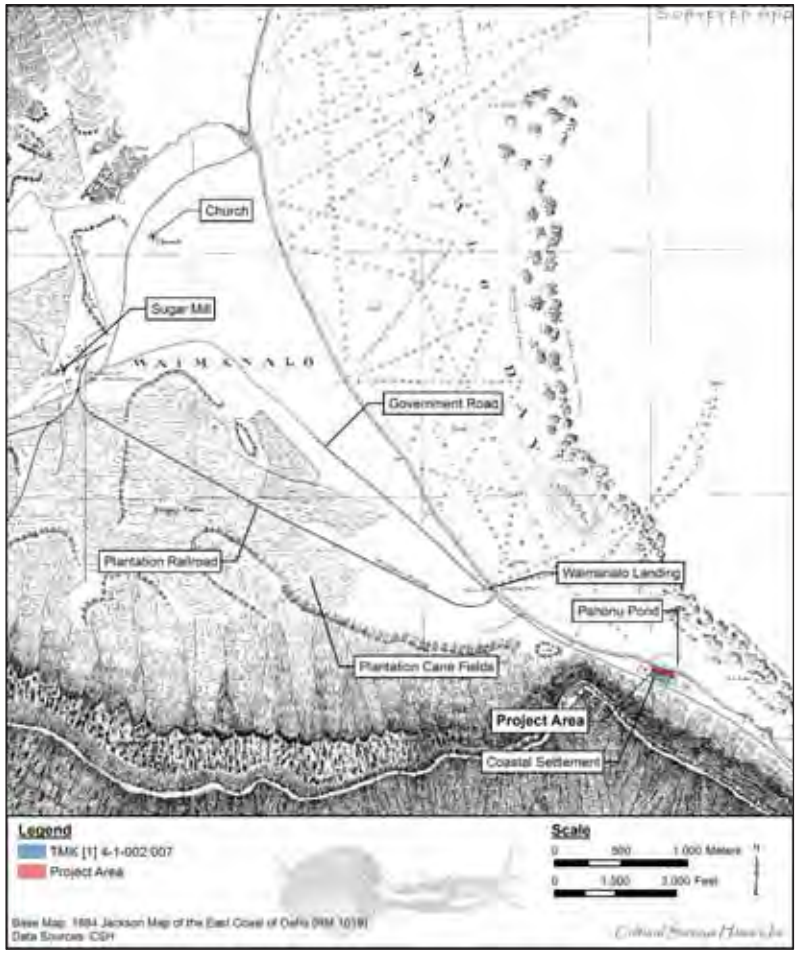

Figure 10. 1884 Jackson map of Waimānalo indicating different landmarks

> At the time, it seemed that the valley was filled with breadfruit, mountain apples, *kukui* and coconut trees. There were taro patches, with banks covered with *ti* and *wauke* plants. Grass houses occupied the dry lands, a hundred of them here and sweet potatoes and sugar cane were much grown. It was a great help toward their livelihood. […] The whole *ahupua‘a* of Waimānalo was leased to white men except the native *kuleana* and because the cattle wandered over them, they were compelled to build fences for protection. The taro patches that were neatly built in the time when chiefs ruled over the people and the land, were broken up. The sugar cane, *ti* and *wauke* plants were destroyed. The big trees that grew in those days, died because the roots could not get moisture. The valley became a place for animals. [*Kuokoa*, 26 October 1906 in Sterling and Summers 1973:244]

The Cummins family eventually began to buy up the *kuleana* lands of the native farmers, gaining some 200 acres in fee. By the early 1870s, Chinese rice farmers were using some of these lands under agreement with John A. Cummins.

4.3.2 Sugar Industry

In 1876, the Hawaiian Kingdom entered into a Reciprocity Treaty with the United States. This allowed the growing Hawaiian sugar industry a free market and the potential for great profits. One of the Chinese rice farmers, Tai Lee, began sugar cultivation on Cummins' Waimānalo lands. Eventually Tai Lee and other Chinese farmers cultivated up to 1,200 acres of cane in Waimānalo (*Honolulu Advertiser* 8 November 1931:1 in Silva 1981:A-22).

John A. Cummins saw the potential of sugar production at Waimānalo. He organized the Waimanalo Sugar Company and began construction of a sugar mill in 1880 approximately 5 km (3.1 miles) northwest of the present project area (see Figure 10 above). During this time, sugar and most other goods were transported between Honolulu and Waimānalo by steamer via the Waimanalo Landing. The Cummins Estate was still renowned for its extravagant hospitality. Lavish weeklong *lū‘au* were given for Hawaiian royalty. In 1883, King Kalākaua visited Waimānalo for John Cummins' birthday celebration:

> After landing from the SS *Waimanalo*, a train of six cars was waiting to convey the party to Waimanalo proper. The spectacle was a magnificent one. The wharf was lined with evergreens; the locomotive and cars were ornamented with flags and banners, the Royal cars being commodiously fitted up with sofa, arm chairs and a canopy. When it was reported 'All Aboard,' away we went, booming along thru' the cane fields, towards the mill. On arrival at Mr. Cummins' house, hundreds of natives flocked to welcome His Majesty. A noticeable feature was the respectful manner in which the Chinese laborers uncovered their heads as the train went by them in the cane fields. [*Honolulu Advertiser* 1883 in Condé and Best 1973:365]

In addition to King Kalākaua's visits to the Cummins 'Ohana, there is also *mo‘olelo* and *mele* about Queen Kapi‘olani's visits to the Cummins family. Pukui and Korn (1973) stated that "According to oral tradition, the chants were presented to the queen, along accompanying feather leis, early in 1883, the year when King Kalākaua and the queen were crowned on February 12" (Pukui and Korn 1973:156).

These chants, which comprise a set of three chants, were created to commemorate the visits of Queen Kapi‘olani to the Cummins' residence called Mauna Loke (Rose Mount) (Pukui and Korn 1973:156).

Despite the growth of the Waimanalo Sugar Company and the larger community of Waimānalo, little development happened near the present project area during this era. One of the only developments that occurred consisted of a small collection of coastal house lots (Figure 11). The walls of the Pāhonu Pond are also depicted on the 1884 map. An improved Government Road is shown running past the project area, however, examination of later maps and archival sources indicate this was a proposed route; the transportation corridor that existed at the time was simply a path, nearly impassable.

In 1885, W.G. Irwin & Company (which later merged with C. Brewer & Company) became agents for the Waimanalo Sugar Company, with John Cummins remaining as manager. In 1890, J.A. Cummins renegotiated his father's original lease on the Waimānalo lands for an additional 30 years and sublet the lands to the Waimanalo Sugar Company. The Waimanalo Sugar Company continued to buy sugar from the Chinese farmers until ca. 1900. The Waimanalo Sugar Company continued to grow throughout the closing decade of the nineteenth century and the beginning of the twentieth century with more and more lands being put under cultivation. As the plantation grew, former ranch lands were converted to cane fields. New irrigation ditches and railroad lines were constructed, and improvements were made to the mill and Waimānalo Landing.

A 1906 map of O‘ahu shows the growth of the Waimanalo Sugar Company and the extent of the increasing lands being put under cultivation (Figure 12). The Government Road is also shown on the 1906 map as being an improved road within Waimānalo that runs to the landing where it then becomes a gravel road along the coast, past the project area to a pass at Makapu‘u where it turns inland, linking the south shore with the windward coast. Despite the presence of an overland transportation corridor, most transportation was still by sea because the Makapu‘u Saddle trail was so rugged that horses could be led over the precarious trail, but not ridden (McGuire and Hammatt 2000:12). An account from the late 1800s demonstrates how dangerous the *pali* route at Makapu‘u could be:

> A noted fisherman of Waimanalo was killed a few days ago while on his way to fish. He had passed the point where the road turns down the pali at Makapuu, and stepping upon a ledge on the face of the bold precipice beyond, the rocks gave way and precipitated him a torn and mangled body a hundred feet below. [*Hawaiian Gazette*, 28 July 1880:3]

A 1916 map of Waimānalo (Figure 13), compiled from surveys in 1880 and 1884, shows the expanding plantation and associated development such as the Waimanalo Landing; the plantation railroad connecting the landing to the mill; the proposed "Kamehameha Highway" alignment through Waimānalo that approximates the present day Kalaniana‘ole Highway; and the proposed improved road corridor along the coast past the project area. One new development depicted on the 1916 map is the construction of a pipeline. The purpose of the pipeline was to carry water from the large reservoir at the very back of the valley to the then newly constructed Makapu‘u Lighthouse (see Figure 13). The pipeline ran through Waimānalo to the landing where the water was pumped in the pipeline along the coast, through the current project area, which then brought water to the house lots (Figure 14).

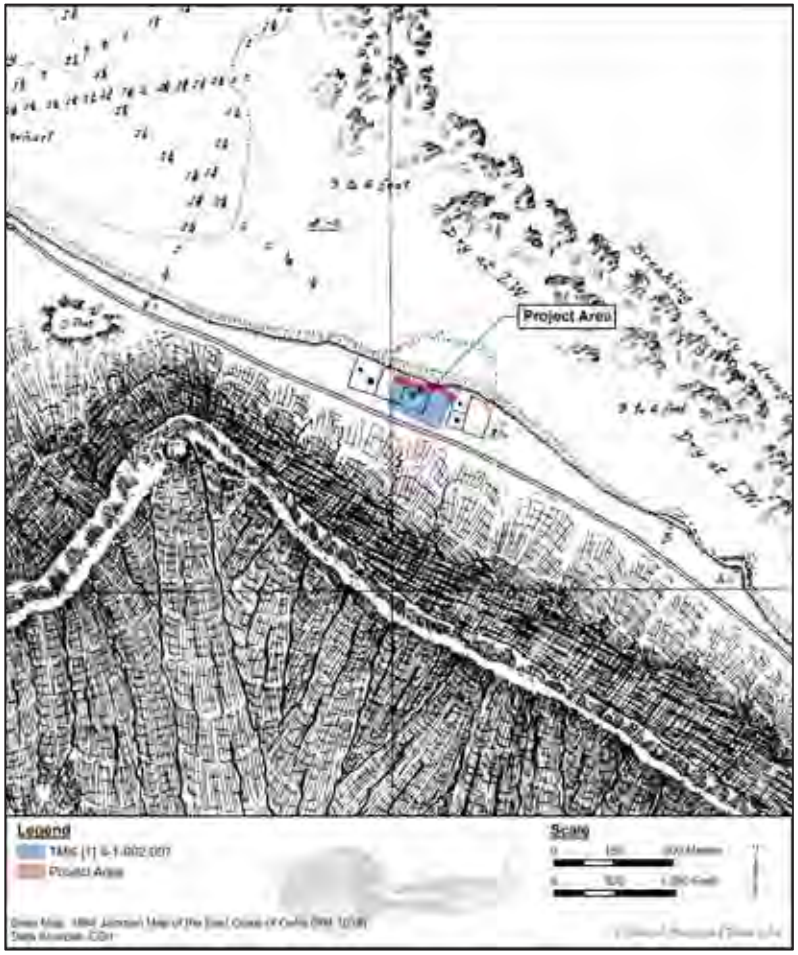

Figure 11. Close-up of the 1884 Jackson map of the east coast of O‘ahu showing project area

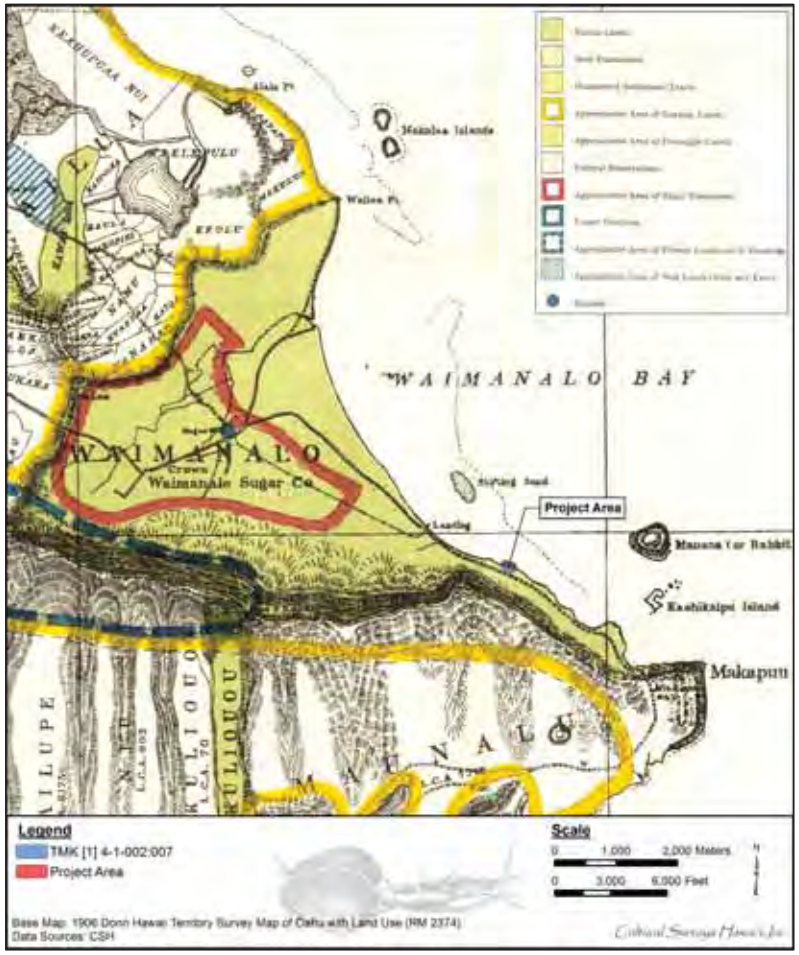

Figure 12. 1906 Donn Hawaii Territory Survey map of O‘ahu with land use showing project area

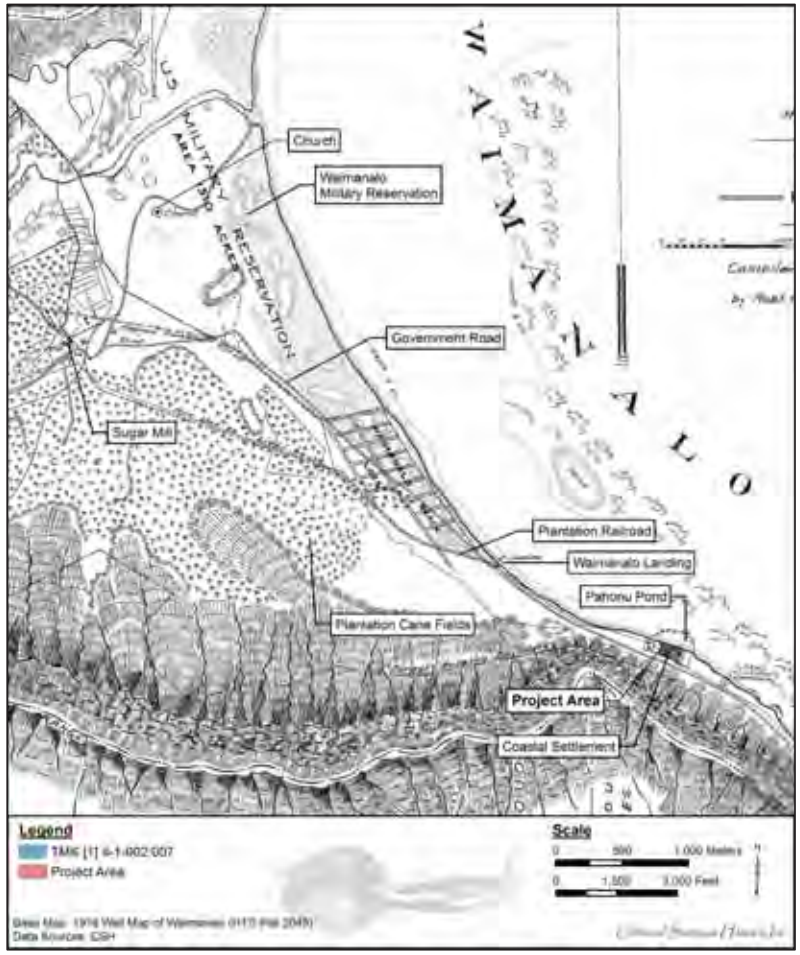

Figure 13. 1916 Wall map of Waimānalo showing project area and features discussed in the text

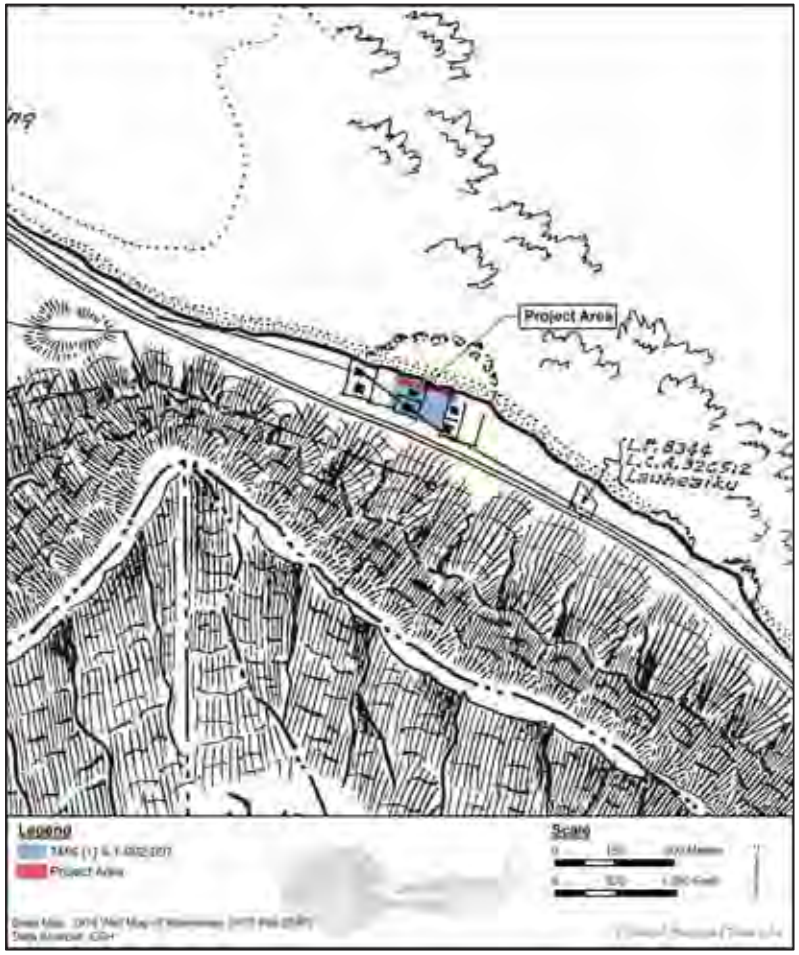

Figure 14. Close-up of the 1916 Wall map of Waimānalo, Walter E. Wall Surveyor showing project area

A 1919 map of Waimānalo shows the continued expansion of the Waimanalo Sugar Company and the associated development such as the constructed railroad lines built near the mill and Waimanalo Landing and an increase in fenced areas (Figure 15). New fences and/or walls are visible around and near the project area in 1919, likely to prevent wayward cattle and livestock out of the house lots. Also, Pāhonu Pond is not depicted (see Figure 15).

With John Cummins death in 1913, his estate sold the remaining fee simple lands and the unexpired lease of Waimānalo lands to the Waimanalo Sugar Company. A 1922 map of the Waimanalo Sugar Company’s fields (Figure 16) shows the plantation’s cane fields stretching across the floor of Waimānalo Valley to the base of the Ko‘olau Range and almost extending south to the current project area.

Under the management of George Bennett, the Waimanalo Sugar Company undertook a series of modernization efforts in the 1930s that included rebuilding the water and irrigation system, mechanized land clearing, and improved road transportation routes (*Honolulu Advertiser* 31 March 1940:1-2 in Condé and Best 1973:367). The Waimanalo Sugar Company continued operations into the 1940s, however, facing rising operational costs and diminishing returns, it ceased operations in 1947. Following the closure of the Waimanalo Sugar Company, the plantation’s water license and irrigation ditch system reverted to the Territory of Hawaii.

4.4 1900s

4.4.1 Military Infrastructure

The Waimānalo Military Reservation, including approximately 1,500 acres along the northern coastal portion of Waimānalo, was established in 1917 (see Figure 13). Limited development and little activity occurred on the military reservation through the 1920s. In 1933, it was renamed Bellows Field and consisted of an infantry and artillery training area, as well as a runway for the Air Corps. Bellows Field developed rapidly during the build-up to World War II, the beginnings of which can be seen in Figure 17. Prior to the bombing of Pearl Harbor in 1941, Bellows was a training area for new recruits and contained only one runway (THANG 2006).

With the onset of World War II, development accelerated at Bellows Field, which became a permanent military post in 1941. A 1943 War Department map (Figure 18) shows the additional roads, structures, and runways constructed at Bellows Field and a major facility arranged around an oval road 300 m northeast of the project area.

Following World War II, activity at Bellows Field declined with much of the area only being used for military recreational purposes and as an emergency landing field. In 1948, the base was placed “on caretaker status” and Bellows Field was renamed Bellows Air Force Base and later, Bellows Air Force Station (THANG 2006:112). A 1952 map (Figure 19) shows the layout of military infrastructure just seaward of the project area including a church and the development of Waimanalo Village 300 m to the west. Schools are shown on both the *mauka* and *makai* sides of Kalaniana‘ole Highway approximately 200 m west of the project area. In 1956, an Air Force communications facility was constructed, with extensive antennae installations (Bartholomew and Associates 1959:16). Bellows Air Force Station continues to be used for military training and recreational purposes.

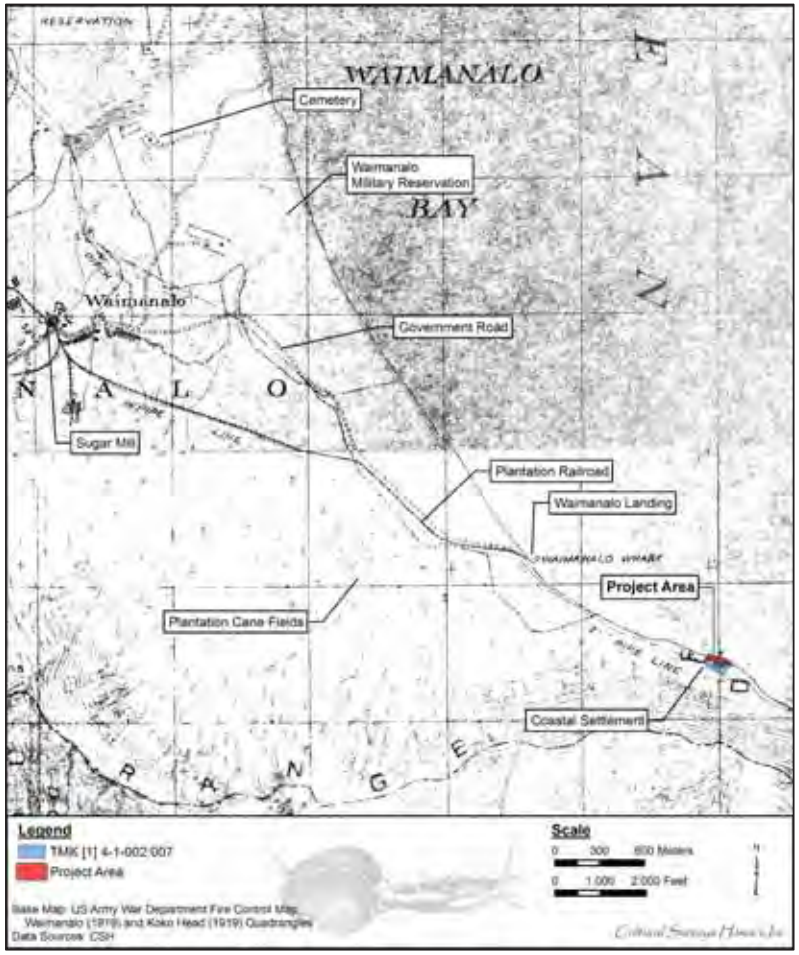

Figure 15. 1919 U.S. Army War Department fire control map, Waimanalo and Koko Head Quadrangles showing project area

Figure 16. Map from 1922 of fields of Waimanalo Sugar Company, showing project area (Condé and Best 1973:368)

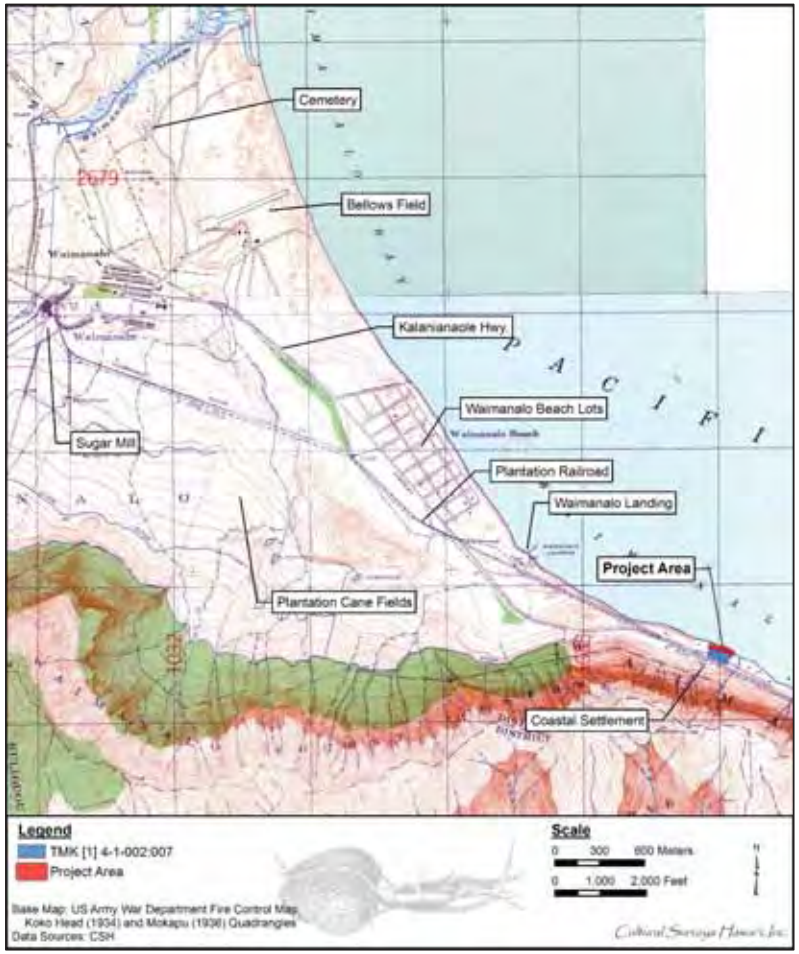

Figure 17. 1934 Koko Head and 1936 Mokapu U.S. Army War Department fire control map, showing project area

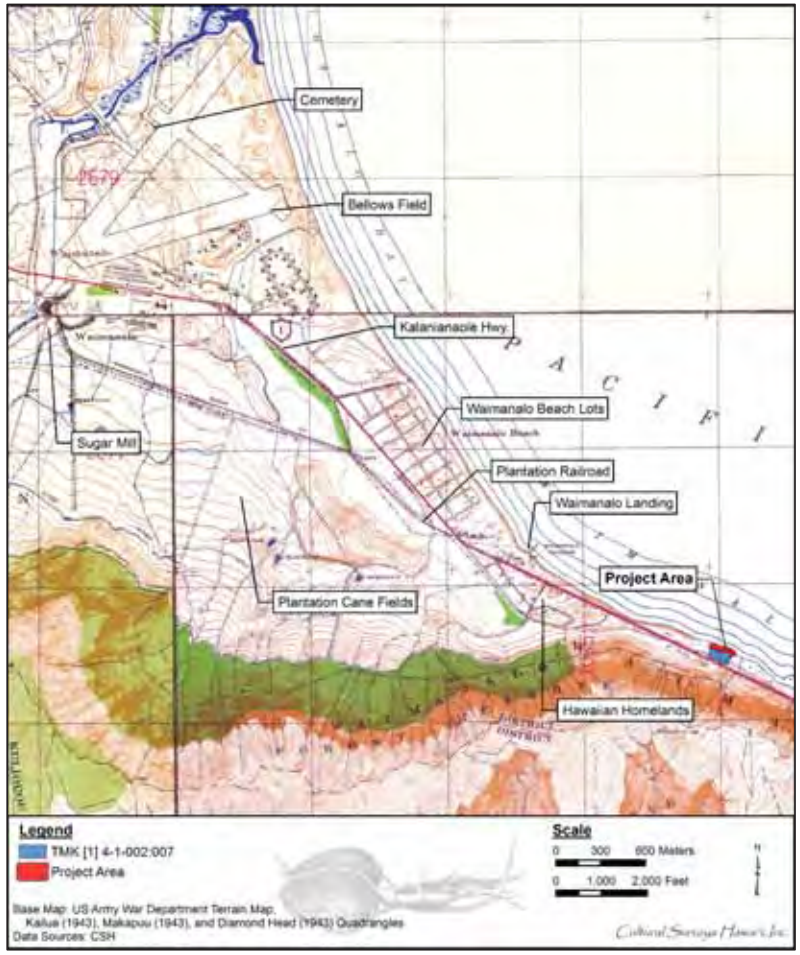

Figure 18. 1943 U.S. Army War Department terrain map, Kailua, Makapuu, and Diamond Head Quadrangles showing project area

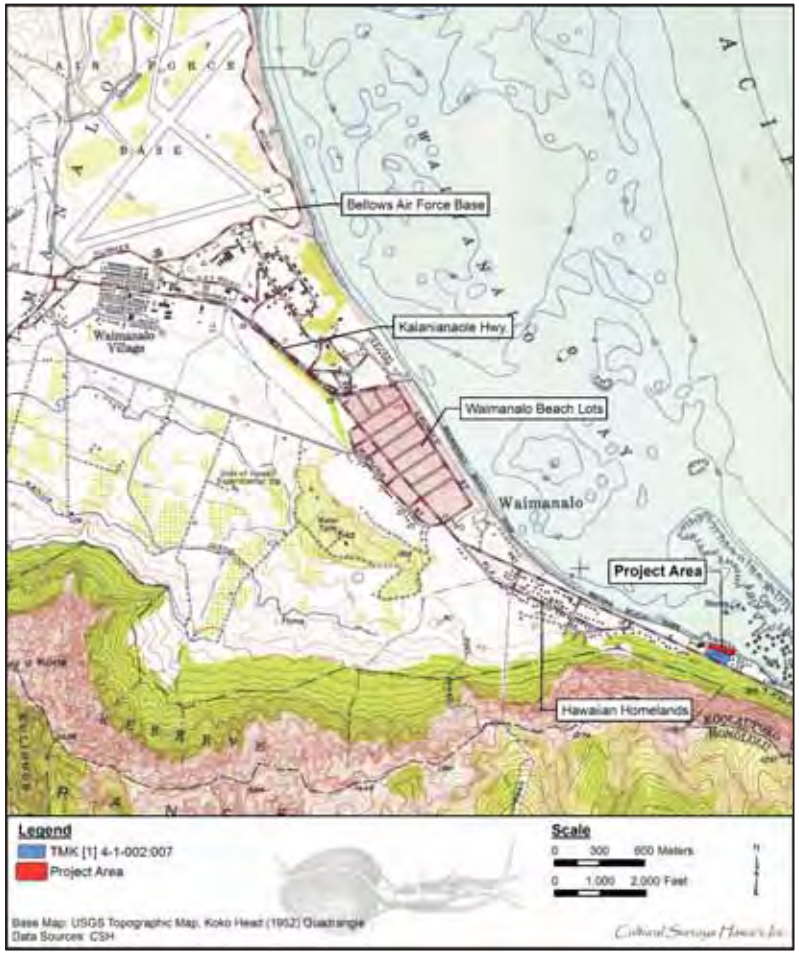

Figure 19. 1952 Koko Head USGS topographic quadrangle showing project area

In 1961, the base was augmented to accommodate the air defense capabilities of a Nike missile site (Figure 20 and Figure 21).

> The 112-acre Bellows launch site was built behind the beach at the southern end of Bellows; the permanent dual control site was located on Waimanalo Pali at the north end of Kamehameha Ridge (Farrell, et al 1997). Dedicated on 4 March 1961, this activity continued until December 9, 1969 when HIARANG was relieved of its air defense mission (Adjutant General of Hawai‘i 1970; Stone 1961; von Hoften 1970:108). The O‘ahu launch sites were entirely above ground in contrast to the CONUS [Convoys within the continental U.S.] operations that usually supplied underground magazines. [THANG 2006:112–113]

Bellows AFS was the first site selected in Hawai‘i for a Nike Hercules battery site (Bennett 2009). The decision to construct the missile site came with much objection from the former governor William F. Quinn (Slocumb 2004). However, upon completion the battery conducted annual tours of the missile launch site, which was “typically attended by the public” (Slocumb 2004:5). According to Bennett (2009), Bellows AFS had two Hercules batteries containing a total of 24 Nike Hercules missiles and 16 launchers. Due to the dual launcher sites, some sources refer to the battery as OA-32 and OA-45 (Bennett 2009). Bennett (2009) relates that the launcher sites are currently in an abandoned state, with only two buildings remaining. The structures are thought to have been a Missile Warhead Test building and a generator building. The U.S. Marine Corps acquired most of Bellows Air Force Station in 1999 and it is now Marine Corps Base Hawaii, Marine Corps Training Area Bellows (MCTAB), which continues to be used for military training and recreational purposes.

4.4.2 Residential Development

The primary residential area in Waimānalo in the early 1900s was in the vicinity of the Waimanalo Sugar Company’s sugar mill, although the current project area was a small settlement of house lots that were established following the *kuleana* awards in 1850. Waimanalo Village was established as housing for plantation workers and their families. Owing to the sugarcane industry and lack of adequate overland transportation, further residential development was hampered. There was a road from Waimānalo to Kailua, but an improved Nu‘uanu Pali route that would link the windward side of the island with Honolulu was still in its nascent stages in the early part of the 1900s. The road leading to the Makapu‘u Saddle and then to the south shore of O‘ahu via the “Road from Honolulu Koolau” (Webster 1851) through Kealakipapa Valley was also a route in and out of Waimānalo, but the *pali* option to get over the pass was a considerable barrier to transportation other than by foot or horse, which could not be ridden over the pass, only carefully led (McGuire and Hammatt 2000:12).

In December 1918, Waimānalo lands were advertised for purchase at public auction, under the deed of trust made by John Cummins in 1896 (*Honolulu Advertiser*, 13 December 1918:11). These lands included the residue and unexpired portion of the lease of 6,970 acres in the Waimānalo Ahupua‘a. At this time, there were three years remaining on the 30-year lease, signed in 1890 and extended one extra year, the cost of which was $1,500 annually. There were also approximately 180 acres of freehold lands, tenements and hereditaments of LCA lands for sale, which included

Figure 20. Portion of the 1969 Koko Head USGS topographic quadrangle showing the locations of OA-32 and OA-45 at Bellows AFS and Kamehame Ridge

Figure 21. Photo of Nike Hercules missiles at Bellow AFS, notice the raised berms surrounding the launch location (Bennett 2009)

‘Āpana 2 of LCA 234-I, awarded to Pahanua (listed as 0.30 acres; LCA 234-I was misidentified as 234-J). Despite it being listed for sale in 1918, ‘Āpana 2, LCA 234-I had already been transferred several times since 1850 and was recorded as privately owned. An additional approximate 18 acres of estate, title, and interests of LCA lands were also offered up for public auction. All the properties for sale were to be sold as a whole and subject to the Waimanalo Sugar Company lease (*Honolulu Advertiser*, 13 December 1918:11).

After 1920, the Territory of Hawaii undertook an extensive road improvement and construction project when the provisions of the Federal Highways Act (FHA) of 1921 were extended to the Territory by an act of Congress in 1924 (MKE Associates and Fung Associates 2013:2-36). On 21 July 1924, Executive Order 4052 returned 4.18 acres of land, previously part of the Waimanalo Military Reservation, to the Territory of Hawaii to support road construction in Waimānalo. The acreage was “set-aside” land no longer suitable for training and was returned because the development of Kalaniana‘ole Highway required additional lands (Belt Collins Hawaii 1995:E-9).

After years of slow progress, the asphalt macadam constructed Kailua-Waimanalo Road was opened in 1924 and it vastly improved overland access (*Honolulu* Advertiser, 3 April 1924:5; McGuire and Hammatt 2000:12). Also in 1924, the Nu‘uanu Pali Road officially opened, linking Waimānalo to both Honolulu and Kailua. The new roads eliminated the need for the landing, which was no longer being used for shipping and transportation (UH Marine Option Program 1999:13). The Kailua-Waimānalo road still terminated at the treacherous Makapu‘u Pali switchback pass and throughout the second half of the 1920s and early 1930s, funding was sought to make the road connection from Koko Head to Waimānalo (*Honolulu Star-Bulletin*, 25 February 1927:19).

With the improved accessibility and visibility of the area, the first successful significant sale of Waimānalo lands to the public occurred with the establishment of the Waimanalo Beach Lots subdivision in 1925. The subdivision, located 1.6 km (1 mile) northwest of the present project area, included 266 lots on 90 acres of land (Bartholomew and Associates 1959:16). Additional residential development occurred in the coastal portion of central Waimānalo with the establishment of Waimanalo Homestead by the Hawaiian Homes Commission in 1925. Qualified homesteaders with 50% or more Hawaiian blood were awarded residential lots in the vicinity of Waimanalo Landing and located inland of Kalaniana‘ole Highway, approximately 1.4. km (0.9 miles) northwest of the project area.

In contrast to the award of residential lots in the Waimanalo Homesteads to qualifying Hawaiians, the Waimanalo Beach lot parcels were auctioned off by the Territory of Hawaii with the basis of the award being one’s ability to submit (and pay) the highest bid. An early sale in the Waimanalo Beach Lots subdivision was made in December 1925, for Lots 34 and 35, which were bought by Harriet Sybil Hocking for $4,300 and $5,100, respectively, and awarded under Land Patent Grant 9042 (Dooley 2011:11). One of the first homes built in the subdivision was on Lots 34 and 35, Hale Pohaku, the Alfred Hocking Beach House, which was completed in 1926 and was listed in the Hawai‘i Register of Historic Places (HRHP) in 2011. The pattern of Hawaiian *ali‘i* and other affluent O‘ahu citizens building grand oceanfront estates began in the 1870s and 1880s in Waikīkī and lasted until the 1960s (Dooley 2011:10), although the development and redevelopment of these properties continues into the present day. The major changes in transportation and utility infrastructure in the early twentieth century enabled the development of housing at what were once more remote oceanfront locations such as Waimānalo. These remote

areas became some of the most desirable locations to build oceanfront estates and a semi-building craze began, reaching its peak in the 1920s and 1930s with the construction of several new estates on the north shore and windward and leeward coasts of O‘ahu (Dooley 2011:10).

In 1931 and 1932, Congress made emergency appropriations to be used to relieve the unemployment situation with construction jobs and to be used in place of funds that states usually provided as match to Federal Aid project funds. The Territory of Hawaii received one million dollars in emergency appropriations and the Territory used $880,000 to create a Hawaii Special Fund to take to the Federal Aid System in 1931. This funding allowed for the construction of hundreds of miles of new roads and road improvements (MKE Associates and Fung Associates 2013:2-36). The influx of federal funding led to the construction of the long proposed Kalaniana‘ole Highway, which was improved in 1933 from the original construction of the Waimānalo-Kailua Road in 1924 (McGuire and Hammatt 2000:12). In 1936, the Territory abandoned the ROW easements it held for the old Waimānalo-Kalua road (*Honolulu Advertiser*, 15 April 1936:5).

4.4.2.1 The Development of the Anderson Estate–Pāhonu

Outside of the record of the *kuleana* award in 1850, the earliest archival record located for the current project area dates to 1910. No record was found of how and from whom they obtained ownership, however, the former Paahanua LCA property was owned by the somewhat infamous Elizabeth Kainana Puahi (Hiram), Lizzie, or Madame Puahi as she was known in the newspapers, and her husband, Moses Puahi. She was a onetime advisor to Queen Kapi‘olani (their relationship ended with a series of dueling lawsuits), a well-known *hula* dancer and *pā‘ū* rider (skirt word by women horseback riders), and notorious owner of a “hula hall” on Kapahulu Avenue in Waikīkī. Moses Puahi was an equally well-known police officer. An announcement in the *Honolulu Advertiser* notes the transfer of the mortgage on the *kuleana* parcel (although it is misidentified as ‘Āpana 2, LCA 234-T, not I) and a tract of land in North Kona from the Puahis to William R. Castle, the prominent Honolulu business person, for the sum of $400 (*Honolulu Advertiser,* 21 August 1910:11).

William R. Castle only held the properties he gained from the Puahis for 5 years when the mortgage for the Waimānalo *kuleana*—although it is misidentified as ‘Āpana 2, LCA 234-J, not I—and the North Kona parcel were transferred to George A. Seyde and Charles S. Crane for $1 on 9 September 1915 (*Honolulu Advertiser*, 11 September 1915:10). George Seyde and Charles Crane were friends and coworkers at the *Honolulu Advertiser*. Charles S. Crane was a prominent business person, journalist, and politician. Charles Crane’s journalism career included being the assistant manager of the *Hawaiian Gazette*, publisher of the Hawaiian language newspaper *Ka Nupepa Kuokoa*, and business manager and later, executive vice president, of the *Honolulu Advertiser*. His political career included serving on the board of supervisors for the City and County of Honolulu, as the sixth Mayor of Honolulu, and as a Territorial Senator. Charles Crane was also well-known for his involvement in the development of the Kaimukī neighborhood and with the Boys Scouts, especially Troop 10.

Regarding Crane and Seyde’s development plans for the *kuleana* parcel, George Seyde cheekily remarked, “I am strong for giving country homes here Hawaiian names and I will call my summer place in Waimanalo ‘Ala Moana Hale,’ which means the boss tells me ‘the wind that blows the

mosquitos away'" (*Honolulu Advertiser*, 17 October 1915). Just a few days after that, a building permit was issued for a $650 beach house (*Honolulu Star-Bulletin*, 23 October 1915).

There are numerous references in the newspapers from 1916-1920 to a Boy Scout Camp at Waimānalo, either "Camp Waimanalo" or "Camp Wilder," and many accounts of Charles Crane's involvement in organizing and leading these camping trips. Analysis of the few photographs that exist from scenes at the camp were compared to modern satellite and photo imagery, and the written descriptions of the camp were carefully analyzed to ascertain whether this camp was located on Charles Crane's property and within the current project area. All indications are that the camp, while near to Charles Crane's property and the current project area, was located in the vicinity of current day Kaupo Beach Park, Sea Life Park, and Hawai‘i Pacific University's Oceanic Institute.

As there was only one LCA in the current project area, the rest of the land contained therein was Crown, then Territory Land, although earlier maps depict what appear to be house lots and/or a small coastal settlement (see Figure 10 and Figure 11; Figure 13 through Figure 15 above). The lands were subject to be sold by the Territory and under Land Patent (LP) 7618 dated 11 October 1920, Nohokula was granted the Preference Right to Purchase (or first right of refusal) on a 0.99-acre property for $2,000 (OHA 2018). The parcel included a large portion of the western part of the current project area. One day later, on 12 October 1920, it was reported that the property was transferred to Ella D. Hamman for $2,000 (*Honolulu Star-Bulletin*, 14 October 1920:2).

As discussed, above, the visibility of and interest in Waimānalo grew because of the improved road access and helped fuel the trend of country beach houses. Charles Crane, a well-known Honolulu, and by now Waimānalo, fixture, had been traveling between the capital and the country for well over ten years before the construction of the Kailua-Waimanalo Road and helped serve as a construction inspector (*Honolulu Star-Bulletin*, 2 April 1924:17). The road was well received, and people began flocking to Waimānalo, not only to build beach homes, but also for social events, a pattern that continues to the present day:

> **'Ain't We Got Fun' Echos Over Waimanalo When The Advertiser Enjoys Frolic**
>
> Members of The Advertiser force were the guests of Charles S. Crane, business manager and Mrs. Crane at a get-together celebration of the newspaper family yesterday at Crane's Roose, Waimanalo, better known as Pahonu (Turtle Pen).
>
> Nearly everyone connected with the editorial, business, and printing offices turned out for the affair, which began in the morning and lasted throughout the day. A program of sports was enjoyed under the management of Ezra Crane, Allan McGuire and Howard Lyman, assisted by H.R. Johnson, Nigel Jackson and Fred Green. The judges were John Traut, D.D. Thaanum, S.P. Correa, Dan Pokipala and G.L. Sampson.
>
> There were swimming races and all kind of land races, tug-of-war and other contests. Baseball and volleyball with A. McGuire, L.P Thurston, and Frances Sing as captains, were played. At 1 o'clock everyone took part in an eating contest which demolished great stores of good things served by Mrs. Crane, Assisted by R.S. Coll, Mrs. A. Perry, Mrs. Allan McGowan and Mrs. G.L. Samson.

> As it was the birthday of the host, a golf outfit was presented to him. Late in the afternoon a great birthday cake was cut and served with punch.
>
> Music for the occasion was given by an orchestra under the direction of G.J. Boisse and Dan Pokipala.
>
> L.P. Thurston was chairman of the committee of arrangements, assisted by George A. Seyde, Robert K. Brown and L.P. Scott. [*Honolulu Advertiser*, 5 January 1925]

The Territory of Hawaii continued selling off Waimānalo lands (and other lands throughout the Islands) through the 1920s and as the decade drew to a close, an expansion of the holdings up for sale was planned. The practice of selling public lands to private interests was not universally well received because while they were legally and technically public auctions, the practice was more akin to private sales and disputes of rights of ownership over many lands ensued (*Honolulu Advertiser*, 12 March 1930:1). The current project area was one of the more visible subjects of one of these disputes when Julia Grossman Wall applied (997) to the Land Commission for purchase of the property (*Honolulu Advertiser*, 12 March 1930:1).

Julia Grossman Wall was the daughter of Edward Shepherd, a prominent Chicago businessmen, and widow of Dr. Moses Edmund Grossman (d. 1921), who was one of the pioneer dentists in Hawai‘i (Siddall 1921:111). Edward Shepard died in August 1922 and Julie was bequeathed a robust $3,800,000 inheritance from her father's estate (*Honolulu Advertiser*, 8 September 1922:6). In 1926, she married Dr. Ormond Edgar Wall (Hawai‘i State Archives 2006), another preeminent Honolulu dentist and successful inventor (Siddall 1921:401; Hawai‘i State Archives 2006).

In 1930, Julia Wall held an option to purchase a portion of the Hamman parcel (LP 7618) and applied to purchase the adjacent Territory lands, which had been subdivided into lots in preparation for auction (*Honolulu Advertiser*, 12 March1930:1). During this time, a claim to the land had been made by a local Japanese family who had been living on the lot for several years, however, it was reported that a settlement with the family had been reached and the application had already been approved by the land board (*Honolulu Advertiser*, 12 March 1930:1). On 1 April 1930, the auction of Territory lands adjacent to LP 7618 was advertised, with an easement for the Kailua-Waimanalo Road over the property until the proposed Kalaniana‘ole Highway was built (*Honolulu Star-Bulletin*, 1 April 1930).

The land commission approved Julia Wall's application to purchase the Territory lands at a higher price than advertised, dismissing the preference right to purchase claim by Toshi Kumagai, who said she had lived on the property for over 20 years. The preference right of purchase claim stated that Toshi Kamagai's father, an employee of Waimanalo Sugar Company, moved to the property, then being leased to the sugar company, in approximately 1908 (*Honolulu Advertiser*, 11 April 1930:5). The matter was referred to the Territory Governor, Lawrence Judd, for a final decision (*Honolulu Advertiser*, 11 April 1930:1); following an investigation he refused to interfere with the sale (*Honolulu Star-Bulletin*, 2 May 1930:1). On the day the Territory lands were set to be auctioned and following a hearing on the Kumagai petition for injunction, the Territorial court halted the sale with a stay of 30 days (*Honolulu Star-Bulletin*, 2 May 1930:1).

Undeterred, Julia Wall moved forward with her plans to build a large beach home in the current project area and purchased a portion of the Hamman parcel (LP 7618) for $11,000 shortly after

the court’s decision to halt the sale of the Territory land (*Honolulu Advertiser*, 6 May 1930:1; *Honolulu Star-Bulletin*, 10 May 1930:13; *Honolulu Advertiser*, 21 August 1930). A few days later, Charles Crane sold his beachfront lot (‘Āpana 2, LCA 234-I) to Julia Wall for $19,000 (*Honolulu Advertiser*, 9 May 1930:13; *Honolulu Advertiser*, 21 August 1930:15). With the purchase of these two lots, Julia Wall bookended the Territorial properties that were embroiled in the legal proceedings.

The territorial commission of public lands decided to authorize the sale of the Waimānalo lots for August 1930, which had been postponed from May and then to June because of the Kumagai injunction (*Honolulu Advertiser*, 27 June 1930:1-2). The sale of the lands was re-advertised, and the price Julia Wall was reported as being willing to pay for the lots had increased from her initial offer (*Honolulu Advertiser*, 27 June 1930:1-2; *Honolulu-Star Bulletin*, 8 July 1930:5).

While there are no accounts that explicitly state what became of the Kumagai claim to the Territory lands as there is no record of a settlement or a court decision, it appears Toshi Kumagai and the land commission arrived at an agreement. The Territory was clearly eager to make the sale of the contested land “at auction” to Julia Wall and at a price well over their appraisal. It would appear that in exchange for Kumagai dropping her preference right to purchase claim on the lots between the Wall holdings, she was given the preference right to purchase, under a “Special Sales Agreement,” the nearby Lot R in July 1930 (State of Hawai‘i DAGS 2018a).

In August 1930, Julia Wall’s purchase offer of approximately $30,000 for the Territory lands was accepted. Combined with her purchase of the Hamman and Crane lots, she owned a contiguous 3-acre parcel that comprises the current project area. Her total investment in the property was upwards of $60,000 (*Honolulu Advertiser*, 21 August 1930:1) and it was reported that she “plans to establish an estate on which she will build a pretentious home. Her plans, it is said, contemplate beautification of the entire area which she now owns at Waimanalo” (*Honolulu Advertiser*, 21 August 1930:1).

A 1930 Territory of Hawaii Survey (conducted in 1928) map of the property shows the parcels purchased by Julia Wall: LP 7618 (por.), ‘Āpana 2 234-I (por.), and the Territory Lots E, F, G, and H (Figure 22). Several dwellings and other buildings and structures depicted on the map include the Crane and Seyde beach homes on the *kuleana* parcel; possibly Hamman beach homes on the Nohokula parcel; and what may be the Kumagai home and associated structures on the Territory lots. The 1930 map also shows the Kailua-Waimanalo Road, constructed in 1924, crossing the southern half of the current project area and the proposed Kalania‘ole Highway alignment (see Figure 22), which was depicted as early as 1884 (see Figure 10 and Figure 11 above), but which had remained unbuilt through this time.

A seawall and pier are shown in LP 7618 and the *kuleana* parcel (see Figure 22). These portions of the seawall are still currently in use (it was later extended), however, the piers no longer exist. This map indicates the seawall predates the Wall ownership of the property, however, no records detailing the development and construction of the seawall and pier were found. An examination of historic maps indicates the pier and seawall were constructed sometime after 1916 as one of the piers appears in a 1919 map, but not in the map from three years earlier (see Figure 14 and Figure 15 above). Also depicted on the 1930 map are stone walls around both LP 7618 and ‘Āpana 2, LCA 234-I. Kumagai’s “Special Sales Agreement” on Lot R, west of the Wall property, is also recorded on

Figure 22. Portion of 1930 Kanahele map of Waimanalo Beach showing project area

the 1930 map. In 1937, the Shriners purchased Lot R from the Territory (State of Hawai‘i DAGS 2018b).

Figure 23, the 1930 Land Court Application 997 Map 1, shows not only the property boundaries, but also the location and the terms of the drainage and existing water pipeline easement over the property. The map also shows the fast pace of development on the Wall estate and surrounding area. The sale of the property was in August 1930, the map was drawn in September 1930, and field-verified in January 1931. From the time the Territory survey map was created (see Figure 22), through the sale of the property, to the time the land court application map was field-verified (see Figure 23) this section of Kalaniana‘ole Highway was moved out of the right-of-way (ROW) easement (the easement was terminated) that crossed the Wall property and was completed (the rest of the road was completed in 1933) and a stone perimeter wall was constructed around the west, south, and east sides of the property. Archival and historic map and photo research and the results of the AIS show this is the same perimeter wall around the current project area and it was the first portion of the Pāhonu estate construction.

Eager to get started on the Waimānalo estate, the Walls had selected an architect and builder for Pahonu by December 1930, three months after purchasing the Territory land (*Honolulu Star-Bulletin*, 1 December 1930:17). By February 1931, the *Honolulu Advertiser* reported there were a number of building sites across Honolulu and rural O‘ahu, including at the Wall property: “The largest single project is that of the home for Mrs. Julia Grossman Wall at Waimanalo, designed by Louis S. [E.] Davis and being built by A.S. Cantin. The distinctive features of the Wall home is the fact that it is being built almost entirely of redwood” (*Honolulu Advertiser*, 8 February 1931:32).

Louis E. Davis, a prominent local architect who designed several significant residential, commercial, government and public buildings across O‘ahu, was renowned for his work in the Spanish Colonial Revival, Mission Revival, Spanish Eclectic, and Mediterranean Revival architectural styles (Cheever and Cheever 2003:91; Sakamoto et al. 2008:38, 42). Davis worked extensively with Theo H. Davies & Company on other residential projects, designing several Spanish Eclectic style residences in the then new subdivision of Kahala (Sakamoto et al. 2008:42). The most well-known examples of Davis’ work include President William McKinley High School, Honolulu Police Station (Merchant Street), State of Hawai‘i Agriculture and Forestry Building, the Spanish Colonial Revival Pahonu estate, Lipolani House, and a number of theaters around the state (Princess, New Pawaa [later Cinerama], New Palama [later Zamboanga], Waipahu, and Lihue) (Angell 2011).

Augustus S. Cantin was the builder of estate by Pāhonu and a well-known figure in the O‘ahu construction industry in the early part of the twentieth century. He served for a time on the Waikiki Sanitation Reclamation, and Improvement Commission (Hawaii Governor 1914:91) and as the City and County of Honolulu Engineer (Thrum 1917:197). According to multiple newspaper accounts, he was also very involved in the Contractors’ Association of Hawaii, was primarily known for his residential construction in Honolulu, and frequently collaborated with Louis Davis and Theo H. Davies & Company.

Initial construction on the estate of Pāhonu progressed quickly and it was featured in the “News and Views of Honolulu Real Estate” column in the *Honolulu Advertiser* (3 May 1931:14; Figure 24).

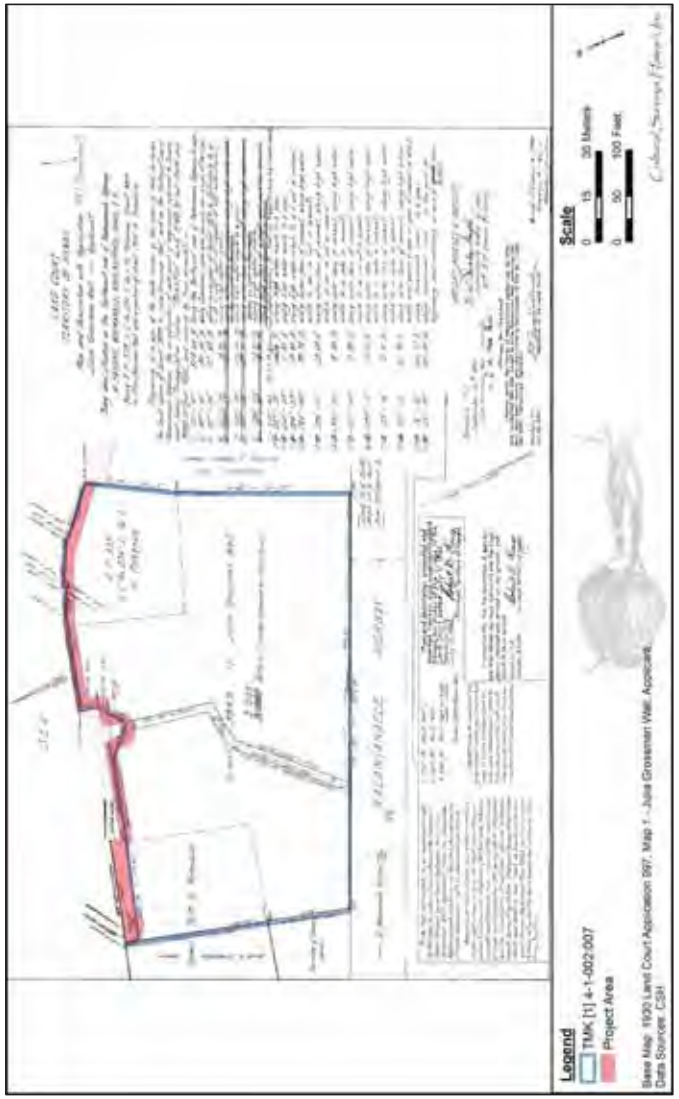

Figure 23. 1930 Land Court Application 997, Map 1–Julia Grossman Wall, Applicant showing project area

Figure 24. Rendering of Pāhonu that appeared in the "News and Views of Honolulu Real Estate" column in the *Honolulu Advertiser* (3 May 1931:14)

A little under a month after the feature on Pāhonu in the *Honolulu Advertiser*, it was reported that

> The atractive residence being built at Waimanalo for Mrs. O.E. Wall is rapidly nearing completion. Finishing details are now in progress, and the house will be ready for occupancy the latter part of June.
>
> Consisting of a spacious main house, gate lodge and servants quarters, boathouse and bathing pavilion, this project has been seven months under construction The cost is $125,000. . . [*Honolulu Star-Bulletin*, 30 May 1931:15]

Despite the flattery and rosy projections, the Walls did not move to the Pāhonu estate until November 1933, a few weeks prior to their daughter, Eva Grossman Wall, getting married (*Honolulu Star-Bulletin*, 44 November 1933:22). On 22 November 1933, Eva married James W. Glover, a prominent contractor in Hawai‘i and a Territorial Representative; the reception for 500 guests was held at the Pāhonu estate (*Honolulu Star-Bulletin*, 25 November 1933:23–24), starting a tradition of using the estate for entertaining that lasted into the present day. The Glovers had two children, a son, Reed, in 1936 and a daughter, Eve, born in 1938 (*Honolulu Star-Bulletin*, 9 January 1951:1). Following the deaths of Ormond Wall in 1937 (*Find A Grave* 2018a) and Julia Grossman Wall in 1948 (*Find A Grave* 2018b*),* Eva Glover (née Reed Grossman) and Edward Shepherd Grossman each received one-half of the estate (including a half-interest each in Pāhonu). Julia's will also provided James Glover with $20,000 and Reed and Eve Glover with $10,000 as well as some miscellaneous sums to others (*Honolulu Star-Bulletin*, 18 November 1948:5). A 1949 aerial photo shows Pāhonu, the current project area, and the continued development of adjacent beachfront lots at this time (Figure 25).

Eva Glover died in 1951 at 38 years old, just three years after her mother, after being admitted to Queen's hospital in November 1950 (*Honolulu Advertiser*, 10 January 1951:1). Upon Eva's death, her estate was inherited by James W. Glover and their children in 1952. The total value of the estate was over $500,000 (over 70% comprised of stocks) including the 50% interest in Pāhonu, which had a total appraised value of $81,824 (*Honolulu Advertiser*, 21 March 1951:1); significantly less than the nearly $200,000 it cost for Julia Grossman Wall to acquire the property and build the estate.

In March 1952, 14 months after Eva's death, James Glover married Barbara Blair Cox Kennedy (later Anthony), daughter of former Ohio Governor and media magnate James Cox (*Honolulu Star-Bulletin*, 7 March 1952:1). In 1953, Edward Shepherd Grossman died (Find a Grave 2018c) and his one-half interest in Pāhonu reverted to the Glover children, Reed and Eve, the only surviving family members and remaining heirs to the Walls (*Honolulu Star-Bulletin*, 4 December 1953:12).

Six years after the death of Eva and five years after he remarried, James Glover died at Pāhonu in 1957 (*Honolulu Star-Bulletin,* 1 March 1957:1). His estate was valued at nearly $3,000,000; the beneficiaries were his wife Barbara and his children, Reed and Eve (*Honolulu Star-Bulletin*, 8 November 1957:7). The bulk of the estate was reported to be used to establish trusts for Reed and Eve (*Honolulu Advertiser*, 8 November 1957:1). Shortly thereafter, Reed married Diane Knutzen (*Honolulu Advertiser*, 14 December 1958:48) and Eve was engaged to John Anderson (*Honolulu Star-Bulletin*, 29 December 1959:24). Eve and John wed in 1961 and for a time made their home in Honolulu (*Honolulu Star-Bulletin*, 26 February 1961:36), but subsequently they

Figure 25. 1949 Waimānalo Coast aerial photograph (UH SOEST) showing project area

moved to Pāhonu, which, according to several newspaper accounts, continued to function as the site for many social affairs and fundraisers. Eve and John later divorced in 1968 (*Honolulu Advertiser*, 26 September 1968:26). A 1975 aerial photo shows the Anderson Estate–Pāhonu with a tennis court that was built sometime after 1950 (Figure 26). The continued development of beachfront lots is also shown in the aerial photo.

Eve Glover Anderson is a well-known citizen on O‘ahu as an accomplished swimmer, athlete, and outdoorsperson; health, women’s rights, education, environmental and animal advocate and activist; community volunteer; and she was also a former Republican State of Hawai‘i. Representative for District 51 (Waimānalo) from 1995-1996 (State of Hawai‘i House of Representatives 2009:36). Eve Glover Anderson was also the longest tenured resident of Pāhonu, by far, having lived there most of her life (*Honolulu Advertiser*, 10 August 1995:2). In addition to the prominent role the estate played in social and fundraising events, it was also well known as a site location for television and film production, primarily the television show Magnum P.I. (1980-1989) in which the exterior and grounds of Pāhonu were used as the setting of the fictional “Robin’s Nest” estate. Other productions shot at Pahonu included the original Hawaii Five-O television series

4.4.3 Diversified Agriculture

The Waimanalo Sugar Company sold its fee-simple land holdings and the remaining years of its lease of government-owned lands to the Waimanalo Agricultural Development Company (Bartholomew and Associates 1959:17). The Waimanalo Agricultural Development Company then sublet 1- to 20-acre farm lots and up to 150-acre pastoral lots to individual farmers in Waimānalo Valley for diversified agriculture. Following the expiration of the agricultural leases in 1953, the Territorial Government began selling approximately 9-acre agricultural parcels in the central valley, known as the Waimanalo Farm Lots subdivision (Bartholomew and Associates 1959:17). Portions of the former plantation irrigation system, with some modifications, continued to be used to provide water to the Farm Lots.

Circa 1950, the University of Hawai‘i established an approximately 30-acre agricultural research farm known as the Waimanalo Agricultural Experiment Station in the central valley, south of the current project area. Research conducted at the experiment station provided local farmers with scientific knowledge about crops and agricultural practices to improve agricultural production in Hawai‘i. The Waimanalo Agricultural Experiment Station was later expanded to approximately 130 acres; it is located approximately 3.5 km (2.2 miles) northwest of the project area (see Figure 19 and Figure 27).

In 1967, the L.W. Campos Ranch relocated from Kailua to Waimānalo, establishing an approximately 200-acre dairy farm. Campos Ranch was purchased by Foremost Dairies in 1969, which expanded the dairy by acquiring an additional approximately 140 acres for pasture. In 1984, the dairy sub-leased an approximately 21-acre parcel to Universal Synergetics (Unisyn). Unisyn was established to research and develop a commercial anaerobic digestion technology for manure and organic waste conversion into agricultural products or other products to be used by farmers. Unisyn developed a full-scale facility and began converting biomass such as trees, grasses, agricultural wastes, animal manures, ocean plants, garbage, and other wet organic wastes into renewable resources such as soil amendments, irrigation water, heat, steam, electricity, or liquid or gas fuels for transportation (e.g., ethanol) (Hammatt et al. 1999:10–11).

Figure 26. 1975 Waimānalo Coast aerial photograph (UH Army War De), showing project area

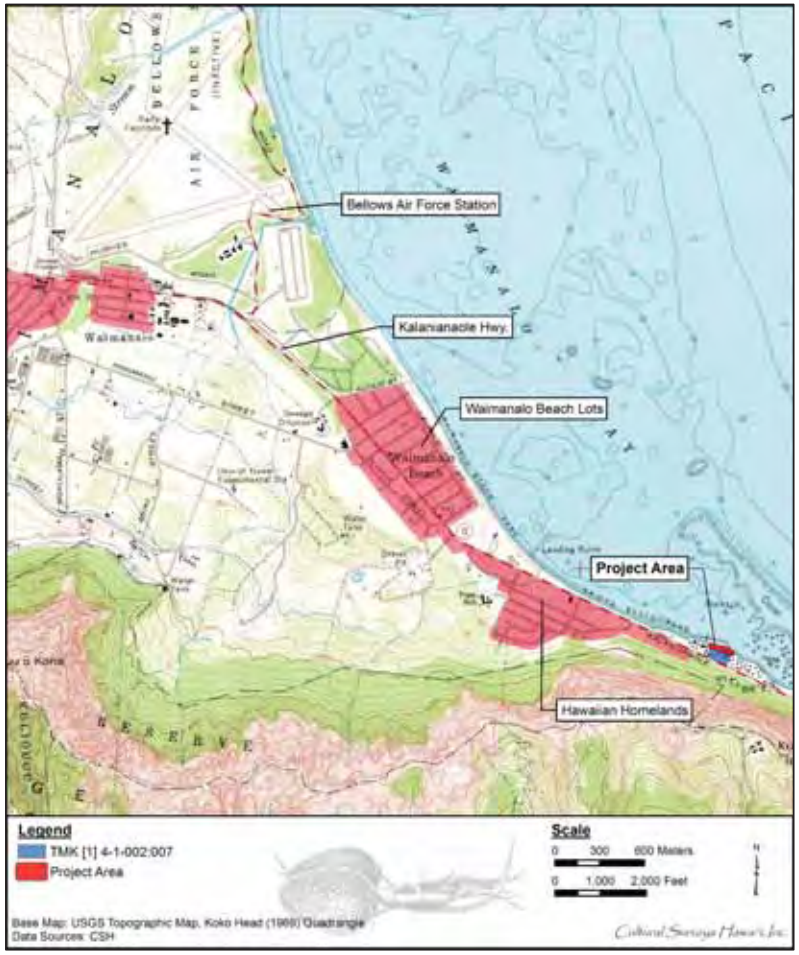

Figure 27. 1969 Koko Head USGS topographic quadrangle showing project area

4.5 Contemporary Land Use

The *mauka* region of Waimānalo is characterized by diversified agricultural lots that include plant nurseries, small-scale truck farms, and horse ranches and stables (Department of Hawaiian Home Lands 2011:17). Residential communities are located both *mauka* and *makai* of Kalaniana‘ole Highway including parcels owned by the Department of Hawaiian Home Lands such as Waimānalo Villages, Kumuhau, Kaka‘ina, and Pine Tree Triangle (Department of Hawaiian Home Lands 2011:9). Small commercial businesses are centered along Kalaniana‘ole Highway, primarily in Waimānalo Town and the *makai* area between Waimānalo Bay State Recreation Area and Waimānalo Beach Park (Department of Hawaiian Home Lands 2011:17). A large portion of the *makai* region of Waimānalo is occupied by the Bellows Air Force Station which continues to be used for military training and recreational purposes. Other recreational activities include horse riding and equestrian facilities such as Town & Country Stables and Waimānalo Polo Club and numerous beach parks along the shore including Bellows Field Beach Park, Waimānalo Bay Beach Park, Waimānalo Beach Park, Kaiona Beach Park, Kaupō Beach Park, and Makapu‘u Beach Park (Department of Hawaiian Home Lands 2011:27).

Section 5 Previous Archaeological Research

5.1 Earliest Archaeological Studies in Waimānalo

One of the earliest archaeological investigations in the Hawaiian Islands took place in Waimānalo. In 1879, Mr. Otto Finsch reported on human burials in sand deposits and associated artifacts in an area that is now Marine Corp Training Area Bellows (MCTAB), formerly Bellows Air Force Station (Finsch 1879). To date, there have been approximately 100 archaeological studies in Waimānalo Ahupua‘a.

In the early 1900s, Thomas G. Thrum attempted to document the *heiau* of the Hawaiian Islands, which he published as part of his “Tales from the Temples” series in the *Hawaiian Annual.* In 1907, he listed the *heiau* for O‘ahu Island, along with any documentation he collected. Only two *heiau* were listed for Waimānalo—Olohana and Pueo. Other than the mention of the names, no further information was included about either *heiau* at the time of the printing. In his discussion of *heiau*, Thrum noted that “Information relative to the Ko‘olau and ‘Ewa districts, as yet, are very meager” (Thrum 1907:60).

In 1930, J. Gilbert McAllister conducted the first systematic survey of archaeological sites on the island of O‘ahu. The fieldwork identified, mapped, and described 384 sites. The Waimānalo and Makapu‘u area sites McAllister identified are listed in the table below (Table 2).

The major foci in archaeological research in Waimānalo has been the Bellows area and to a much lesser extent the Waimānalo State Recreation Area. MCTAB is one of the most extensively studied areas on O‘ahu. Beginning in the 1960s, approximately 70 separate reconnaissance, survey, excavation, and monitoring projects have taken place, most in conjunction with construction activity. Human burials, lithic scatters, soil features and/or occupation layers have been found almost everywhere archaeological investigations have taken place. Possibly, the most important finds occurred in dune deposits adjacent to the mouth of Waimānalo Stream referred to as State Inventory of Historic Places (SIHP) # 50-80-15-018. Radiocarbon dates on charcoal from cultural layers within the dune which placed the earliest occupation to around 300-400 C14 years AD have been much disputed (see for example Dye and Pantaleo 2010) but these deposits are still considered to be among the oldest in Hawai‘i (Cordy and Tuggle 1976; Kirch, 1985:71; Pearson et al. 1971). Much of the research since this discovery of early Bellows Dune occupation has focused on attempting to connect other archaeological finds in more inland areas of Bellows to this early Polynesian settlement. Bellows remains a focus of continuing archaeological research.

Approximately a dozen archaeological studies were carried out at the Waimānalo State Recreation Area just south of MCTAB mostly between 1976 and 1980. There was hope that the occupation layers documented just to the north might be present in the State Recreation Area but findings thus far have been rather disappointing.

Relatively little work has been conducted in Waimānalo Ahupua‘a inland of Kalaniana‘ole Highway. Studies by Barrera (1984), Dixon (1993), and Sinoto and Pantaleo (1993) have reported nothing of significance. Hammatt and Borthwick (1988) and others have documented plantation era infrastructure (e.g., ditches, flumes, tunnels, reservoirs) in surveys of former cane lands. Perzinski et al. (2002) reports three inadvertently disturbed human burials and a cultural layer (SIHP # 50-80-15-5939), which were encountered during construction activities on Department of

Hawaiian Home Lands (DHHL) adjacent to Kalaniana‘ole Highway. These finds were, however, in Jaucas sand deposits close to the coast.

Table 1. McAllister (1933) sites in Makapu‘u and Waimānalo

Site #	Location	Type of Site	Description	Comments
1	Makapu‘u Point, above lighthouse	Kū‘ula	A *pōhaku* image of Malei, a female *kupua* who was the deity for the *uhu* (parrotfish)	Disappeared, probably destroyed
2	Top of Waimānalo Gap	–	Stone pile, 15 x 45 ft and 9 ft high	–
3	Kealakīpapa Valley Rd	Old trail	Trail from Wāwāmalu to Makapu‘u	Trail runs “from a point slightly mountainwards of the lighthouse road up Kealakīpapa Valley, down the Waimānalo gap, and through the village site in Waimānalo”
381	Waimānalo side of Olomana, on the edge of Waimānalo cane field facing Ko‘olau Range	*Heiau* (unnamed)	Approx. 250 ft x 130 ft with two terraces, with some waterworn pebbles and “an amazing amount of old coral scattered throughout the rocks”; site known to E.P. Kaniaupio	McAllister unable to obtain names of two *heiau* (Sites 381, 382); however, he believed it likely the two *heiau* mentioned by Thrum, Pueo and Olohana, probably refer to Site 381 or 382
382	Pōhakunui, Waimānalo	*Heiau* (unnamed)	A small *heiau*, approx. 50 x 90 ft, built on crown of a little hill, at foot of *pali* on mountainward edge of cane field just back of Waimanālo mill	–
383	Haununaniho, near sea side of mill, Waimanālo	Pu‘uhonua	A small hill said to have been famous in olden days as a place of refuge	–
383-A (SIHP # -1037)	Pāhonu	Pond	A pond approx. 500 ft x 50 ft; turtles raised here for use by *ali‘i*	Located at Shriners Beach

Site #	Location	Type of Site	Description	Comments
384	Kaupō Village complex	Various	“In its prime, it consisted of a few fishing huts, a fishing shrine (*ko‘a*), and possibly a small *heiau*”; lists sites o, j, b, k, n, e as being most important	–
384-a	Kaupō Village complex	Sand-floored enclosure, 5 x 14 paces	Well-preserved, with two wide 3-4-ft high entrances; lava tube near inland end 15 ft long x 2-3-ft high, with adjoining clear area 25 ft x 30 ft marked by line of stones	–
384-b	Kaupō Village complex	Lava tube and habitation site	“Ruins centered around a lava tube,” 15 ft long, 4 ft high, floor 10 ft wide; entrance faced and stepped; wall surrounds tube with small enclosure in NW corner, with cache in one of the walls	Excavation found: four bone buttons, one pearl button, a rib fragment (human?), and pelvis of a small animal; lava tube inhabited until “recently” by Kakilaka, “a Hawaiian hermit who avoided contact even with his own people”
384-c	Kaupō Village complex	Lava bubble shelter	Sanded floor, 37 ft diameter with dome-like 6-ft-high ceiling, with center opening	Found bits of ash, charcoal, *‘opihi* (limpet) and cowrie shell on floor
384-d	Kaupō Village complex	Many enclosures	“Varying sizes and workmanship”	–
384-e	Kaupō Village complex	Portion of old roadway	14 ft wide and bordered by walls 2 ft high, part of it paved with flat slabs of lava	“. . . paved and bordered by walls, would seem not to have been needed by the Hawaiians before pack animals and vehicles came into use.”
384-f	Kaupō Village complex	Present roadway	–	–
384-g	Kaupō Village complex	Lava block wall	Irregular, narrow, 3 ft high	–
384-h	Kaupō Village complex	Low walled enclosure	20 ft x 95 ft; walls on all sides except inland side; inner wall separates eastern third	–

Site #	Location	Type of Site	Description	Comments
384-i	Kaupō Village complex	Platform	Well-built, 3 ft high on *makai* side, paved with small rough lava; rocks at base of wall placed on end	–
384-j	Kaupō Village complex	Possible *heiau*	“Only a corner of a very old platform, which suggests a *heiau*, remains”; 5 ft high, constructed of lava blocks evenly fitted to form faces, adjoining is old weathered coral wall 3 ft high	McAllister based his suggested function of *“heiau”* on style of construction; also, “. . . the construction of the present highway obliterated the greater portion of the site”; memo in SHPD files confirms this
384-k	Kaupō Village complex	Large rectangular enclosure	79 x 110 ft. x 5 ft high before its top stones had been removed; two smaller walled enclosures adjoining it on north	McAllister notes at the time of the survey, the site “. . . which is now pointed out as a *heiau*, was undoubtedly a cattle pen. If it was ever a *heiau*, all features have been completely obliterated.”
384-l	Kaupō Village complex	Small platform	Platform surrounded by large lava blocks on end and paved with small fragments of lava and coral	–
384-m	Kaupō Village complex	Enclosures (2)	5 ft x 10 ft with walls 3-4 ft high and 2 ft thick; 30 ft x 60 ft outlined rectangle lies east of it and similar one on west	–
384-n	Kaupō Village complex	Probable house site	“a slightly elevated area” 10 x 20 ft with low walls on three sides	–
384-o	Kaupō Village complex	Fishing shrine (*ko‘a*)	Approximately 10 ft high with uneven surface 15 ft x 25 ft	“Unique in its lack of small pieces of coral … and in being built just off shore … It is said that the top was formerly evenly paved, forming a level platform.”

Archaeological studies near the current project area are listed and briefly summarized in Figure 28 and Table 3. This section serves as an overview of all previous archaeology near the current project area. Historic properties near the project area are depicted in Figure 29.

5.2 Recent Archaeological Studies in Vicinity of Project Area

5.2.1 Sterling and Summers 1978

Sites of O‘ahu was first published in 1962 as a compilation of McAllister’s 1933 work along with history, tradition, legend, place names, and land descriptions from several different sources. Reprinted in 1978, the work provided a comprehensive volume pertaining to O‘ahu archaeology. Charles Alona, a local informant, whose interviews are a part of the Bishop Museum Hawaiian Ethnographic Notes (HEN) Collection, some of which were included in *Sites of O‘ahu* (Alona 1939 in Sterling and Summers 1978), identified two sites near the current project area. Site 21 was a large rock, *Kini*, a female rock that attracted *akule* and *ō‘io* fish. It is located 408 m (1,339 ft) to the southeast of the current project area and was originally closer to the coast but moved inland when the road was built (Alona 1939 in Sterling and Summers 1978:149-250). Approximately 1 km (0.62 miles) to the southeast of the current project area is *Kaluahine Ko‘a*, a small, stacked rock fish shrine (Alona 1939 in Sterling and Summers 1978:251). *Pōhaku Pa‘akikī* was identified by one of the authors, Catherine C. Summers, in 1954. It is a stacked rock mound, approximately 1.75 km (1.1 miles) from the current project area, at the shore of Kaupō Beach. At low tide, *Pōhaku Pa‘akikī*, rises out of the water and at high tide, it is in the water (Sterling and Summers 1978:252). Sites 21–23 do not have designated SIHP #s.

5.2.2 Hammatt 1988

CSH conducted archaeological reconnaissance of a 3.9-acre parcel adjacent to the west side of Sea Life Park. The parcel had been levelled and filled, likely during the construction of Kalaniana‘ole Highway. Despite historic properties being present in the surrounding area (Kaupō Village), no sites had been recorded within the study area before the parcel was modified.

5.2.3 Medical Examiner 1988a and 1988b

The City and County of Honolulu Police Department and the Department of Medical Examiner investigated two burials at Kaiona Beach Park in Waimānalo. Two reports regarding the burials were written, however, these reports are not publicly available.

5.2.4 UH Marine Option Program 1999

The University of Hawai‘i Marine Option Program (1999) conducted an underwater survey of the remains of Waimānalo Landing, in the near-shore waters of Waimānalo Beach Park. The remains of the pier, machinery, pilings, loading equipment, and various other material remains were observed, though no SIHP number was assigned to the site area

5.2.5 McGuire and Hammatt 2000

McGuire and Hammatt (2000) conducted archaeological monitoring during the installation of light poles at a ball-field at Waimānalo Beach Park. No cultural material was observed.

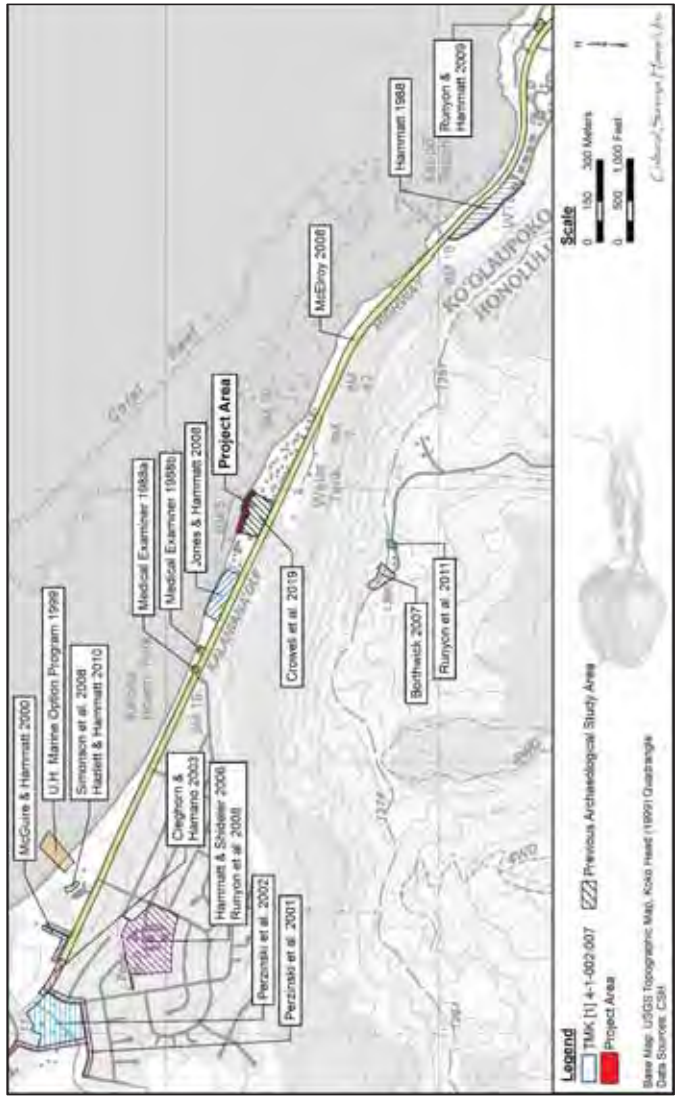

Figure 28. Previous archaeological studies near the present project area

Table 2. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results
McAllister 1933	Island-wide survey	O'ahu	Identified three *heiau* (Sites 380, 381, and 382), a *pu'uhonua* (place of refuge) (Site 383), a fishpond (Site 383-A/ SIHP # -1037), and abandoned coastal village (Site 384)
Sterling and Summers 1978	Compilation	O'ahu	Three sites identified *Kini* (Site 21), *Kaluahine Ko'a* (Site 22), and *Pohaku Paakiki* (Site 23)
Hammatt 1988	Archaeological reconnaissance	3.9-acre parcel adjacent to Sea Life Park, Waimānalo	No findings; parcel had been leveled and filled
Medical Examiner 1988a	Police and Medical Examiner's reports	Kaiona Beach Park, Waimānalo	Not available
Medical Examiner 1988b	Police and Medical Examiner's reports	Kaiona Beach Park, Waimānalo	Not available
UH Marine Option Program 1999	Underwater survey	Waimānalo Landing	Documents machinery, pilings, and various pieces of loading equipment
McGuire and Hammatt 2000	Archaeological monitoring	Waimānalo Beach Park	No cultural materials observed, no historic properties identified
Perzinski et al. 2001	Archaeological monitoring	Roadways *mauka* of Kalaniana'ole Hwy and Waimānalo Beach Lots subdivision	No historic properties identified
Perzinski et al. 2002	Archaeological monitoring	*Kupuna* housing project, *mauka* of Kalaniana'ole Hwy	Three human burials and a cultural layer (SIHP # 50-80-15-5939) identified within Jaucas sand

Reference	Type of Study	Location	Results
Cleghorn and Hamano 2003	Archaeological monitoring	Sandwich Isles Communications Rural Fiber Optic Ductlines Project (TMK: [1] 4-1-037:001–003)	One historic property identified consisting of a small charcoal pit and historic road bed (SIHP # 50-80-15-6518) and assessed as not significant
Hammatt and Shideler 2006	Archaeological literature review and field inspection	Blanche Pope Elementary School, Waimānalo	Archaeological monitoring program recommended because of presence of three burials and a cultural layer at a site 500 m to northwest of the school
Borthwick 2007	Archaeological field inspection	HECO site, Kamehame Ridge	No historic properties identified
Jones and Hammatt 2008	Archaeological monitoring	Proposed Wastewater System and Utilities Upgrades at Kaiona Beach Park (TMK: [1] 4-1-003:016)	Two historic properties identified, SIHP #s 50-80-15-6751, two separate cultural layers, and 50-80-15-6752, three separate burial events containing four individuals total
McElroy 2008	Archaeological monitoring	Kalaniana‘ole Hwy ROW, Sandy Beach Park to Waimānalo Beach Park	Eight isolated artifacts (pre- and post-Contact) throughout project corridor; one historic property identified: a disturbed cultural layer, SIHP # 50-80-15-6696, a temporary use marine exploitation site
Runyon et al. 2008	Archaeological monitoring	Blanche Pope Elementary School, Waimānalo	No cultural materials observed, no historic properties identified
Simonson et al. 2008	Archaeological inventory survey	Waimānalo Beach Park for reconstruction of wastewater system	One site near coast, northwest of project area; SIHP # 50-80-15-7042, a pre-Contact subsurface cultural layer

Reference	Type of Study	Location	Results
Runyon and Hammatt 2009	Archaeological monitoring	Makapu‘u Beach Park reconstruction of wastewater systems project	Documentation associated with Kaupō Village, a Hawaiian fishing village established during early 1850s, indicates village was partially within today’s Makapu‘u Beach Park; no archaeological cultural deposits identified as a result of project’s monitoring program
Hazlett and Hammatt 2010	Archaeological monitoring	Waimānalo Beach Park for reconstruction of wastewater system	Only sparse cultural material observed (disarticulated animal bone, a soda bottle, and two pit features)
Runyon et al. 2011	Archaeological literature review and field inspection	DAGS Radio Facilities project at Kamehame Ridge location on summit of Ko‘olau Ridge overlooking present project area	One historic property designated (SIHP # 50-80-14-7191); consisting of two concrete foundations related to a former Nike military Oahu Defense Area (OA) facility, OA-32
Crowell et al. 2019	Archaeological inventory survey	Waimānalo Paradise Subdivision Project, (present project) TMK: [1] 4-1-002:007	Three newly identified historic properties were documented within the project area: SIHP # 50-80-15-8747, former Anderson Estate–Pāhonu remnants, assessed as not significant due to insufficient integrity; historic property previously demolished and therefore retains only integrity of location SIHP # 50-80-15-8748, a pre- to late post-Contact subsurface cultural layer SIHP # 50-80-15-8749, human burial, SIHP # -8749 designated as a separate site per consultation with SHPD History & Culture Branch, but burial is in a cultural/ archaeological association with SIHP # -8748 cultural layer

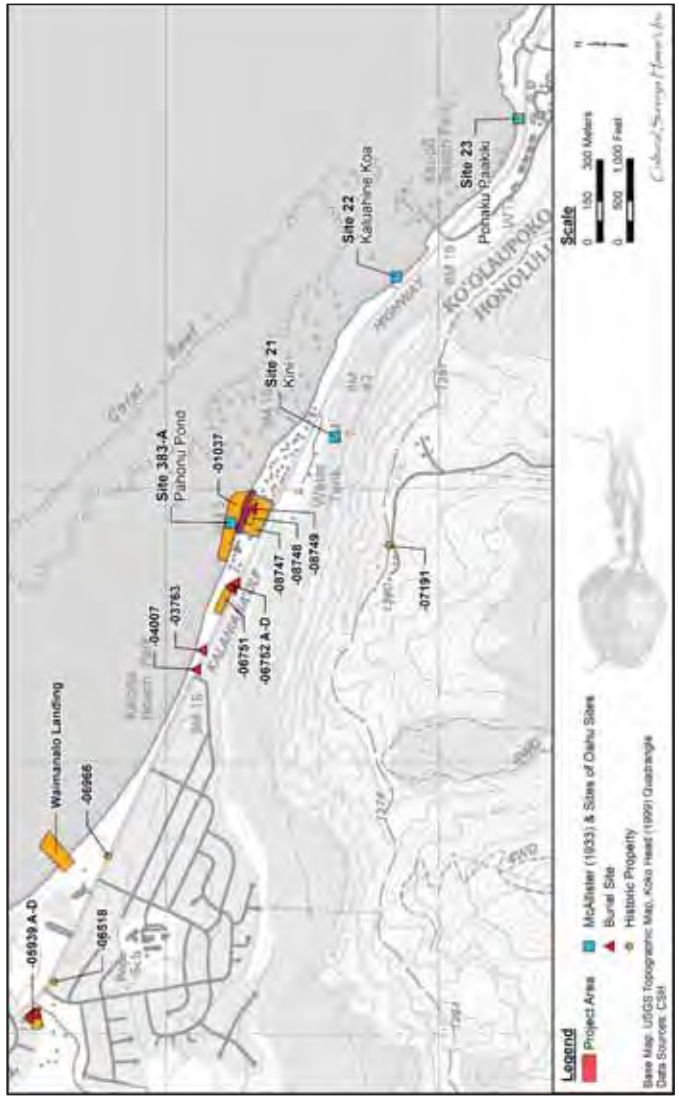

Figure 29. Previously identified historic properties in the vicinity of the project area (Sites of O‘ahu Sites 21–23 do not have designated SIHP #s)

5.2.6 Perzinski et al. 2001

CSH conducted archaeological monitoring of the installation of fiber optic cable lines along roadways *mauka* of Kalaniana‘ole Highway and the Waimānalo Beach Lots subdivision (Perzinski et al. 2001). No historic properties were identified.

5.2.7 Perzinski et al. 2002

CSH conducted archaeological monitoring during the construction of a *kupuna* housing project, *mauka* of Kalaniana‘ole Highway (Perzinski et al. 2002). Three human burials and a cultural layer (SIHP # 50-80-15-5939) were encountered during construction activities within Jaucas sand.

5.2.8 Cleghorn and Hamano 2003

Pacific Legacy conducted archaeological monitoring for the Sandwich Isles Communications Rural Fiber Optic Ductlines Project (TMK: [1] 4-1-037:001-003). One historic property identified consisting of a small charcoal pit and historic road bed (SIHP # 50-80-15-6518) and assessed as not significant.

5.2.9 Hammatt and Shideler 2006

CSH performed a literature review and field inspection (Hammatt and Shideler 2006) at six Department of Education (DOE) schools, including Blanche Pope Elementary in Waimānalo, in support of wastewater improvement projects at the schools. An archaeological monitoring program was recommended for the wastewater improvement project because of the presence of three human burials and a cultural layer at a site (SIHP # 50-80-15-5939) 500 m to the northwest of the school.

5.2.10 Borthwick 2007

CSH conducted an archaeological field inspection and surface survey (Borthwick 2007) of all accessible portions of a proposed communication project on the Ko‘olau Ridge summit at the top of Kamehame Ridge. The ridge-top site had been heavily modified through cutting, filling, and grading during the construction of the existing structures at the site. CSH recommended consultation with SHPD because of the presence of World War II and Cold War era military infrastructure and the potential for the interruption or barrier to access of the Ko‘olau Summit Ridgeline Trail.

5.2.11 Jones and Hammatt 2008

CSH conducted archaeological monitoring during wastewater system and utility upgrades at Kaiona Beach Park in coastal Waimānalo. Two subsurface cultural layers (SIHP # 50-80-15-6751 Features A and B) and four human burials (SIHP # 50-80-15-6752 Features A–D) were encountered during excavations in Jaucas sand.

5.2.12 McElroy 2008

Garcia and Associates (GANDA) completed archaeological monitoring (McElroy 2008) of the construction and installation of new fiber optic duct lines in the Kalaniana‘ole Highway ROW from Sandy Beach Park, along the southeast shore of O‘ahu, to Waimānalo Beach Park. Eight isolated artifacts were collected throughout the project corridor and included a basalt canoe breaker, a triangular stone, four glass bottles, and two shells with possible drilled holes. A disturbed cultural layer was identified near Muliwai‘ōlena Stream in Waimānalo and it was

designated SIHP # 50-80-15-6696. SIHP # -6696 contained pre- and post-Contact cultural material as well as modern material and was interpreted as a temporary use marine exploitation area.

5.2.13 Runyon et al. 2008

CSH reported on archaeological monitoring of a wastewater improvement project at Blanch Pope Elementary in Waimānalo. Archaeological monitoring was carried out following the completion of a literature review and field inspection (Hammatt and Shideler 2006). No cultural materials were observed, and no historic properties were identified.

5.2.14 Simonson et al. 2008

CSH conducted an archaeological inventory survey (Simonson et al. 2008) at Waimānalo Beach Park for reconstruction of wastewater system. A pre-Contact subsurface cultural layer containing midden (marine shell, sea urchin, faunal bone, coral and mammal bone), fire-cracked rock, charcoal deposits, and lithic debitage (basalt flakes) was identified and designated SIHP # 50-80-15-7042.

5.2.15 Runyon and Hammatt 2009

CSH (Runyon and Hammatt 2009) reported on archaeological monitoring for a Makapu’u Beach Park reconstruction of wastewater systems project. Documentation associated with Kaupō Village, a Hawaiian fishing village established during the early 1850s, indicates the village was partially within today’s Makapu‘u Beach Park. No archaeological cultural deposits were identified during the monitoring.

5.2.16 Hazlett and Hammatt 2010

During archaeological monitoring of the Waimānalo Beach Park for reconstruction of wastewater system project area (Hazlett and Hammatt 2010) only sparse cultural material was observed (disarticulated animal bone, a soda bottle, and two pit features).

5.2.17 Runyon Shideler, and Hammatt 2011

CSH (Runyon, Shideler, and Hammatt 2011) prepared an archaeological literature review and field inspection report for a DAGS Radio Facilities project at a Kamehame Ridge location on the summit of the Ko‘olau Ridge overlooking the present project area. One historic property was designated (SIHP # 50-80-14-7191), consisting of two concrete foundations related to a former Nike military Oahu Defense Area (OA) facility, OA-32. According to background research, the facility was in operation from March 1961 through March 1970. As the existing structure remnants are 50 years or older, they were historic properties. This study developed substantial information on the Nike complex

5.2.18 Crowell et. al. 2019

CSH conducted an AIS for the current project parcel (TMK: [1] 4-1-002:007) for the Waimānalo Paradise Subdivision project (Crowell et al. 2019). The AIS fieldwork originally consisted of ten test excavations (T-1 through T-10) completed between 9 and 13 July 2018. Following the completion of the initial ten test excavations, six additional test excavations were conducted (T-11 through T-16). Two additional test excavations (T-11 and T-12) were excavated east of T-6 within the footprint of the proposed new construction. Three additional excavations (T-13, T-14, and T-15) were excavated south and east of T-6 based on the results of the T-6

excavation and an additional 2.3 m (7.5 ft) extension of T-6 was excavated to the north. One additional test excavation (T-16) was excavated at the south end of the property, perpendicular to the perimeter wall. CSH conducted additional fieldwork between 25 and 30 July 2018, providing archeological monitoring of geotechnical boring in the project area.

Three newly identified historic properties were documented including the Anderson Estate-Pāhonu remnants (SIHP # 50-80-15-8747) distinguished by 12 features; a culturally expressed A horizon (SIHP # 50-80-15-8748) distinguished by 14 features; and a human burial (SIHP # 50-80-15-8749).

The boundaries of the historic property were determined to be the entire former estate property (TMK: [1] 4-1-002:007). A total of 12 extant features of the historic property (SIHP # 50-80-15-8747) were identified during the AIS. These are distributed throughout the project area and include two extant buildings consisting of a gate/guesthouse (Feature 1) and a pool/boathouse and boat ramp (Feature 2), four structures consisting of a perimeter wall on east, south, and west boundaries (Feature 3), landscape terraces/decorative feature on the south perimeter wall (Feature 4), seawall and stairs on the north boundary (Feature 5), and tennis court (Feature 6), and five structural remnants consisting of one large concrete pad and foundation of the former main house (Feature7), three partially demolished sidewalls (Feature 8 through Feature 10), one subsurface wall remnant (Feature 11), and a subsurface privy/cesspool remnant (Feature 12).

SIHP # -8748 was documented in nine test excavations (T-1, T-5, T-6, T-8, T-11, T-12, T-13, T-14, and T-15) (Figure 30) and dispersed midden. In the eight test excavations that contained features, the midden material observed and sampled from both the A horizon and the features were consistent: marine shells, turtle shell, faunal osseous remains (mainly pig, but also dog), fish bone, sea urchin, fire-affected rock (FAR), and charcoal. The distribution of the midden was not consistent, however, either within each test excavation or across the site, and no appreciable concentrations were observed in any of the test excavations. Midden materials were lightly and spottily distributed throughout the A horizon and in four test excavations (T-6, T-8, T-12, and T-13) were mixed with late-nineteenth/early twentieth century materials. Only a few traditional Hawaiian artifacts, or historic materials, were identified and collected from the A horizon in eight of 16 test excavations.

SIHP # -8749 consists of a single set of human remains in the north central portion of the project area. SIHP # -8749 is a primary, in situ sub-adult human burial documented in T-6 within the culturally enriched A horizon (SIHP # -8748) between 143-150 cmbs. SIHP # -8749 is designated as a separate site per consultation with the SHPD History & Culture Branch, but the burial is in a cultural/archaeological association with the SIHP # -8748 cultural layer.

A total of 31 artifacts were collected during the project. This includes seven traditional artifacts, 23 historic artifacts, and a *Conus* shell. The traditional artifacts consist of one hammerstone, three *‘ulu maika*, one stone sinker, one squid/octopus lure, and one canoe anchor/breaker. The historic artifacts include 14 glass bottle or bottle fragments, one milk glass jar, one pressed glass tumbler, one ceramic hollowware fragment, two ceramic tableware fragments, four metal fragments, one shell button, and five milled wood fragments.

Figure 30. Aerial photo of the project area showing proposed new construction footprint and excavated archaeological test excavations

.

Various faunal osseous materials were collected from ten test excavations (T-1, T-5, T-6, T-8, T-9, and T-11 through T-15). The identified faunal remains include cow (*Bos taurus*), pig (*Sus scrofa*), goat (*Capra hircus*), dog (*Canis lupus familiaris*), bird (Aves), turtle (Cheloniidae), fish (Osteichthyes), shark (Selachimorpha), sea urchin (*Heterocentrotus mamillatus*), and rat (*Rattus rattus*), as well as various fragments belonging to medium mammals (inconsistent with human morphology).

Section 6 Community Consultation

6.1 Introduction

Throughout the course of this assessment, an effort was made to contact and consult with Native Hawaiian Organizations (NHOs), agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise/and or knowledge of the *ahupua‘a* of Waimānalo. CSH initiated its outreach effort in August 2019 through letters, email, telephone calls, and in-person contact. CSH completed the community consultation in October 2019.

6.2 Community Contact Letter

Letters (Figure 31, Figure 32, and Figure 33) along with a map and aerial photograph of the project area were mailed with the following text.

> At the request of HHF Planners, on behalf of Waimanalo Paradise LLC, Cultural Surveys Hawai‘i, Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Waimānalo Paradise Seawall Repair Project, Waimānalo Ahupua‘a, Ko‘olaupoko District, O‘ahu Island, Tax Map Keys (TMK): [1] 4-1-002:021 & 022. The seawall project area is located at 41-505 Kalaniana‘ole Highway and includes approximately 0.17 acres of the two TMKs, which encompass a total of 3.005 acres. An oblique aerial image of the seawall project area is included as (Figure 1) and the project area is also depicted on a portion of the 1999 Koko Head U.S. Geological Survey (USGS) topographic quadrangle map (Figure 2) and a 2013 Google Earth aerial photograph (Figure 3).
>
> Waimanalo Paradise LLC is the owner of two residential oceanfront parcels in Waimānalo adjacent to a historical Pāhonu (turtle pond). The property was recently subdivided into two (2) parcels. The two contiguous parcels are bordered by Kalaniana‘ole Highway to the west (*mauka*), residential parcels to the east, the Shriners Beach Club to the west, and the Pacific Ocean to the north (*makai*). The properties are fronted by a seawall constructed of stone and concrete grout that was constructed between 1911 and 1928.
>
> The seawall is 585 feet long with a crest elevation that ranges from +11.0 feet mean sea level (msl) to +5.0 feet (msl). The seawall can be categorized into seven (7) segments (1, 2, 3A, 3B, 3C, 4, and 5) based on observed differences in height and profile along the wall length.

Wall	Lot	Length	Crest Elevation
1	021	65	+11.0 feet (msl)
2	021	65	+11.0 feet (msl)
3A	021	95	+11.0 feet (msl)
3B	021	30	+8.0 feet (msl)

3C	021	75	+7.0 feet (msl)
4	022	135	+5.0 feet (msl)
5	022	120	+5.0 feet (msl)

> A structural analysis of the seawall identified various damages and structural deficiencies including cracks, delamination, spalling, abrasion, undermining, and sinkholes. Portions of the wall have inadequate resistance to design soil and design wave loads. An engineering alternatives analysis was conducted to evaluate options to repair, retrofit, or replace the seawall. The retrofit option was selected as the preferred alternative.
>
> The following repairs will be performed for all wall sections:
>
> - Repair delaminations and spalls from isolated small steel connections and random embedded steel at the front surface of the wall.
> - Patch vertical and diagonal cracks to mitigate potential loss of fines through cracks.
> - Repoint and parge shallow and more deeply abraded and missing front surface mortar.
> - Fill undermined areas at the toe of the wall with tremie concrete, remove material susceptible to scour at the toe of the wall as is feasible and fill the void with tremie concrete to increase scour resistance at the wall base.
> - Replace missing, settled and spalled concrete masonry unit (CMU) wall extensions with new reinforced concrete wall extensions.
>
> The following additional repairs will be performed by individual wall section:
>
> - Wall 1 – Delaminated areas of the top cap of the splash guard will be removed and replaced.
> - Wall 2 – Delaminated areas of the top cap of the splash guard will be removed and replaced.
> - Wall 3A – Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2.
> - Wall 3B – Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2.
> - Wall 3C – Remove and replace delaminated areas of the top cap of the splash guard. Increase wall crest elevation from +7.0 feet (msl) to +9.0 feet (msl).

- Wall 4 – Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl).
- Wall 5 – Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. Reconstruct a 15-foot section of wall that was previously removed. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl).

Construction is planned to commence September 2020 and be completed by March 2021.

The purpose of this CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project. We are seeking your kōkua and guidance regarding the following aspects of our study:

- **General history as well as present and past land use of the project area**
- **Knowledge of cultural sites which may be impacted by future development of the project area—for example, historic and archaeological sites, as well as burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as mo‘olelo and traditional uses.**
- **Referrals of kūpuna or elders and kama‘āina 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 or in the vicinity of the project area.**

Cultural Surveys Hawai‘i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawai‘i 96734 Ph. (808) 262-9972 Fax: (808) 262-4981

Job code: WAIMANALO 37 hhammatt@culturalsurveys.com www.culturalsurveys.com

August 2019

Aloha,

At the request of HHF Planners, on behalf of Waimanalo Paradise LLC, Cultural Surveys Hawai‘i, Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Waimānalo Paradise Seawall Repair Project, Waimānalo Ahupua‘a, Ko‘olaupoko District, O‘ahu Island, Tax Map Keys (TMK): [1] 4-1-002:021 & 022. The seawall project area is located at 41-505 Kalaniana‘ole Highway and includes approximately 0.17 acres of the two TMKs, which encompass a total of 3.005 acres. An oblique aerial image of the seawall project area is included as Figure 1 and the project area is also depicted on a portion of the 1999 Koko Head U.S. Geological Survey (USGS) topographic quadrangle map (Figure 2) and a 2013 Google Earth aerial photograph (Figure 3).

Waimanalo Paradise LLC is the owner of two residential oceanfront parcels in Waimānalo adjacent to a historical Pāhonu (turtle pond). The property was recently subdivided into two (2) parcels. The two contiguous parcels are bordered by Kalaniana‘ole Highway to the west (*mauka*), residential parcels to the east, the Shriners Beach Club to the west, and the Pacific Ocean to the north (*makai*). The properties are fronted by a seawall constructed of stone and concrete grout that was constructed between 1911 and 1928.

Figure 1. Oblique aerial image of the seawall repair project area

Figure 31. Community Contact Letter Page 1

WAIMANALO 37 – CIA for the Waimanalo Paradise Seawall

Page 2

The seawall is 585 feet long with a crest elevation that ranges from +11.0 feet mean sea level (msl) to +5.0 feet (msl). The seawall can be categorized into seven (7) segments (1, 2, 3A, 3B, 3C, 4, and 5) based on observed differences in height and profile along the wall length.

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A structural analysis of the seawall identified various damages and structural deficiencies including cracks, delamination, spalling, abrasion, undermining, and sinkholes. Portions of the wall have inadequate resistance to design soil and design wave loads. An engineering alternatives analysis was conducted to evaluate options to repair, retrofit, or replace the seawall. The retrofit option was selected as the preferred alternative.

The following repairs will be performed for all wall sections:

- Repair delaminations and spalls from isolated small steel connections and random embedded steel at the front surface of the wall.
- Patch vertical and diagonal cracks to mitigate potential loss of fines through cracks.
- Repoint and parge shallow and more deeply abraded and missing front surface mortar.
- Fill undermined areas at the toe of the wall with tremie concrete, remove material susceptible to scour at the toe of the wall as is feasible and fill the void with tremie concrete to increase scour resistance at the wall base.
- Replace missing, settled and spalled concrete masonry unit (CMU) wall extensions with new reinforced concrete wall extensions.

The following additional repairs will be performed by individual wall section:

- Wall 1 – Delaminated areas of the top cap of the splash guard will be removed and replaced.
- Wall 2 – Delaminated areas of the top cap of the splash guard will be removed and replaced.
- Wall 3A – Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2.
- Wall 3B – Remove and replace delaminated areas of the top cap of the splash guard. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2.
- Wall 3C – Remove and replace delaminated areas of the top cap of the splash guard. Increase wall crest elevation from +7.0 feet (msl) to +9.0 feet (msl).

Figure 32. Community Contact Letter Page 2

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Page 3

- Wall 4 – Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl).
- Wall 5 – Remove delaminated and spalled splash guard and replace with a new reinforced concrete splash guard. At sinkholes, excavate to base of wall, install geotextile fabric, and fill sinkholes. Install concrete width extension to provide similar resistance to design overturning forces as Walls 1 and 2. Reconstruct a 15-foot section of wall that was previously removed. Increase wall crest elevation from +5.0 feet (msl) to +9.0 feet (msl).

Construction is planned to commence September 2020 and be completed by March 2021.

The purpose of this CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project. We are seeking your *kōkua* and guidance regarding the following aspects of our study:

- **General history as well as present and past land use of the project area**
- **Knowledge of cultural sites which may be impacted by future development of the project area—for example, historic and archaeological sites, as well as burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as *mo'olelo* and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama'āina* 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 or in the vicinity of the project area.**

In advance, we appreciate your assistance in our research effort. If you are interested in participating in this study, please contact Kamuela Kaapana at kkaapana@culturalsurveys.com. We are also available by phone at (808) 262-9972.

Mahalo nui loa,

Kamuela Kaapana
Cultural Researcher

Figure 33. Community Contact Letter Page .

6.3 Community Contact Table

Below in Table 3 are names, affiliations, dates of contact, and comments from NHOs, individuals, organizations, and agencies contacted for this project. Results are presented below in alphabetical order and correspondence is included only from individuals who gave permission to have their statements published.

Table 3. Community Contact List

Name	Affiliation	Comment
Ahuna, Harold	*Kama‘āina*	Meeting set up through daughter, Cheryl on 11 Oct 2019 Ahuna ‘Ohana was recommended to interview. Interviewed on 11 Oct 2019 at home in Niu Valley.
Ahuna, Cheryl	*Kama‘āina*	Letter and figures sent via email on 6 September 2019 Meeting set up on 11 October 2019 via text message. Interviewed at father’s home in Niu Valley on 11 October 2019. CSH sent email on 31 October 2019 interview summary draft.
Aikau, Clyde	Aikau Pure Hawaiian Surf Academy, Waikiki Stakeholder	Letter and Figures sent via USPS 30 August 2019
Aila, Jr., William	Chairman, Department of Hawaiian Home Lands	Letter and Figures sent via USPS 30 August 2019 Letter and Figures sent via email 3 September 2019
Aloha Shriners Beach Club		Letter and Figures sent via USPS 3 September 2019 Letter and Figures sent via email 3 September 2019
Aquino, Kamakana	Waimānalo Hawaiian Homes Association	Letter and Figures sent via USPS 30 August 2019
Cypher, Mahealani	Ko‘olaupoko Hawaiian Civic Club	Letter and Figures sent via USPS 30 August 2019 Letter and Figures sent via email 3 September 2019 Ms. Cypher replied via email 3 September 2019 CSH replied via email 17 September 2019

Feiteira, Blossom	President, Association of Hawaiians for Homestead Lands	Letter and Figures sent via USPS 3 September 2019
Hanawahine, Roxanne	Na ‘Ohana o Puaoi a me Hanawahine (NHO)	Letter and Figures sent via USPS 30 August 2019 Letter and Figures sent via email 3 September 2019
Hewett, Alice P.	President, Ko‘olaupoko Hawaiian Civic Club	Letter and Figures sent via USPS 30 August 2019
Hilo, Regina	Burial Sites Specialist, SHPD	Letter and Figures sent via email 3 September 2019
Ho, Wilson Kekoa	Chair, Waimānalo Neighborhood Board No. 32	Letter and Figures sent via USPS 3 September 2019
Ho-Lastimosa, Ilima	God’s Country Waimānalo (NHO)	Letter and Figures sent via USPS 30 August 2019 Letter and Figures sent via email 3 September 2019
Hussey, Sylvia	Interim CEO, Office of Hawaiian Affairs	Letter and Figures sent via USPS 30 August 2019
Ito, Wallace K.	Limu Hui Coordinator, KUA	Letter and Figures sent via email 3 September 2019
Kala‘i, Kamuela	*Kama‘āīna*	Letter and Figures sent via email 3 September 2019 Ms. Kala‘i replied 3 September 2019: *Pehea oe? He makani olu keia.* *Ae loa!* *E hui pū kāua no na mo'olelo hoihoi o keia one hānau o ku'u mau kamali'i a me kona ohana o kou lāua mākuakāne a me na Kūpuna.* *Mahalo nui!* CSH responded to email on 3 September 2019 to set up interview: *Mahalo kou ae ana mai no ka hui pu ana.* *Pehea keia poalima, la 6 o Kepakemapa, ma kahi o ka hola 10am? Noonoo aela au, e hui pu kaua ma Kaiona a hiki ke kamailio e pili ana i na moolelo no nei wahi a me na moolelo like ole o Waimanalo.*

		Ina aole hiki ke hui pu i kela la, e hai wale mai i ka manawa kaawale nou. Ms. Kalai agreed to the meeting date and time via email on 5 September 2019. CSH emailed Ms. Kala‘i on 14 October 2019 interview summary for review, edits, additions and comments. Ms. Kala‘i replied to email on 15 October 2019 with edits and additions/corrections to interview summary. CSH revised interview summary and emailed new draft on 16 October 2019. Ms. Kala‘i approved new draft on the same day.
Kalama, Charlani	*Kama‘āina*	Letter and Figures sent via email 3 September 2019
Kalima, Kalani	*Kama‘āina* and fisherman of Waimānalo President, Waimānalo Hawaiian Civic Club	Letter and Figures sent via email 3 September 2019 CSH followed up with Mr. Kalima on 5 November 2019 regarding approval of Mr. Kalima and his father’s previous consultation for Burial Treatment Plan and inclusion in CIA report.
Kanahele, Dennis “Bumpy”	Aloha First (NHO)	Letter and Figures sent via USPS 30 August 2019
Kassebeer, Louana	Waimānalo Health Center, Community Ourteach & Education Worker	Letter and Figures sent via USPS 30 August 2019
Keeno, Kaleo	Lāhui Kaka‘ikahi (NHO)	Letter and Figures sent via USPS 30 August 2019
Kia, Ewa	*Kama‘āina*	Letter and Figures sent via USPS 30 August 2019
Koa, Maynard “Beanie”	Pelekikena, Hawaiian Civic Club of Waimanalo	Letter and Figures sent via USPS 30 August 2019
Ko‘olaupoko Hawaiian Civic Club		Letter and Figures sent via USPS 30 August 2019 Ms. Cypher replied on behalf of the Ko‘olaupoko Hawaiian Civic Club 3 September 2019

Kukea-Schultz, Kanekoa	Executive Director, Kako‘o ‘Oiwi	Letter and Figures sent via USPS 3 September 2019
Lee, Chris	Representive, House District 51	Letter and Figures sent via USPS 3 September 2019
Loa, Geraldine	*Kama‘āina* of Waimānalo; Department of Hawaiian Homelands	Letter and Figures sent via USPS 30 August 2019
Luthy, Tamara	Ethnographer, SHPD	Letter and Figures sent via email 3 September 2019
Manu	Hawaiian Island Café	Letter and Figures sent via in person on 27 September 2019
Migita, Clifford	Waimānalo Agricultural Association	Letter and Figures sent via USPS 30 August 2019 Letter and Figures sent via email 3 September 2019
Moala, Lisa	Alu Like, Inc	Letter and Figures sent via email 3 September 2019 Ms. Moala replied via email 3 September 2019 CSH interviewed *kūpuna* on 02 October 2019 CSH emailed Ms. Moala on 31 October 2019 a draft of interview summary for edits, additions, and/or corrections CSH met with kūpuna on 14 November 2019 to finalize and approve interview summaries.
Noe, Galea‘i	President, Waimanalo Health Center	Letter and Figures sent via USPS 30 August 2019
Peahi, Apela	Peahi ‘Ohana (NHO)	Letter and Figures sent via USPS 30 August 2019
Pi‘iohi‘a, Keahi	Kū Hou Kuapā, Project Manager	Letter and Figures sent via email 3 September 2019
Rogerson, Ikaika	President, Waimānalo Limu Hui	Letter and Figures sent via email 3 September 2019 Mr. Kaleo Puana, Vice-President of Waimanalo Limu Hui, replied via telephone 4 September 2019 CSH met with Mr. Puana and Mr. Rogerson on 5 September 2019 at Kaiona Beach Park and Pāhonu Pond.

		CSH scheduled meeting with Mr. Puana and Mr. Ikaika Rogerson for CSH emailed Mr. Rogerson and Mr. Puana on 15 October 2019 interview summary for review, edits, and comments CSH sent follow-up email on 4 November 2019 to Mr. Rogerson and Mr. Puana on status of review of the interview summary Mr. Rogerson replied on 4 November 2019 that both Mr. Puana and himself approve the interview summary.
Solis, Kaahiki	Cultural Historian, SHPD	Letter and Figures sent via email 3 September 2019 Ms. Solis replied via email 4 September 2019 with suggestions
Stone, Jaynie I.	Hui Kaleleiki ‘Ohana	Letter and Figures sent via USPS 30 August 2019
Thielen, Laura	Senator, District 25	Letter and Figures sent via USPS 30 August 2019
Waimānalo Canoe Club		Letter and Figures sent via USPS 3 September 2019
Waimānalo Hawaiian Civic Club		Letter and Figures sent via USPS 30 August 2019
Waimānalo Hawaiian Homes Association		Letter and Figures sent via USPS 30 August 2019
Wong-Kalu, Hinaleimoana	Chair, O‘ahu Island Burial Council	Letter and Figures sent via USPS 30 August 2019 Letter and Figures sent via email 3 September 2019
Yee, Christian Kaimanu	*Kama‘āina*, knowledge of *mo‘olelo* and *wahi pana*	Letter and Figures sent via USPS 30 August 2019 Letter and Figures sent via email 3 September 2019

6.4 *Kama‘āina* Interviews

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *mana‘o* and *‘ike* with CSH whether in the interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and in no way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

6.4.1 Waimānalo Limu Hui

On 5 September 2019, Cultural Surveys Hawai‘i (CSH) met with Mr. Ikaika Rogerson, President of the Waimānalo Limu Hui, and Mr. Kaleo Puana, Vice-President of the Waimānalo Limu Hui, at Kaiona Beach Park to discuss the Waimānalo Paradise Seawall Repair Project and to share their *‘ike* of the Pāhonu pond. Mr. Rogerson and Mr. Puana are both born and raised in Waimānalo. The next paragraph below is a quick overview of the Waimānalo Limu Hui.

The Waimānalo Limu Hui is a community-based group that consists primarily of Waimānalo residents who seek to restore and revive the *limu* that was once predominately found throughout Waimānalo Bay. In addition to the reviving the presence of *limu*, the Waimānalo Limu Hui has also taken on the *kuleana* to restore the rock wall that makes up the Pāhonu pond. Under the direction and guidance of *kūpuna* and along with *limu* and fishpond restoration practitioners, Waimānalo Limu Hui is making strides and is already seeing results from their work.

Mr. Rogerson and Mr. Puana took CSH staff *makai* of the project site via Kaiona Beach Park. While walking to Pāhonu, Mr. Puana pointed out a small area on the sand. Mr. Puana said that there is fresh water flowing out from under the ground (Figure 34). CSH staff asked Mr. Puana if he knew where the water is coming from. Mr. Puana replied that he and Mr. Rogerson believe that the flow is coming from underneath. There are no surface-level streams that flow directly to Pāhonu. Mr. Rogerson added that the fresh water mixed with the sea water creates brackish water. This type of water is ideal for sea life to flourish. Mr. Rogerson then added that he has witnessed an increase of various native *limu* (at least 12 different species) that can be found along the rock wall (pointing to the Pāhonu wall), native fish, such as *he‘e* (octopus), *loli* (sea cucumber), *leho* (cowry shell), *weke* (goatfish), and *halalū* (young big-eyed scad) have been returning, as well as native birds and even a *‘īlioholoikauaua* (monk seal) has been spotted at Pāhonu.

As we continued to walk along the project wall, Mr. Rogerson pointed out another area where fresh water flows, from underground (Figure 35). Once again, there are no surface-level streams in this area and that the fresh water must be coming out from underground. Mr. Puana added that it is probably coming from some old lava tubes. When it rains, the water filters through the mountain and flows underneath. In both fresh water flow areas, Mr. Rogerson and Mr. Puana had pointed out a specific *pōhaku* (rock, stone) within the project wall. They use these *pōhaku* as indicators to mark the area of the fresh water flow.

In regards to the two fresh water flows, both Mr. Rogerson and Mr. Puana voiced their concerns about how the construction/restoration of the project wall will affect the flow of fresh water? Will the repairs of the wall damage, restrict, or cease the fresh water flow? Do they [the contractors] need to dig into the ground to fix the wall? These fresh water flows play a huge role in the life and survival of *limu* and other sea life. CSH also noted that the markers used in identifying the fresh water flow areas are *pōhaku* markers already found in the existing wall structure.

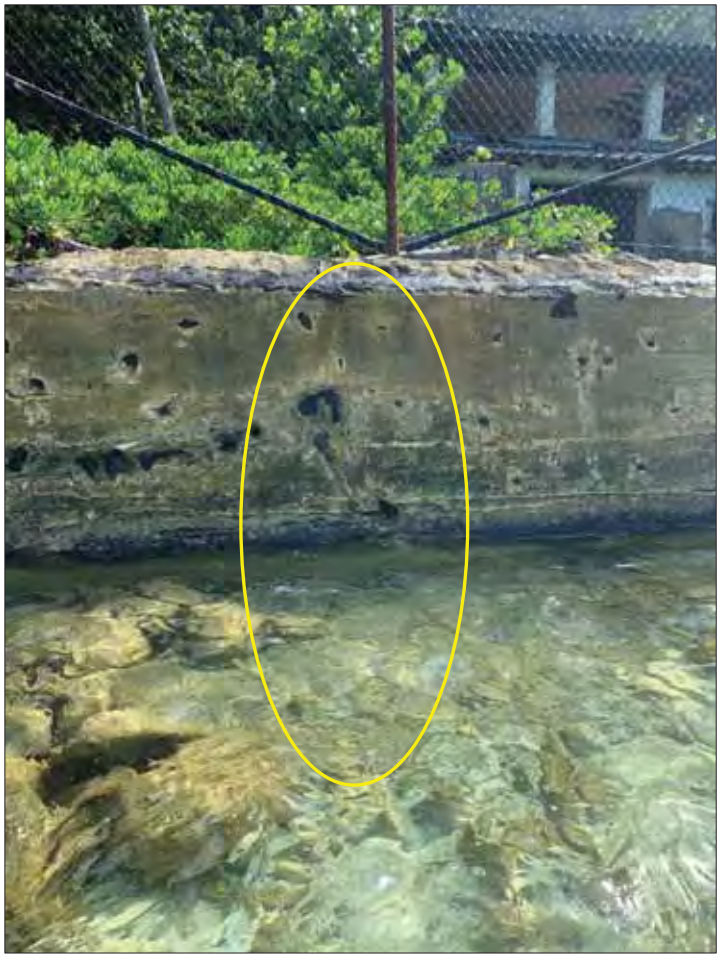

Figure 34. Fresh Water Flow (Windward side) (CSH 2019)

Figure 35. Fresh Water Flow (‘Ewa side) (CSH 2019)

Mr. Rogerson and Mr. Puana continued to talk about the efforts of the Waimānalo Limu Hui and explained the process and steps on how *limu* is planted within the area. Mr. Rogerson demonstrated that the *limu* is made into a *lei* and then tied to a rock. Then, the rock (with the *lei limu* tied to it) is then taken out to sea in a designated area. Mr. Rogerson continued to add that they only use *limu* that is sporing as the spores are spread through the currents. CSH inquired with Mr. Rogerson on where they receive their *limu* and what species are they planting. Mr. Rogerson explained that Uncle Wally Ito (a *limu* practitioner in ‘Ewa) provides them with *limu* that used to be found or is ideal within the waters of Waimānalo. Mr. Puana added that it is the knowledge of our *kūpuna* and understanding of their land and sea that are guiding them on what *limu* to plant.

CSH then asked where does the Waimānalo Limu Hui get their *pōhaku* for the Pāhonu wall as well as the ones used for the *limu*. Mr. Puana said all *pōhaku* are gathered around the Pāhonu area. Usually, loose *pōhaku* can be found along the project area wall. *Pōhaku* that are found are mainly used for the Pāhonu wall while other *pōhaku* are used to plant *limu*. Since the *pōhaku* are gathered from around the area, Mr. Puana and Mr. Rogerson do have some concerns on how the project will affect the rocks around the area.

- Will the construction workers need to access the wall from the Pāhonu side?
- Will they be removing the loose rock? Use the loose rocks for the wall?

Mr. Puana and Mr. Rogerson did note that they would like to work with the project team/developers. They did also note that if the crew could help gather the loose rocks and just keep them in a pile, that would be helpful for the Waimānalo Limu Hui and community to complete their goals on the wall and *limu* restoration.

As of right now, only 1/3 of the pond wall is complete (Figure 36). Mr. Rogerson is hoping to complete the wall with the next 5 five years. Both Mr. Rogerson and Mr. Puana had spent time researching about Pāhonu; looking up *mo‘olelo* (story) and images from the past. The overall goal and intention is to build the wall as historically accurately as possible. For example, Mr. Rogerson explained that on the ‘Ewa side of the wall (where they have restored, see Figure 36) there was an opening that was not part of the original structure. Mr. Rogerson added that when they closed that opening, the current changed and became more mellow within the pond area. One key thing to note is that there was once a pier that used to be Pāhonu. Mr. Rogerson and Mr. Puana inquired with CSH staff if we knew of anything or possessed any picture that indicated the pier. At that time, CSH said no, however, CSH committed to help Waimānalo Limu Hui in researching this pier.

In regards to working on the wall, Mr. Rogerson added that the work on the wall is dependent on the many natural factors such as weather, current, and tides. He mentioned that Mr. Puana and himself would even work on the wall at night, if the conditions were right. And as a community, Mr. Puana added that the Waimānalo Limu Hui holds community events (last one had at least 350+ people), which include Waimānalo and non-Waimānalo residents. Mr. Rogerson and Mr. Puana wanted to emphasize that the Waimānalo Limu Hui is strictly funded by the community. Mr. Rogerson said “We have no money. It is just the community doing something for the love of their community. Everyone contributes in their own way.”

When CSH asked about any cultural practices that takes place at Pāhonu, Mr. Puana recalled the *mo‘oelo* about how *ali‘i* (chiefs, rulers) would keep *honu* (turtle) within Pāhonu as food. From

Figure 36. Area of Pāhonu (Sept 2019) wall that has been restored by the Waimānalo Limu Hui

Mr. Puana stated that “This is our Mauna Kea space in Waimānalo.” Because of this significance, sea water from Pāhonu was gathered into an *‘ohe* (bamboo) container and sent over to Mauna Kea as a *ho‘okupu* (offering).

CSH then asked Mr. Puana of any other practices that they know of that happens within the Pāhonu area. Mr. Puana did recall that he had heard of a *hālau hula* (a hula group) conduct a cultural practice called *hi‘uwai*. Please note: *hi‘uwai* is a practice in which a person will purify or cleanse themselves in the water. Both Mr. Puana and Mr. Rogerson mentioned that plenty fisherman utilize this area and its surrounding, especially during certain seasons, like *‘oama* (young goatfish). But overall, both Mr. Puana and Mr. Rogerson said that this area has been used by the community for generations, from gathering *limu*, to fishing, to teaching *keiki* (child) how to swim, or to spend time as a family. Mr. Puana did want to note that one of the goals of Waimānalo Limu Hui is to utilize this area for educational purposes.

Mr. Puana stated that “It [Pāhonu] is a classroom, not just one beach. We can use to teach future generations.” Throughout our interview, Mr. Puana and Mr. Rogerson always credited the *‘ike* of *kūpuna*. *Kūpuna* were scientists in their own right. They understood salinity levels, the flow of *‘auwai* (irrigation stream) to feed the pond, the ideal living conditions in which fish and other sea creatures survive, and so forth. *Kūpuna* had a strong relationship and bond with the land and sea. While looking at the project wall area, Mr. Puana inquired about utilizing that space as an educational area. Mr. Puana noted that it would be great to promote the *mo‘olelo* of Pāhonu by putting up signage on the wall or utilizing the wall space to teach lessons when teachers bring their students to Pāhonu. One big question is how can this wall contribute to the community?

Once again, both Mr. Puana and Mr. Rogerson would like to emphasize that they are willing to collaborate with developers and see how they can work together. Some overall questions and concerns include:

- Fresh water flow access and how/if the wall will affect the flow
- Will the construction restrict access to the Pāhonu (or even Kaiona Beach Park)?
- Will loose *pōhaku* be used on the wall? Will the developers be able to help the Waimānalo Limu Hui gather *pōhaku*?
- Can the Waimānalo Limu Hui and/or community/schools utilize the wall as a teacher tool? Such as to hang signage, used like a blackboard, and etc.

6.4.2 Kamuela Kala‘i

On 6 September 2019, Cultural Surveys Hawai‘i, Inc. (CSH) met with Kamuela Kala‘i at Kaiona Beach Park to discuss the Waimanalo Paradise Seawall Repair Project and to share her *‘ike* about any cultural practice and burial concerns of the area. Kamuela Kala‘i is a cultural practitioner as well as a protector of *iwi kūpuna* or Hawaiian bones/burials. Even though Kamuela Kala‘i is not originally born and raised in Waimānalo, she has raised her *keiki* and *mo‘opuna* in Waimānalo. The father of her *keiki* is Harold Ahuna Jr., also known as Uncle Bunny. He is the son of Harold Alika Ahuna who was *hānai* (raised) by Joseph Papa Wong, who is the son of Charles Alona Wong. Charles Alona Wong was featured as a Waimānalo informant in research conducted by Mary Kawena Pukui, a Native Hawaiian historian. Charles Alona’s work can be found in “Sites of Oahu” by Sterling and Summer (1978). Many of the *mo‘olelo* about Ko‘olaupoko area were kept and told by Charles Alona and his wife, Kealoha Alona. The Alona/Ahuna family lived in

Waimānalo for generations, keeping the Native Hawaiian language and cultural practices alive within the *‘ohana*. Ms. Kala‘i recommends to CSH to reach out to the Ahuna *‘Ohana*.

Ms. Kala‘i remembered Kaiona and Pāhonu as being a place where families and community members could gather to fish, paddle, swim, and have some family time. When living in Waimānalo, Ms. Kala‘i recalled many times her and her *‘ohana* would go to Kaiona and Pāhonu. “My children, ‘Alohi and Kala‘i grew up with these wonderful experiences. Both of them love the ocean and could swim at a very young age.” Even to this day, she is now taking her *mo‘opuna* to Pāhonu to learn to swim, just as she has done with her own *keiki*. Ms. Kala‘i added that “my *mo‘opuna* have been able to go swimming in Pāhonu on occasion but not as much as their mom or uncle, who grew up there.” Ms. Kala‘i emphasized the fact that this place (referring to Kaiona and Pāhonu) has always been a family area. Generations of *kānaka* (people) of Waimānalo grew up here; spending time with their *‘ohana*; connecting to the ocean. The *pilina* (relationship) of *kānaka* to sea is strong in Waimānalo.

When asked by CSH about some cultural practices/traditions that her *‘ohana* did, Ms. Kala‘i remembered fishing around the area for *‘oama* (young weke or goatfish) and even going on a boat to Mānana to fish. Ms. Kala‘i mentioned that her *kāne*’s (husband) *‘ohana* loved to fish. They not only loved to fish but knew and understood the current and surrounding coral beds. Ms. Kala‘i added by saying that “My father in law, Alika, was raised here from baby time and brought up old style. He was a master *lawai‘a* (fisherman) because he was born into an *‘ohana* of lifelong *lawai‘a*.” Ms. Kala‘i continued on by saying the he (Alika Ahuna) knew the ocean like the back of his hand.

Ms. Kala‘i shared that Alika Ahuna taught his sons on how to fish, dive, drive, boat, make salt, throw net, make limu, pound ‘opihi, and everything else about the ocean. They would pack coolers of ice, refreshments, and head out in the morning. Returning in the late afternoon, the cooler would be filled with all kinds of fish such as *‘ōpakapaka* (blue snaper*)*, *weke‘ula* (type of goatfish or mullet), *he‘e, aholehole* (Hawaiian flagtail), and all other kinds of fish. Ms. Kala‘i added that “my mother-in-law, Dudee, was an excellent cook and would steam or fry fish for dinner” adding that the Ahuna ‘ohana would always share their meals with friends and family. Ms. Kala‘i wanted to highlight that they would only take exactly what they needed to feed their *‘ohana*. The catch would be equally divided and everyone would have enough fish to eat and share. Ms. Kala‘i continued on by saying that these experiences were passed down to her keiki. Both still have the same passion for the ocean as their father and the Ahuna ‘Ohana and continue to practice and perpetuate the skills and knowledge that has been passed down to them. Ms. Kala‘i added that “even to this day, my son is now a lifeguard and loves to surf the waves at Mānana and anywhere the waves are up. He lives on the same property in Waimānalo that he was born and raised on; the very same ‘āina his kūpuna lived on for generations.”

Ms. Kala‘i recalled memories of her father-in-law, Alika Ahuna, where they would go to Mānana and pick *‘opihi* (limpet) or even harvest *pa‘akai* (salt). She even remembered that one time, he *kāhea* (call out) to the flocks of birds when they were going to *holoholo* by Mānana. “He would whistle and the entire flock of birds would swoop down to greet him. He did it at least twice that day. Kupaianaha!”

Later on during the interview, Ms. Kala‘i noticed *limu ‘ele‘ele* (Enteromorpha Proligera) growing on some *pōhaku* (Figure 37). She explained that you can tell when it is ready to harvest

Figure 37. *Limu ‘ele‘ele on* rocks by Kaiona Beach Park.

when the *limu* sways in the water like hair. Ms. Kala‘i shared that after you harvest the *limu*, you need to soak it in some salt water. Drain the water then you can eat it. Mr. Kala‘i recalled that she used to eat *limu ‘ele‘ele* with beef stew.

CSH mentioned that CSH staff has previously met with the Waimānalo Limu Hui, a group of community volunteers whose efforts are to restore the life of the *limu* and the rock wall of Pāhonu, have mentioned that there are two fresh water flows flowing into Pāhonu. Ms. Kala‘i did not know of the two water flows, but was not surprised to hear the news. She mentioned that the water is probably going through the mountain and then flowing through lava tubes underground. Ms. Kala‘i reiterated herself that fresh water when mixed with sea water helps create a healthy environment for sea life. Ms. Kala‘i then recalled and told the story about the *ali‘i* who used to keep turtles in the pond to eat. She also recalled that even though the *ali‘i* had passed, some people continued to eat turtle meat. However, it is no longer a normal practice today.

As for the wall and project area, Ms. Kala‘i recalled that there were *iwi kūpuna* found in the project property area. A notice was sent out to the community members if anyone would like to claim these *iwi kūpuna*. Even though she does not have direct lineal ties to Waimānalo, she felt it was right for her to represent her *‘ohana* and claimed the *iwi kūpuna*. The *iwi kūpuna* were left in their original spot that they were found. Ms. Kala‘i then looked towards *mauka* and said that there are burial caves within the mountains (just *mauka* of Kaiona and Pāhonu). Kamuela Kala‘i shared that even though there are burial caves *mauka* side, no one really knows there true location.

In summary, Ms. Kala‘i expressed several concerns about the project area. In regards to the *iwi kupuna*, Ms. Kala‘i would like clarification that if more *iwi kūpuna* are found, what will happen with the *iwi*? Will the project stop? Ms. Kala‘i mentioned earlier that there are burial caves around the area and in most cases, if one is found, then there will likely be others. Along with the concerns about the *iwi kupuna*, Ms. Kala‘i is also concerned on how would the wall will affect the fresh water flow? Life in the sea? Because fresh water is reaching the sea (which is evident by the sea life that is flourishing in the Pāhonu/Kaiona area), how deep in the ground are they going? Ms. Kala‘i reiterated again that fresh water is vital for sea life, therefore, how will the wall affect/restrict access to fresh water? Lastly, Ms. Kala‘i voiced another concern about the actual wall. Ms. Kala‘i would like clarification on the type of materials the developers will be using for the wall? Sea walls, even though they are helpful for development, are not always helpful or safe for the sea. Lastly, Ms. Kala‘i was concerned if the development would affect/restrict access to the area? Pāhonu/Kaiona are heavily used by the community. It is an area that have created memories for generations. Families do cultural practices, such as fishing, paddling, and increasing the relationship to kanaka and the sea. Would the project limit access or use of the area?

6.4.3 Alu Like, Inc. Waimānalo Kūpuna Program

On 2 October 2019, Cultural Surveys Hawai‘i (CSH) met with a group of *kūpuna* at the Waimānalo Kūpuna housing complex. Many of the *kūpuna* have been living in Waimānalo for many years and/or have memories of visiting Waimānalo and possess knowledge of the area. At this group interview, there were 15 *kūpuna* in attendance. Due to the respect of the *kūpuna*, many did not feel comfortable in having their name in this summary. For those *kūpuna* in which we have their authorization to use their name, we will. For those *kūpuna* in which we do not have their authorization to use their name, we will use the phrase "*kupuna* of Waimānalo."

CSH staff and *kūpuna* participated in Native Hawaiian protocol prior to the start of the group meeting. This protocol consisted of a CSH staff offering an *oli* to the *kūpuna*. A kupuna representative of the group (Ms. Kaholi) then offered two oli in response; one oli in which she composed for Waimānalo and other traditional *oli lei*. After protocol, CSH staff presented to the *kūpuna* which included introductions of all CSH staff, overview of the project, the purpose of the cultural impact assessment (CIA), and how the group interview process will work. The *kūpuna* were asked to split into three groups. This allowed for a more intimate "talk-story" condition. Below shows the number of *kūpuna* per group. Each group also consisted of one CSH cultural researcher staff.

Group One: 4 *kūpuna*

Group Two: 6 *kūpuna*

Group Three: 5 *kūpuna*

This interview summary will be presented by group. If applicable, at the beginning of each group interview summary, it include the names of *kūpuna*. Once again, with the respect of *kūpuna*, many did not feel comfortable with sharing their name and/or having their name included in the summary. However, some did feel comfortable in sharing their memories and knowledge of the area.

6.4.3.1 Group One

***Kūpuna*: Dolina Kuakini Kaholi, Ahuena Lakalo, Phyllis T. Lonokapu, Margaret A. White**

CSH staff went over the project area with the group as well as going over the goals and purpose of the talk story session and the CIA. As CSH staff passed out the CSH Authorization Form, CSH staff reminded the participants of their rights and how the information will be shared and/or utilized in the CIA. Out of the four *kūpuna* participants in the group, all four agreed to sign the Authorization Form and their names to be utilized in the CIA.

As CSH started going over the project details, Ms. Lakalo wanted clarification on who were the ones paying for the project, UH [University of Hawaii], State [State of Hawai‘i], DHHL [Department of Hawaiian Homelands]. Ms. Lakalo explained that UH has been constantly calling her to see if she would be able to share information and will be okay having tourist coming through the Waimānalo area. Ms. Lakalo expressed her hesitancy about the process [referring to the interview] as she explained that many companies also go to the *kūpuna* to ask them to give them their *mana‘o*. She wanted to make sure that they [the Waimānalo Seaside Project Wall] is not planning on building a highrise like how they did in Kailua.

CSH staff clarified who the client of the Waimānalo Seaside project were and that the purpose of this talk story is to discuss the reconstructing the property seawall. CSH staff made it clear that CSH company did not know what were the actual plans for the property site.

Ms. Kaholi as well as Ms. Lakalo then added that the lands where the project site will is technically Hawaiian Homelands. Both Ms. Kaholi and Ms. Lakalo emphasized the fact that those lands were supposed to be for the Hawaiians, and yet, DHHL keeps giving away lands that are meant for *kūpuna*. They [DHHL] sold the land to the Anderson ‘Ohana and then to Magnum P.I.

people. Ms. Lakalo added by saying "And now look, big tour buses are always coming into Waimānalo."

CSH staff asked the *kūpuna* of any memories that they would like to share about the Waimānalo area. CSH staff shared about his experience growing up in the community of Maunalua and the surrounding area. Ms. Kaholi then said, with a smile, "I grew up Kalama side too." Ms. Kaholi continued to share that the land by Kalama Shopping Center is the home of Pele [deity in Native Hawaiian culture]. That land area is her breathing hole…a huge volcanic mound. That why Kalama valley, Ms. Kaholi added, "get plenty ‘uhane [spirits]." Ms. White asked the group "where this Kalama place is?" Ms. Kaholi and Ms. Lakalo said that it's in Hawai‘i Kai. CSH staff clarified that Waimānalo Ahupua‘a extends from Olomana [by Kailua] to Maunalua [now called Hawai‘i Kai].

Ms. White then added that she used to gather *limu* in all different areas, like Hau‘ula, and even in Waimānalo to make *ake* (liver). Ms. White added that "I used to make ake all the time but now no more limu. I can only make ake with limu huluhulu waena. Bellows used to have plenty limu lipoa." However, Ms. White did want to note that ake tastes best with limu huluhulu waena saying that "I have a friend that sells ake using limu lipoa. People by ‘um and like ‘um but to me it's not the same."

Ms. Kaholi then shared that by the project site there used to be plenty turtle and *akule.* Sometimes you could see the turtles chasing the *akule*. However, you don't see many *honu* anymore. Ms. Lonokapu agreed and shared that she has noticed the same thing, mentioning that when she was young, the sea life was thriving. It [the Pāhonu/Kaiona area] is not the same.

Ms. Lakalo and Ms. Kaholi then added that there used to be plenty native plants growing along the shore line of Waimānalo. Ms. Kaholi said that because she grew up Kalama side, she recalled going to Waimānalo through Makapu‘u side. Both, Ms. Kaholi and Ms. Lakalo added that *hala* trees and *kauna‘oa* used to grow along the shore. Ms. Kaholi shared that *‘ilima* (the wild kind, not the bush kind), used to grow in adbundance. Ms. Kaholi recalled that she used to be able to walk down to the beach, grab the *kauna‘oa* and sit right there to make lei.

In addition to the plants growing in this region of Waimānalo, Ms. Kaholi shared mo‘olelo about areas within Maunalua. Ms. Kaholi mentioned that by Alan Davis, there used to be pōhinahina (Vitex ovata), adding "in the morning getting up and the fragrant of lipoa limu, looking at the rim of Kohelepelepe (Koko Crater) the rise shinning on it would look pink from the sea spray or ehukai."

CSH then asked the *kūpuna* if they had any *mana‘o* to share about the project site. All were in an agreement that if they fix the wall, it could benefit everyone. However, it should be noted that some concerns about the actual development were 1) the type of materials they are going to use to re-build the wall and 2) will it restrict access to the area.

6.4.3.2 Group Two

Out of the six *kūpuna* that were within this group, only two felt comfortable in sharing information. In honoring their rights as *kūpuna*, they would not like to have their name published in the report but have agreed to share *‘ike* about the Waimānalo area.

CSH staff went over the project area once again with the group of *kūpuna* just to make sure everyone understood the project as well as the process of CIA. As mentioned earlier, many of the *kūpuna* were uncomfortable of sharing their name and knowledge. Many of them has expressed concerns that this process does not work and many companies turn to *kupuna* just for show. However, there were two *kupuna* who agreed to share *mo‘olelo* and knowledge that this *kupuna* had about the area, but the *kupuna* would not like to use their name.

As a Native Hawaiian of Waimānalo, this *kupuna* would like to share that “This was our playground, we were able to swim through the entire ocean without restriction”. Growing up, as the *kupuna* of Waimānalo continued, there were an abundance of *limu* and turtles, however, once construction and the erection of buildings from Sea Life Park arose, the chemicals used to seep into the ocean destroying the wild life. For example, there used to be plenty seaweed in Waimānalo. The *kupuna* added that we don’t smell any *lipoa* anymore, before we could, there was so much. The area was called Kaupō. Used to have plenty sharks bites. The *kupuna* added that “my tūtū” said there was a rock and it was for the sharks. This *kupuna* of Waimānalo also added that there used be salt beds within the old fishing village. This *kupuna* continued to add that there used to be a sea wall extending out to the ocean all the way from here to Makapu‘u, where the turtles would nest.

The *kupuna* of Waimānalo continued with sharing stories about Waimānalo, like when Pele [a deity within Native Hawaiian culture] went around the island, she built the stones [*mauka* of Makapu‘u], the men had destroyed it for the road. Ever since the mana had disbursed [spirits] and is scattered around that area. Plenty of burial sites under the parking lot.

CSH did mentioned that *iwi kupuna* were discovered on the property. *Kupuna* did say that Hawaiians would bury their own in their yards so the *kupuna* was not surprised to hear the *iwi kupuna* were found. The *kupuna* did want CSH to note that if one set of *iwi kupuna* there will probably be more.

CSH then asked the *kūpuna* of Waimānalo about any *mo‘olelo* that they knew about the project site and/or surrounding area. One of the *kupuna* shared that there is a story that encompassed the area from Makapu‘u all the way to Shriners [which is adjacent to the project site]. The Lopez family owned Shriners. They sold the property because the sea wall would break from the ocean. It crumbled and erosion took place. It took the Lopez family years to sell the property. It is said that a man did bad thing [mauka of Makapu‘u]. Old Hawaiians believe it was the cause of the smallpox epidemic that spread throughout the area. This kupuna of Waimānalo continued to share about the area and about Pele’s brother, who was in charge [a god] of all sharks explaining that “fishermen left ho‘okupu [offerings]. John A. Cummins plantation told to care of the rock..” This rock is located within the Kaupō area.

CSH asked about the seawall and explained what the project will be doing to the seawall. One *kupuna* of Waimānalo did voice some concerns. The *kupuna* did mentioned that the project should try their best to not use any man-made materials for the construction of the wall. Most of the resources can be found right in the sea. It makes sense to use what we already have and what exists in nature…ocean rocks. If not, then the wall will just crumble and would need to be repaired again. The *kupuna* wanted to point out the fact that Hawaiians never used mortar. Rocks [and materials from the land/sea] are more durable. If you are putting concrete on rocks, on sand, it will fall apart. However, the *kupuna* of Waimānalo did want to make clear that it is important to build the wall as

to prevent erosion, otherwise it will take their property. But, the *kupuna* did voice a concern about the height of the wall. The *kupuna* would like to know as to why the developer is making the wall higher? What is its purpose? Is it for a resort or to help prevent erosion?

Some other concerns all the *kūpuna* voiced to CSH is how will the wall affect the water source? How will it affect the wildlife? With the [Waimānalo] Limu Hui doing their best to restore the *limu* in the water, will the development harm the environment? Also, will the development restrict access to the area? On another note, the property is known to have had a sinkhole. Is there a possibility to have more? Also, will this affect the structure and stability of the wall?

6.4.3.3 Group Three

Out of the five *kūpuna* that were within this group, only one felt comfortable in sharing information, Edith K. Kanekoa

The following is a summary of an interview with Edith K. Kanekoa. Ms. Kanekoa was born in Nahiku on the island of Maui. She is the youngest of nine children. She had six brothers and two sisters.

Ms. Kanekoa noted that her grandfather is from Waipio on the island of Hawai‘i. She has traced her genealogy back to Kanekoa who she noted was the nephew of the Kamehamehanui. She added that he was known as Prince Kanekoa.

Ms. Kanekoa’s family moved to Hana, Maui where her father had built a two-story home. Her father was a builder. She recalled that people would pay him for his work with animals including donkeys, mules, and horses. She recalled watching her brothers feed these animals as a child. She mentioned that her father was taken away from his family as a child because he was half-Chinese. He went home to his mother when he was seven years old. She also noted that at seven years old, her father got his first job from a “big, tall” German man who hired him to cut trees.

Ms. Kanekoa is the mother of five children. She raised her children without any help from their father. Her children are now all grown and retired. She also noted that she has 55 great grandchildren.

While living on Maui, Ms. Kanekoa got married before moving to Honolulu. She moved to Honolulu because her husband, a musician, was looking for a better job. They lived in Mayor Wright Homes in Honolulu before moving to Laie while she attending college. While attending classes, she also worked on campus to provide for her children. She also worked at Hartfield’s, a women’s clothing store, during the summers.

After Ms. Kanekoa graduated from college, she moved to Glendale, California and taught for four years in North Hollywood. She noted that she was the only Hawaiian teacher in the district. She recalled teaching the children about Hawaiian culture including organizing May Day programs, teaching *hula* (dance), and making *holokū* (a loose, seamed dress with a yoke and usually with a train). After teaching in California for four years, she moved to Washington State where she continued teaching until retiring. When Ms. Kanekoa retired from teaching, she returned to Hawai‘i. She lived in Waikīkī for five years before moving to the Alu Like Waimānalo Kūpuna Hale in 2002.

Ms. Kanekoa stated that she was told that “when the military took over down here [Bellows], where they were digging, they were leveling, lot of bones were found, they left it out. . . I heard

they just left it out on the property and did not bury it till several days later, that was not smart for them to do that." She added, "bulldozer piled it [‘*iwi*] up against the wall," and asked "what was the governor doing then?" She stated that the military was flattening the land to build a runway for airplanes, however, it was never built. She believes that how the military handled the discovery of *‘iwi* at Bellows was disrespectful.

While discussing the proposed repairs to the seawall, she stated that "that's what they need to do in Waikīkī. . . the ocean is taking all the dirt out."

6.4.4 Harold Ahuna Jr. and Cheryl Ahuna

On 11 October 2019 Cultural Surveys Hawai‘i Inc. (CSH) met with Harold Ahuna Jr. and his daughter Cheryl Ahuna at Mr. Ahuna's house in Niu Valley. Even though Mr. Ahuna no longer physically lives in Waimānalo, the Ahuna family still have their property in Waimānalo. This property has been with the Ahuna family for generations. The Ahuna family can connect their lineage to Waimānalo for generations recounting many *mo‘olelo* that their *tūtū* man (grandfather) had shared about Waimānalo. Some of these *mo‘olelo* have been shared by Mr. Ahuna‘s *tūtū* man, Charles Alona, to Aunty Mary Kawena Pukui and can be found in the book, Sites of O‘ahu by Summers and Sterling (1978). During the interview, Ms. Ahuna shared some pictures of Waimānalo in the past. Please note that it is unclear however, when these pictures were taken.

When CSH introduced the potential project area by Pāhonu, Mr. Ahuna shared that the project area is in a flood zone. Mr. Ahuna explained that a river once flowed through the properties by the project area. When it rains really hard in Waimānalo, the area will tend to flood. Mr. Ahuna added that Eve Anderson (one of the previous owners of the property) should have known that when she acquired the property.

While looking at an old photograph of Waimānalo (Figure 38), Mr. Ahuna pointed out where him and his *‘ohana* used to live in Waimānalo. Mr. Ahuna said that there used to be pigs around the surrounding area. Mr. Ahuna along with his *‘ohana* could sometime tell in which direction the wind was blowing because of the smell. Mr. Ahuna said "When the wind blew from Kona side, you could smell two things; pigs and limu." CSH then asked Mr. Ahuna and Ms. Ahuna if they had any *mo‘olelo* to share about Pāhonu or the surrounding area. Mr. Ahuna shared that the area was used to keep turtles. It was like a turtle sanctuary. Mr. Ahuna remembered that in his kid time, turtles would use the area of Pāhonu to mate and as a birthing place. Mr. Ahuna added that there were plenty of turtles during his time. However, you hardly see as much anymore.

CSH shared about the efforts of the Waimānalo Limu Hui and their goals of restoring *limu* to Waimānalo as well as repairing the Pāhonu rock wall. Ms. Ahuna applauds the effort of the community in restoring the *limu*. Both Mr. Ahuna and Ms. Ahuna recalled that Waimānalo was rich with sea life. However, Ms. Ahuna did voice a slight concern over the Pāhonu wall. It was shared with the community of Waimānalo that the pond wall originally only contained one opening and not two (as it has been for years). Therefore the Waimānalo Limu Hui closed the ‘Ewa side opening of the wall. However, Ms. Ahuna noted that because the opening closed, the current has changed and may affect the life of the pond as there may not be enough current flow inside the pond. Ms. Ahuna continued by saying that current flow helps with the cycle of water. If ocean water remains stagnant, then algae and other bacteria (which may be harmful to people and most importantly sea life) can grow. The second wall opening allowed this flow to happen. Ms. Ahuna also remembered that there was always two opening while she grew up within the area.

CSH brought up a *mo‘olelo* about a pier that used to be in the area as it was mentioned by other community members. Mr. Ahuna explained that there used to be a pier located close to Pāhonu, where people would keep their boats. However, one *keiki* unfortunately died from jumping off the pier into shallow water. In another picture (Figure 39), Mr. Ahuna explains that the pier in Figure 39 is the Waimanalo Pier, which was located by what is called Beach Park by Pope Elementary school. Mr. Ahuna added that this pier is where a lot of the shipments came into Waimānalo. In the picture (as Mr. Ahuna points to the picture), you see the train tracks and the pier. The Cummins *‘Ohana* used this area to ship all their sugar cane.

CSH asked Mr. Ahuna about any cultural practices that him and his *‘ohana* used to practice while living in Waimānalo. Mr. Ahuna explained that we were all raised in the *kai*. Any time we needed fish, *limu*, or salt, we would know when and where to go and gather. This was our life. My *keiki* (which includes Ms. Ahuna) were raised to understand the water and the relationship we between *kanaka* and land/sea. There were plenty different kind of fish and *limu*.

Mr. Ahuna added that his family would go out to Mānana (also known as Rabbit Island) and there would be plenty fish over there. Ms. Ahuna added that their *‘ohana* was taught and knew how to harvest salt from that island. Ms. Ahuna continued to explain that you had to be ma‘a (familiar) with the ocean and have a true connection. To sail out to Mānana can be tricky because of the reefs. If the tide is too low or you don't know where the beds of reefs were, you will get stuck. Also, Mr. Ahuna shared that there used to get plenty *limu* in the area. When the wind blew from a certain direction, you could smell the *limu*. There used to be plenty *limu kala* and *limu lipoa*. During low tide, we used to go out and pick the *limu*. The sad thing is you don't see it or smell it any more.

Mr. Ahuna also added that right by Kaupō, there used to be a fishing shrine. Mr. Ahuna explained that many fishermen, including his *‘ohana*, understood the importance of these shrines and the relationship that Hawaiians had to their environment. We used to honor the shrine as it blessed us with *i‘a*. Please note: i‘a does not only mean fish, but all sea life.

In regards to the project area, Mr. Ahuna and Ms. Ahuna did not object them in redoing the wall. It is probably much needed. However, they both did express that the developers need to have a clear understanding of the land, sea, and weather. Like mentioned earlier, Mr. Ahuna shared the project area has a tendency to flood during heavy rain. When rebuilding, the developers should keep this in mind.

6.4.5 Kalani Kalima and his Father

CSH is still awaiting approval of consultation.

Figure 38. Waimānalo (date unknown) (Courtesy of Ahuna ‘Ohana)

Figure 39. Waimānalo Pier (date unknown) (Courtesy of Ahuna ‘Ohana)

Section 7 Traditional Cultural Practices

Timothy R. Pauketat succinctly describes the importance of traditions, especially in regards to the active manifestation of one's culture or aspects thereof. According to Pauketat,

> People have always had traditions, practiced traditions, resisted traditions, or created traditions . . . Power, plurality, and human agency are all a part of how traditions come about. Traditions do not simply exist without people and their struggles involved every step of the way. [Pauketat 2001:1]

It is understood that traditional practices are developed within the group, in this case, within the Hawaiian culture. These traditions are meant to mark or represent aspects of Hawaiian culture that have been practiced since ancient times. As with most human constructs, traditions are evolving and prone to change, resulting from multiple influences including modernization as well as other cultures. It is well known that within Hawai‘i, a "broader 'local' multicultural perspective exists" (Kawelu 2015:3).While this "local" multicultural culture is deservedly celebrated, it must be noted that it often comes into contact with "traditional Hawaiian culture." This contact between cultures and traditions has undoubtedly resulted in numerous cultural entanglements. These cultural entanglements have prompted questions regarding the legitimacy of newly evolved traditional practices. The influences of "local" culture are well noted throughout this section, and understood to represent survival or "the active sense of presence, the continuance of native stories, not a mere reaction, or a survivable name. Native survivance stories are renunciations of dominance, tragedy and victimry" (Vizenor 1999:vii). Acknowledgement of these "local" influences helps to inform nuanced understandings of entanglement and of a "living [Hawaiian] contemporary culture" (Kawelu 2015:3). This section strives to articulate traditional Hawaiian cultural practices practiced within the *ahupua‘a* in ancient times, and the aspects of these traditional practices that continue to be practiced today; however, this section also challenges "tropes of authenticity" (Cipolla 2013) and acknowledges the multicultural influences and entanglements that may "change" or "create" a tradition.

This section integrates information from Sections 3–6 in examining cultural resources and practices identified within or in proximity of the project area and in the broader context of the encompassing Waimānalo landscape.

7.1 *Ka‘ao* and *Mo‘olelo*

Ko‘olaupoko, and Waimānalo especially, is greatly mentioned in the *Epic Tale of Hi‘iakaikapoliopele.* While on her epic journey to retrieve her sister's lover, she lands at Makapu‘u with her traveling companions and decides to continue her journey through Ko‘olau. They reach Kailua where they come across Muliwai‘ōlena and her daughter ‘Āpuakeanui. Muliwai‘ōlena is a stream in Waimānalo. It was also the location of a two-day battle between Ka‘eo, an *ali‘i* from Moloka‘i and O‘ahu forces (Fornander 1878, Vol. II:262).

In one particular tale about Lonoikamakahiki, he enters a canoe race and defeats the ruling chief Kākuhihewa and won the island of O‘ahu. Lonoikamakahiki gained the upper hand in the race by paddling inside of the Waimānalo reef (Fornander 1917:300-302).

7.2 *Wahi Pana*

Many of the *kūpuna* and community members have shared, Pāhonu was a pond built to house turtles for *ali‘i*. In the past, turtles were seen like fish and was once raised to be eaten, but only by *ali‘i*. This traditional custom is no longer being practiced however, the pond is still being utilized by the community. Mr. Ahuna shared that Pāhonu was also a sanctuary for the turtles. Turtles would sometimes gather at Pāhonu to mate and use as a birthing area.

> Pāhonu pond measures five hundred feet long and fifty feet wide. Turtles were traditionally kapu, and only the ali‘i could eat them. One ali‘i was so fond of turtle meat, he had a sea wall built for his turtles. Every turtle caught in Waimānalo…was put into this pond. The pond wall was probably restored in the 1960s. [Landgraf, 1994:152]

> There was once a chief who was so fond of turtle meat that he ordered a sea wall built to keep captured turtles from escaping. Every turtle caught by a fisherman was put into this enclosure. No one else was allowed to partake of turtle meat under penalty of death. No one dared to eat turtle a long as the old chief lived. [Sterling and Summer, 1978:249]

The Waimānalo Limu Hui is a community-led organization that is working on restoring the sea life around Pāhonu as well as the Pāhonu rock wall. Throughout the years, the rock wall that makes up Pāhonu has been slowly deteriorating. The Waimānalo Limu Hui host community work days where members of the Waimānalo community come together to help move rocks and repair the pond wall. All rocks gathered from the Pāhonu area. It is with hope that Pāhonu can be restored. It is also with hope that Pāhonu can be utilized as an educational resource for the community.

7.3 Subsistence and Gathering

In many of the interviews with the *kūpuna* and community members of Waimānalo, *limu* was a focal point of the conversations. Many *kūpuna* told countless *mo‘olelo* about their kid time days where they would go to Kaiona and the surrounding area to gather *limu*.

Limu ‘ele‘ele was mentioned during an interview with Kamuela Kala‘i. This *limu* can still be seen in the waters of Waimānalo in the Kaiona/Pāhonu area. As Ms. Kala‘i mentioned, this *limu* likes to grow in brackish water; when fresh water mixes with salt water. When the *limu* is long and hair like, that is the right time to gather *limu* and eat with fish or other foods.

Mr. Harold Ahuna Jr. and his daughter, Ms. Cheryl Ahuna mentioned the smell of *limu kohu (asparagopsis taxiformis)* during their time growing up and being raised in Waimānalo. They both have mentioned that when the sea was rich with *limu* and the wind blew a certain direction, the scent of *limu* will flow throughout Waimānalo. It is at this moment that people knew it was time to pick and gather *limu*.

As shared in the almost every interview conducted, the presence of *limu* has been on the decline and has not been prominent as it has been in the past. Therefore, the Waimānalo Limu Hui, which consists of mainly Waimānalo residents, have made it their mission to restore *limu* in Waimānalo waters. Waimānalo Limu Hui as taken on the *kuleana* to plant native *limu* varieties in hopes to bring back the life of *limu* to Waimānalo.

All of Waimānalo waters were once rich with various *i‘a* (fish and other sea animals). Many kūpuna and other community members shared about their *lawai‘a* or fishing experiences around Kaiona and Pāhonu. These practices include pole fishing, diving, as well as being able to identify different fish species.

As Waimānalo Limu Hui works on restoring the *limu* within the waters, they have also noticed a return of fish. They have seen an influx of *he‘e*, *loli*, *leho*, *weke*, *halalū* as well as many others.

Ms. Kala‘i along with Mr. Ahuna and Ms. Ahuna all shared stories and experiences of fishing throughout Waimānalo. The Ahuna family have a strong relationship with the ocean, raising a multiple generational fisherman. Mr. Ahuna and Ms. Ahuna shared that their *‘ohana* would sail to Mānana, where they would fish and harvest salt. Ms. Kala‘i recalled that they would catch *‘ōpakapaka*, *aholehole*, *weke‘ula*, and other types of fish. Each catch would then be divided so that everyone will have enough fish to eat.

One of the *kūpuna* of Waimānalo shared that there were once a lot of *akule* on the waters by Kaiona and Pāhonu. This kupuna continues to share that there were so much *akule* that the turtles would chase them.

Even though the sea life is not as rich as it was in the past, the community is striving to restore the sea life as well as to continue the practices of their kūpuna.

7.4 Religious Practices and Burials

Many of the *kūpuna* and community members of Waimānalo has expressed concerns of burials within the area. One human burial, SIHP # -8749, is located in the vicinity of the current project area.

Ms. Kala‘i, a *kama‘āina*, came to represent as a cultural descendant for the *iwi kūpuna* that was inadvertently discovered on the project site. She offered cultural protocol and shared that the *iwi kupuna* should be left where they have shown themselves. In addition, Ms. Kala‘i mentioned that *kūpuna* have shared that there are burials sites *mauka* of the project area. However, Ms. Kala‘i explained that no one really knows their true location.

Two *heiau* were constructed in Waimānalo. Pueo Heiau was the biggest of the two and located on what is now known as Waikūpanaha Road. Pōhakunui Heiau was much smaller and erected on the top of a small hill “just back of the Waimānalo hill” (McAllister in Sterling and Summer, 1978:246).

In addition to these *heiau,* there was is a shrine called Wailea. It is located on the ridge dividing Waimānalo and Kailua. It is devoted to the Lea, the goddess of canoe builders (Pukui et al. 1974:225) and a fish god that marked the best fishing grounds (Landgraf 1994:138). Kaluahine was a *ko‘a* that can no longer be located and most likely destroyed (Sterling and Summers 1978:251). Kini is a female *pōhaku* near Pāhonu that would attract fish. When the road was built, the *pōhaku* was moved from Pāhonu (Sterling and Summers 1978:250).

According to Pukui (1986), a *hi‘uwai* is a type of water purification that usually happens at the end of the year. *Hi‘uwai* is can be more identified as a spiritual or cleansing practice in a which a person immerse themselves in the ocean or stream and repents.

> *I kela me keia la mua o ka makahiki, he la hoomaemae ia no ka lahui mai o a o o ka aina, no na haumia o ka aina ma lalo o na rula o ka oihana kahuna, aohe mea koe i kauhale, ua kapa ia la he la hiuwai, hiuwai kane, hiuwai wahine, hiuwai keiki, hiuwai ka aina. O ia ko lakou la mihi i ke akua* […] [Ka Makaainana 2 December 1895]
>
> On every first day of the year, it was the day of cleaning for the people from all different lands, for all the uncleanliness of the land under the rules of the priests, nothing remains from the community. This day was called water purification, male water purification, female water purification, child purification, land purification. It is a day to repent to god […] [Translation by Author, Kamuela Ka‘apana]

As shared by Waimānalo Limu Hui, they have heard that there was a *hālau hula* who has once used the area of Pāhonu as a place to *hi‘uwai* as the *hālau hula* has a connection to Waimānalo.

Section 8 Summary and Recommendations

8.1 Results of Background Research

Background research for this study yielded the following results which are presented in approximate chronological order:

1. Ko‘olaupoko, the traditional name for the *moku* encompassing Waimānalo, translates literally as “the short windward” in contrast to the northern half of this coastline known as Ko‘olauloa, “the long windward.” This may reflect the relative short distance from the sea to the great *pali* of the Ko‘olau Mountains, which seem to loom directly over much of this district.
2. Towering above the northern *mauka* section of Waimānalo Ahupua‘a are the peaks of Lanipō and Pu‘u o Kona, while the peaks of Makapu‘u and Pu‘u o Moloka‘i characterize the southern *makai* section.
3. The overall wind name for Waimānalo is Limulīpu‘upu‘u. Pāhonu as a specific wind called ‘Alopali.
4. Waimānalo, Puhā, and Muliwai‘ōlena are streams found in this *ahupua‘a*. A *mauka* spring called Waikupanaha can also be found. Two companion springs, one *mauka*, Kupunakāne, and one *makai* called Kupunawahine, were reported to cry out to each other in soft voices on sunny days (Sterling and Summers 1978:247).
5. Pāhonu Pond was built for an ali‘i who was fond of turtle. Turtle was kapu and only the ali‘i was allowed to eat the turtle. (Sterling and Summer, 1978:249)
6. At the time that Kamehameha became the sole ruler of O‘ahu, Moloka‘i, Lāna‘i, Hawai‘i, and Maui, he retained the *ahupua‘a* of Waimānalo as his own personal property when he divided the conquered lands of O‘ahu among his warrior chiefs and counselors (‘Ī‘ī 1959:69-70). His sons Liholiho and Kauikeaouli—Kamehameha II and Kamehameha III, respectively—inherited most of Waimānalo Ahupua‘a (Commissioner of Public Lands 1929:28).
7. As a result of the Kuleana Act of 1850, the *ahupua‘a* of Waimānalo was awarded to Victoria Kamāmalu and subject to the *kuleana* claims of the commoners, and 113 *kuleana* land claims were awarded in Waimānalo (Barrère 1994; Kame‘eleihiwa 1992). There were three Land Commission Awards found around the project area with one being on the project site.
8. John A. Cummins saw the potential of sugar production at Waimānalo and in 1880 he organized the Waimanalo Sugar Company and began construction of a sugar mill. As the plantation grew, former ranch lands were converted to cane fields, new irrigation ditches and railroad lines were constructed, and improvements were made to the mill and Waimanalo Landing.
9. By the 1920s, plantation sugarcane fields stretched across the floor of Waimānalo Valley to the base of the Ko‘olau Range (Bartholomew and Associates 1959:14–15).
10. The intense cultivation of sugar in Waimānalo led to diverse forms of agriculture that continue today. The Waimanalo Sugar Company sold its fee-simple land holdings and the remaining years of its lease of government-owned lands to the Waimanalo Agricultural Development Company in 1947.
11. There were piers along the shore line, with Waimānalo Landing being the main pier for shipping sugar cane and other goods in and out of Waimānalo.

8.2 Results of Community Consultation

CSH attempted to contact 43 Native Hawaiian Organizations (NHOs), agencies, and community members. Of the 7 people that responded, 5 participated in formal interviews, and 2 gave recommendations. Below is a list of individuals who shared their *mana‘o* and *‘ike* about the project area and Waimānalo Ahupua‘a. *CSH is still awaiting approval of consultations.*

1. Waimānalo Limu Hui, Community Group
2. Kamuela Kala‘i, *Kama‘āina*
3. Alu Like, Inc., Waimānalo Kūpuna Program;
4. Harold Ahuna Jr. and Cheryl Ahuna, *Kama‘āina*
5. Kalani Kalima and his father, *Kama‘āina*

8.3 Impacts and Recommendations

Based on information gathered from the cultural and historical background and the community consultation, CSH identified potential impacts and makes the following recommendations based on approved community consultations. *CSH is still awaiting approval of consultations.*

1. Previous archaeological studies have indicated the presence of three State Inventory of Historic Properties (SIHP # 50-80-15-8747, the former Anderson Estate Pāhonu remnants, SIHP # -8748, pre- to late post-Contact subsurface cultural layer, and SIHP # -8749, a human burial) within the project area.
2. Ms. Kala‘i, though she is not a federally recognized lineal descendant, claimed *iwi kupuna* found on the project area via cultural descendancy.
3. Ms. Kala‘i expressed that there are burial caves towards the mountain side of the project area and that if one set of *iwi kupuna* were found, then others may be around.
4. The Waimānalo Limu Hui expressed some concerns on how the proposed project will impact the mission and goal of their organization. There are two fresh water underground flows that were discovered. Fresh water is needed to create a more conducive environment for sea life to flourish.
5. The Waimānalo Limu Hui utilize the loose *pōhaku* (rock) that are found along the property seawall.
6. The Waimānalo Limu Hui produced the following concerns regarding the proposed project:
    a. Access to Pāhonu. How/if/will construction of the sea wall will affect access to the pond?
    b. Use of loose *pōhaku*. Will the developers be utilizing or moving the loose rocks along the sea wall. The Waimānalo Limu Hui use the loose rocks around the area to help rebuild the Pāhonu wall.
    c. Depth of the wall and how far it will go into the ground. Because there are two underground water flows, the depth of the sea wall may potentially impact the water flow.
    d. The Waimānalo Limu Hui President (Ikaika Rogerson) and Vice-President (Kaleo Puana) are willing to collaborate with developers on how they (Waimānalo Limu Hui and the developers) can work together. For example, if the developer/construction will be needing access to the Pāhonu or utilize any of the

loose rocks, will the developers/construction be willing to help dig up other *pōhaku* for the Pāhonu wall?

7. Many *kūpuna* (elders) and community members reflected on family gatherings and quality time being spent at Kaiona and Pāhonu.
    a. Will the sea wall development project affect access to Pāhonu or Kaiona?
8. Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended.
9. In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance

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1975 UH SOEST Waimanalo coast aerial photograph. University of Hawai‘i at Mānoa School of Ocean and Earth Science and Technology–Coastal Geology Group. Online at http://soest.hawaii.edu/coastal/webftp/Oahu/mosaics/

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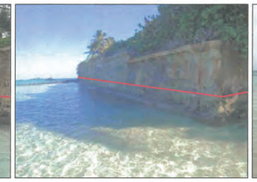
APPENDIX E

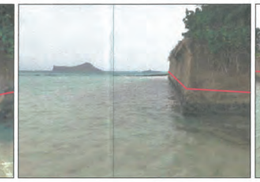
Certified Shoreline Map

1

2



3



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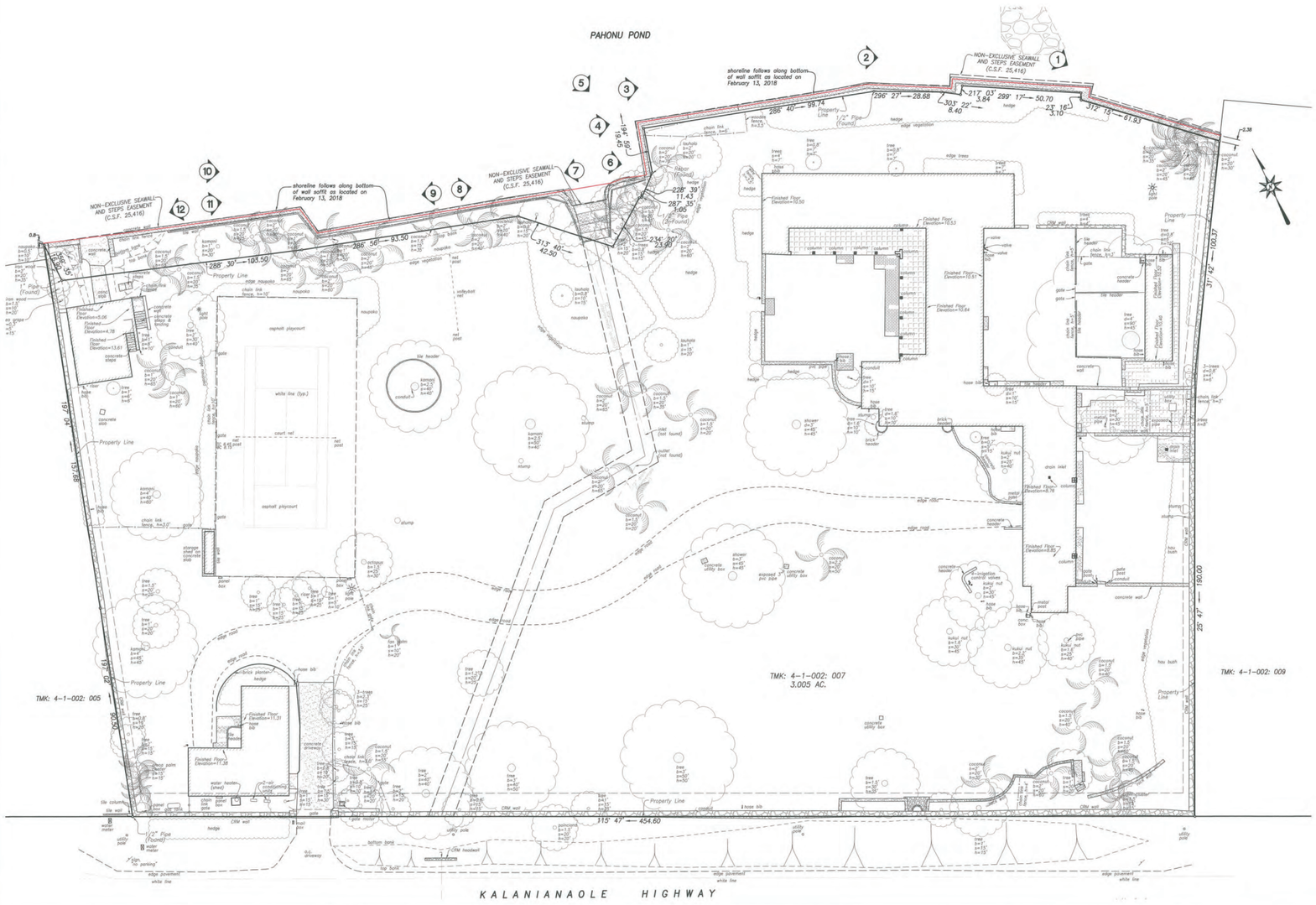

The shoreline as delineated in red is hereby certified as the shoreline as of
JUN 05 2018
Chairperson, Board of Land and Natural Resources

ABBREVIATIONS:

CRM Concrete Rubble Masonry

NOTES:
Azimuths are referred to Government Triangulation Station "Makapuu" Δ.

1 *Denotes approximate position and direction of shoreline photographs.*

GRAPHIC SCALE 1"=20'
20 10 0 20 40 60

KENI S. NISHIURA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 9043
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

LICENSED PROFESSIONAL LAND SURVEYOR No. 9043

KN Surveying, LLC
500 ALAKAWA STREET, #100A
HONOLULU, HAWAII 96817
PH. 524-7100

SHORELINE SURVEY
AT 41-505 KALANIANAOLE HIGHWAY

OWNER: WAIMANALO PARADISE LLC
PAHONU, WAIMANALO, KOOLAUPOKO, OAHU, HAWAII
AS SHOWN ON LAND COURT APPLICATION 997 MAP 1
TAX MAP KEY: 4-1-002: 007
SCALE: 1 IN. = 20 FT.

SURVEY OFFICE COPY

FEBRUARY 13, 2018 FIELD BOOK NO. 159: 01

42" X 30"

APPENDIX F

Draft EA Pre-Assessment Consultation Correspondence

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

KIRK CALDWELL
MAYOR

ROBERT J. KRONING, P.E.
DIRECTOR

MARK YONAMINE, P.E.
DEPUTY DIRECTOR

September 30, 2019

HHF Planners
ATTN: Scott Ezer
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer,

Subject: Waimanalo Paradise Seawall Repairs Draft Environmental Assessment Consultation 41-5-5 Kalanianaole Highway, Waimanalo, Oahu, Hawaii TMK: (1) 4-1-002:021 and 022

Thank you for the opportunity to review and comment. The Department of Design and Construction has no comments at this time.

Should you have any additional questions, please call me at 768-8480.

Sincerely,

Robert J. Kroning, P.E.
Director

RJK:ms (786959)

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February 23, 2020

Mr. Robert J. Kroning, P.E.
Director
Department of Design and Construction
City and County of Honolulu
650 South Beretania Street, 11th Floor
Honolulu, Hawai'i 96813

Dear Mr. Kroning:

Waimānalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated September 30, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project. We appreciate your efforts to review the project information and to inform us that your department does not have any comments to offer at this time.

Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Mahalo,

HHF Planners

Scott Ezer
Principal

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluldpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

KATHY K. SOKUGAWA
ACTING DIRECTOR

TIMOTHY F. T. HIU
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

October 14, 2019 2019/ELOG-1807(AB)

Mr. Scott Ezer
HHF Planners
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer:

SUBJECT: Pre-Environmental Assessment Consultation
Chapter 343, Hawaii Revised Statutes
Waimanalo Paradise Seawall Repair
Tax Map Keys 4-1-002: 021 and 022 (formerly parcel 007)

Thank you for the opportunity to provide pre-consultation comments for the forthcoming Environmental Assessment (EA). The Project involves extensive repairs and improvements to an existing nonconforming seawall. The improvements are intended to protect the property from wave damage, erosion, and the effects of sea level rise. The Project will take place within the shoreline setback area, and requires a Shoreline Setback Variance (SSV). You have asked that we identify relevant issues and concerns to address in the EA. The Department of Planning and Permitting has the following comments:

1. The EA must discuss compliance with the shoreline setback regulations, Chapter 23 of the Revised Ordinances of Honolulu. Please address the review criteria for the SSV, discuss the resultant hardship if the SSV cannot be granted, and why the proposal is the most practicable solution to permit reasonable development of the lots.

2. The EA should thoroughly examine alternatives to the proposal discussed in your letter, and not assume without analysis that hardship will be established, or that the proposal is the most practicable alternative. These alternatives should minimally include: No action, beach nourishment, seawall removal, new seawall located somewhat inland of the shoreline, and new seawall placed outside of the shoreline setback area. Alternative designs of the seawall, such as scour apron, revetment, etc., should also be discussed.

3. The EA should include a discussion of the loko ia, and whether or not protection is already provided to the site by this structure. If the loko ia already provides protection, the necessity of the seawall may be called into question. Considering the size of the lots, the limited development potential (per the restrictive covenant), and the existence of the historical off-shore structures, a new, reinforced seawall addition at the shoreline may not be necessary.

4. The EA should include a discussion of compliance with Mayors Directive 18-1, related to climate change, and the Oahu Resilience Strategy. This EA should assume a sea level rise rate of 3.2 feet in the next 30 years throughout the document.

5. Please include the Office of Climate Change, Sustainability and Resiliency on your list of agencies to receive a copy of the EA for comment.

Should you have any further questions, please contact Alex Beatty, at 768-8032.

Very truly yours,

for Kathy K. Sokugawa
Acting Director

HHF PLANNERS
places for people

February 23, 2020

Ms. Kathy Sokugawa, Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813

Dear Ms. Sokugawa:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated October 14, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project. We appreciate your efforts to review the project information and offer the following responses to each comment.

1. A discussion of how the proposed project relates to the shoreline setback regulations, Chapter 23 of the Revised Ordinances of Honolulu, and the applicable review criteria for the shoreline setback variance application (SSV) is outlined in Section 5.2.5 of the Draft EA. Detailed review of the hardship standard for granting a SSV, including justification to support the Proposed Action as the most practicable solution, will be provided in the forthcoming SSV application. We are unaware of any legal requirements to provide an analysis of hardship as part of the EA review process.

2. We appreciate your input into the formulation of alternatives to be considered. Alternatives to the proposed seawall repairs and modifications are described in Section 2.5 of the Draft EA. The coastal engineering analysis prepared by Sea Engineering, Inc. (2020) for the proposed project evaluated a range of nine alternatives: (1) no action; (2) managed retreat; (3) beach restoration (4) beach restoration with stabilizing structures; (5) revetment; (6) hybrid seawall-revetment; (7) seawall removal; (8) seawall replacement; and (9) seawall repair.

3. Analysis of the alternatives, as well as the analysis of impacts associated with the Proposed Action, consider the impacts to Pāhonu Fishpond, which is listed on the Hawai'i Register of Historic Places and is a cultural and recreational asset for the community. While it is correct to assume that the exterior fishpond wall provides a limited amount of protection from wave surges, the fishpond wall is insufficient by itself to protect the project site due to its height and the nature of its construction. The Proposed Action was determined to be the most cost effective and least environmentally impactful method to increase the property's resilience to coastal hazards and sea level rise over the 50-year planning period.

4. The 3.2-foot sea level rise exposure area (3.2 SLR-XA) in relation to the project area is described in the Draft EA, along with a discussion of the potential impacts from sea level rise and climate change. Compliance with the Mayor's Directive 18-02 (July 16, 2018) related to climate change and the *O'ahu Resilience Strategy* (2019) is discussed in Sections 3.8 and 5.2.6 of the Draft EA, respectively.

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5. The City's Office of Climate Change, Sustainability and Resiliency was not included in the pre-assessment consultation process conducted in September 2019. At your request, their office will be added to the distribution list to review notice of the Draft EA availability.

Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any additional comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

Pacific Guardian Center | 733 Bishop Street, Suite 2590 | Honolulu, Hawaii 96813
Telephone: 808.545.2055 | Facsimile: 808.545.2050 | www.hhf.com | email: info@hhf.com

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

WES FRYSZTACKI
DIRECTOR

JON Y. NOUCHI
DEPUTY DIRECTOR

TP9/19-787085R

October 5, 2019

Mr. Scott Ezer, Principal
HHF Planners
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer:

SUBJECT: Waimanalo Paradise Seawall Repairs Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalanianaole Highway, Waimanalo, Oahu, Hawaii
TMKs: (1) 4-1-002: 021 and 022

This is in response to correspondence dated September 12, 2019, requesting our input and comments on the subject project. We have the following comments:

1. **Street Usage Permit.** A street usage permit from the Department of Transportation Services should be obtained for any construction-related work that may require the temporary closure of any traffic lane on a City street.

2. **Roadway, Sidewalk and Crosswalk Closures.** If there are any roadway, sidewalk or crosswalk closures, alternate routes should be provided for vehicles, pedestrians, and bicyclists that are safe and clearly marked.

3. **Best Management Practice (BMP) Controls.** BMP controls should be included at the construction site to prevent trailing of dirt and debris onto adjacent roadways.

4. **Roadway Damage.** Any damage to the existing roadway and sidewalk area caused by the project should be repaired to current City standards as well as meet Americans with Disabilities Act requirements.

5. **Neighborhood Impacts.** The area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel (fire, ambulance, and police), Oahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details and status throughout the project and the impacts that the project may have on the adjoining local street area network.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Virginia Sosh, of my staff, at 768-5461.

Very truly yours,

Wes Frysztacki
Director

HHF PLANNERS
places for people

February 23, 2020

Ms. Wes Frysztacki, Director
Department of Transportation Services
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawai'i 96813

Dear Mr. Frysztacki:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated October 5, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project. We appreciate your efforts to review the project information and offer the following responses to your comments.

Construction-Related Impacts
Kamehameha Highway is a state highway under the jurisdiction of the State Department of Transportation (HDOT). No impacts to the highway or the property's driveway are expected as construction activities would be contained within the property. Although no traffic lane closures or impacts to bicycle or pedestrian access along the highway are currently anticipated, any such work would be coordinated with HDOT. The Draft EA will specify that best management practice controls would be used at the construction site to prevent dirt and debris from entering adjacent roadways.

Public Notification
We concur that keeping neighboring property owners and the local community apprised of the project during both the planning and construction phases is important. In an effort to maintain positive community relationships, representatives from the project team intend to provide a presentation to the Waimānalo Neighborhood Board when the Draft EA is published.

Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any additional comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

Pacific Guardian Center | 733 Bishop Street, Suite 2590 | Honolulu, Hawaii 96813
Telephone: 808.545.2055 | Facsimile: 808.545.2050 | www.hhf.com | email: info@hhf.com

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

LD 1715

October 14, 2019

HHF Planners
ATTN: Waimānalo Paradise Seawall Repairs
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Via email: lkurisaki@hhf.com

Dear Sirs:

SUBJECT: **Waimānalo Paradise Seawall Repairs, Draft Environmental Assessment Pre-Assessment Consultation**, 41-505 Kalanianaole Highway, Waimānalo, Island of Oahu, Hawai'i; TMKs: (1) 4-1-002:021 and 022

Thank you for the opportunity to review and comment on the above subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed a copy of your request to DLNR's various Divisions for their review and comments.

Enclosed are responses received from the (a) Division of Aquatic Resources, b) Engineering Division, and (c) Land Division – Oahu District on the subject matter. Should you have any questions, please feel free to contact Barbara Lee at (808) 587-0453 or by email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
SEP 19 2019
Division of Aquatic Resources
DAR 6017

September 17, 2019

MEMORANDUM

LD 1715

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

RECEIVED
LAND DIVISION
2019 OCT 11 AM 10:45
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Waimanalo Paradise Seawall Repairs Draft Environmental Assessment Pre-Assessment Consultation**
LOCATION: 41-505 Kalanianaole Highway, Waimanalo, Island of Oahu
TMK: (1) 4-1-002:021 and 022 (formerly 4-1-002:007)
APPLICANT: HHF Planners on behalf of Waimanalo Paradise, LLC

Transmitted for your review and comment is information on the above-referenced project. Please note there is a typographic error in the project's street address in the attached request letter—this has been corrected in the above location data.

Please submit any comments to DLNR's Land Division by **October 11, 2019.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee by phone at 587-0453, or write to barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed:

Print Name: BRIAN J NEILSON, DAR ADMINISTRATOR
Date: 10-10-19

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
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
KAHO'OLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: 10/9/2019
DAR # 6017

RECEIVED
LAND DIVISION
2019 OCT 11 AM 10:45
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Daniel Lager, Aquatic Biologist
Daniel J Lager 10/9/2019

SUBJECT: Waimanalo Paradise Seawall Repairs Draft Environmental Assessment
Pre-Assessment Consultation

Request Submitted by: HHF Planners

Location of Project: 41-505 Kalanianaole Highway, Waimanalo, Island of O'ahu

Brief Description of Project:

Two residential properties fronting the ocean in Waimanalo have a seawall which needs to be repaired to protect them from wave damage, erosion, and the effects of sea level rise. The existing seawall was built between 1911 and 1928 and over time has developed structural deficiencies including cracks, delamination, spalling, abrasion, undermining, and skin-holes. The repairs and modifications of the seawall will increase the height of portions to achieve a minimum of 9 feet along its length. The repairs also include patching cracks, filling front surface mortar, replacing undermined areas with tremie concrete and adding reinforced concrete wall extensions.

Comments:
☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: Date: 10-10-19
Brian J. Neilson
DAR Administrator

DAR# 6017

Brief Description of Project

This project is has proposed best management practices (BMP) of using 8" Biosock filter around terrestrial work areas, having wooden form around in-water work areas and implementing a 5' deep floating silt curtain around in-water work areas.
The project is planned to commence Sept. 2020 and be completed by March 2021.

DAR# 6017

Comments

The Division of Aquatic Resources (DAR) would appreciate if the Draft Environmental Assessment (DEA) for this project would address how these actions will impact the near shore habitat and the extent of the impact. DAR would like to review the findings from the technical studies which are listed in the proposal looking at coastal processes, erosion, marine water quality, and marine biology. The existing seawall and the immediate area below it should be surveyed for the presence of any living coral. In the event there is coral present appropriate measures should be made to mitigate for that loss or relocate them to adjacent habitats.

DAR is in support of the listed best management practices BMPs with in the work plan provided. Implementing the practice of utilizing erosion control and land-based sources of pollution (LBSP) barrier measures at the proposed project site is crucial to preventing damage to the near shore habitat from sediment and chemical discharge. Periods of heavy precipitation increase run-off across these types of surfaces and there is a higher risk of LBSP ending up in in the marine ecosystem. If there is any spills of sediment or waste water during the upgrade project it should be reported promptly and the impact to the marine habitats need to be assessed by DAR.

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plans DAR requests the opportunity to review and comment on those changes.

Regards,

Daniel Lager
Aquatic Invasive Species Biologist
Dept. of Land and Natural Resources
Division of Aquatic Resources
1039 Sand Island Parkway
Honolulu, HI 96819
daniel.j.lager@hawaii.gov

LD 1797

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2019 SEP 27 AM 10: 51
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 17, 2019

MEMORANDUM

LD 1715

FROM

TO:

DLNR Agencies:
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Waimanalo Paradise Seawall Repairs Draft Environmental Assessment Pre-Assessment Consultation**
LOCATION: 41-505 Kalanianaole Highway, Waimanalo, Island of Oahu
TMK: (1) 4-1-002:021 and 022 (formerly 4-1-002:007)
APPLICANT: HHF Planners on behalf of Waimanalo Paradise, LLC

Transmitted for your review and comment is information on the above-referenced project. Please note there is a typographic error in the project's street address in the attached request letter—this has been corrected in the above location data.

Please submit any comments to DLNR's Land Division by **October 11, 2019.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee by phone at 587-0453, or write to barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:

Print Name: Carty S. Chang, Chief Engineer
Date: 9/25/19

Attachments
Cc: Central Files

19SEP19AM10:50 RECEIVED

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Waimanalo Paradise Seawall Repairs Draft Environmental Assessment Pre-Assessment Consultation
TMK(s): (1) 4-1-002:021 and 022 (formerly 4-1-002:007)
Location: 41-505 Kalanianaole Highway, Waimanalo, Island of Oahu
Applicant: HHF Planners on behalf of Waimanalo Paradise, LLC

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

Signed: CARTY S. CHANG, CHIEF ENGINEER

Date: 9/25/19

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 17, 2019

MEMORANDUM

LD 1715

FR ~~TO:~~ **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

TO ~~FROM:~~ Russell Y. Tsuji, Land Administrator
SUBJECT: **Waimanalo Paradise Seawall Repairs Draft Environmental Assessment Pre-Assessment Consultation**
LOCATION: 41-505 Kalanianaole Highway, Waimanalo, Island of Oahu
TMK: (1) 4-1-002:021 and 022 (formerly 4-1-002:007)
APPLICANT: HHF Planners on behalf of Waimanalo Paradise, LLC

Transmitted for your review and comment is information on the above-referenced project. Please note there is a typographic error in the project's street address in the attached request letter—this has been corrected in the above location data.

Please submit any comments to DLNR's Land Division by **October 11, 2019.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee by phone at 587-0453, or write to barbara.j.lee@hawaii.gov. Thank you.

BL If the repair work ~~exceeds~~ extends the ~~square feet~~ area covered by the easement, then the easement may need to be amended. Encumbered by GL-6083.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: Cal Nayahara
Print Name: CAL NAYAHARA
Date: 9/19/19

Attachments
Cc: Central Files

February 23, 2020

Mr. Russell Y. Tsuji
Administrator, Land Division
State of Hawai'i Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Tsuji:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-505 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated October 14, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project. We appreciate your efforts to review the project information and offer the following responses to each comment.

Division of Aquatic Resources (DAR)

Chapter 3 of the Draft EA provides a description of existing conditions and potential impacts to the natural environment, including resource areas that are of concern to DAR such as coastal processes, marine water quality, and biological resources within the nearshore marine environment. We look forward to receiving any comments on the coastal assessment and marine resources assessment prepared to support the proposed project, which are summarized in Chapter 3 and attached as appendices in the Draft EA. The summary presented in Chapter 3 includes a discussion of any coral colonies that were identified in the vicinity of the project area.

As mentioned in your comments, best management practices will be followed to contain land-based sources of pollution and prevent damage to the nearshore habitat from sediment and chemical discharge. Also, we appreciate the reminder that prompt reporting is necessary for any sediment or waste water spills that occur during construction. Should there be any substantial changes to the project plans, DLNR would be notified of such changes.

Engineering Division

According to the Flood Hazard Assessment Tool gis.hawaiinfip.org/FHAT from the State of Hawai'i website, the project area includes sections in both Flood Hazard Zone VE, defined as an area outside the 0.2% annual chance floodplain, and Flood Hazard Zone AE, defined as unstudied areas where flood hazards are undetermined, but flooding is possible. The Draft EA will describe flood hazards and the proposed project's compliance with the rules and regulations of the National Flood Insurance Program.

Land Division, O'ahu District

We note that the existing easement may need to be amended if the repair work extends into the area covered by the easement.

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Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any additional comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

Pacific Guardian Center | 733 Bishop Street, Suite 2590 | Honolulu, Hawaii 96813
Telephone: 808.545.2055 | Facsimile: 808.545.2050 | www.hhf.com | email: info@hhf.com

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
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

REF:OCCL:SS

Correspondence: OA 20-61

SEP 25 2019

HHF Planners
c/o Leslie Kurisaki
Pacific Guardian Center
733 Bishop St., Suite 2590
Honolulu, HI 96813

SUBJECT: Draft Environmental Assessment Pre-Consultation Regarding Proposed Waimanalo Paradise Seawall Repairs, Waimanalo, Oahu
Seaward of Tax Map Keys: (1) 4-1-002: 021 and 022

Dear Ms. Kurisaki,

Thank you for contacting the Department of Land and Natural Resources, Office of Conservation and Coastal Lands (OCCL) regarding the Environmental Assessment (EA) that is being prepared for the proposed repair work to be done at the subject property. Your letter included a project summary sheet, existing site plans, a location map with photographs, and details of the work to be completed. The information provided states that the repairs would consist of: (1) repair of spalls from isolated small steel connections and random embedded steel at the front surface of the wall; (2) patching of vertical and diagonal cracks to mitigate potential loss of fines through cracks; (3) fill and repair shallow and more deeply abraded and missing front surface mortar; (4) increasing of scour resistance at the wall's base by filling and replacing undermined areas at the toe of the wall with tremie concrete; (5) replace missing, settled, and spalled concrete masonry unit wall extensions with new reinforced concrete wall extensions; (6) removing and replacing derelict areas of the top cap and splash guard; and (7) increasing the wall crest elevation for sections 3C, 4 and 5 to +9.0 feet msl. Existing sinkholes at the base of the wall will also be filled.

The OCCL appreciates your notification of the proposed work and will wait until the Draft Environmental Assessment (DEA) is received before making substantive comments, determinations, or decisions, if any. If you have further questions, please feel free to contact Salvatore Saluga in the Office of Conservation and Coastal Lands at 587-0399 or Salvatore.J.Saluga@hawaii.gov.

Sincerely,

SAMUEL J. LEMMO, ADMINISTRATOR
OFFICE OF CONSERVATION AND COASTAL LANDS

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February 23, 2020

Mr. Samuel J. Lemmo
Administrator, Office of Conservation and Coastal Lands
Department of Land and Natural Resources
State of Hawai'i
P.O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Lemmo:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated September 25, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project. We appreciate your efforts to review the preliminary project information and to inform us that your office will wait to review the Draft EA before offering any substantive comments.

Your letter and this response will be included in the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

MARY ALICE EVANS
DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

DTS 201910090850LI

October 17, 2019

Mr. Scott Ezer, Principal
HHF Planners
Attn: Waimanalo Paradise Seawall Repairs
733 Bishop Street, Suite 2590
Honolulu, HI 96813

Dear Mr. Ezer

Subject: Environmental Assessment Pre-Assessment Consultation for Waimanalo Paradise Seawall Repairs, 41-5-5 Kalanianaole Highway, Waimanalo, Oahu, Hawaii; Tax Map Key: (1) 4-1-002: 021 and 022

The Office of Planning (OP) is in receipt of your Environmental Assessment (EA) pre-assessment consultation request, received September 18, 2019, for the proposed Waimanalo Paradise seawall repairs and modifications.

According to your request, Waimanalo Paradise, LLC is proposing repairs and modifications to an existing seawall fronting two oceanfront parcels in Waimanalo, Oahu. The existing seawall is approximately 585 feet long with a crest elevation ranging from 11 feet to 5 feet mean sea level. The proposed action will raise the height in portions of the seawall to achieve a minimum 9-foot height along its length, to protect the residential property from wave damage, erosion, and the effects of sea level rise.

The OP has reviewed the subject EA pre-assessment consultation request and has the following comments to offer:

1. Please note that the new Environmental Impact Statement Rules, Hawaii Administrative Rules (HAR) Chapter 11-200.1, took effect on August 9, 2019, including a definition of trigger of environmental review. The EA should discuss the trigger(s) of requirements of Hawaii Revised Statutes (HRS) Chapter 343.

2. The Hawaii Coastal Zone Management (CZM) Law, HRS Chapter 205A, requires all state and county agencies to enforce the CZM objectives and policies. To best inform, the subject EA should include an assessment with mitigation measures if

needed, as to how the proposed project conforms to each of the CZM objectives and supporting policies set forth in HRS § 205A-2, as amended.

3. The proposed seawall modification project is located within the shoreline area as defined in HRS § 205A-41. Pursuant to HRS 205A-44(b), permitted structures may be repaired, but shall not be enlarged within the shoreline area without a shoreline setback variance. The EA should specifically discuss the compliance with the requirements of county shoreline setback ordinances, by consulting with the Department of Planning and Permitting, City and County of Honolulu.

4. According to the consultation request, portions of the proposed work will take place below the mean higher high water line in Waters of the United States. Pursuant to Code of Federal Regulations (CFR), 15 CFR 930, if an Army Corps of Engineers Permit is required for the proposed seawall project, a federal consistency review may be required from the OP, Hawaii CZM Program.

If you have any questions regarding this comment letter, please contact Shichao Li of our CZM Program at (808) 587-2841.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

HHF PLANNERS
places for people

February 23, 2020

Ms. Mary Alice Evans, Director
Office of Planning, State of Hawai'i
P.O. Box 2359
Honolulu, Hawai'i 96804

Dear Ms. Evans:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated October 17, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project. We appreciate your efforts to review the project information, and offer the following responses to each comment.

1. We have reviewed the new Environmental Impact Statement Rules, Hawai'i Administrative Rules Chapter 11-200.1 that took effect in August 2019. The trigger that requires compliance with Hawaii Revised Statutes (HRS) Chapter 343 is identified in Section 1.1 of the Draft EA.
2. We acknowledge that HRS Chapter 205A-1 defines the Coastal Zone Management (CZM) area to encompass "all lands in the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea." Section 5.1.3 of the Draft EA addresses the project's conformance with the objectives of HRS Chapter 205A-2.
3. The City and County of Honolulu Department of Planning and Permitting (DPP) is the designated lead agency with regulatory authority over development within the shoreline area. As such, the landowner will be consulting with DPP to process the EA and ensure compliance with HRS Chapter 343. A discussion of how the proposed project relates to the shoreline setback regulations, Chapter 23 of the Revised Ordinances of Honolulu, and the applicable review criteria for the shoreline setback variance application is outlined in Section 5.2.5 of the Draft EA.
4. Thank you for the information about the Hawai'i CZM Program federal consistency review. The Department of the Army has determined that the Proposed Action is not subject to their regulatory jurisdiction and does not require authorization under their permitting system. As such, federal CZM consistency review is not required for the project.

Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any additional comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

Pacific Guardian Center | 733 Bishop Street, Suite 2590 | Honolulu, Hawaii 96813
Telephone: 808.545.2055 | Facsimile: 808.545.2050 | www.hhf.com | email: info@hhf.com

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

September 30, 2019

SUBJECT: Response to Draft Environmental Assessment Pre-Assessment Consultation Letter, Waimanalo Paradise Seawall Repairs, Oahu, Hawaii; Corps Ref: POH-2019-00189

Scott Ezer, Principal
HHF Planners
Pacific Guardian Center
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer:

The Honolulu District, U.S. Army Corps of Engineers (Corps), Regulatory Branch is in receipt of your letter dated September 12, 2019, regarding the proposed repair and modifications to an existing 585-foot long seawall in Waimanalo, Oahu, Hawaii. In preparation for the development of an Environmental Assessment, you have identified the need to obtain a permit from the Corps.

We have reviewed your submittal pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344; “Section 404”) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403; “Section 10”). Section 404 requires Department of the Army (DA) authorization for the discharge (placement) of dredged and/or fill material into waters of the U.S., including wetlands. Section 10 requires DA authorization for the placement of structures in, under or over navigable waters of the U.S. and/or other work affecting the course, location, condition or capacity of such waters. Based on the preliminary information provided, it appears that you will likely need authorization under both Section 10 and Section 404.

You are proposing to have the project authorized with a Nationwide Permit 3 for Maintenance. I have enclosed a Pre-construction Notification application that you may use to submit project information. I am also enclosing a Drawing Checklist for your reference. We strongly encourage you to avoid and minimize impacts to the Pacific Ocean to the greatest extent possible. Nationwide Permits may only be used to authorize projects that have no more than minimal individual and cumulative adverse environmental impacts. Additional information pertaining to our permitting program can be found at:

https://www.poh.usace.army.mil/Missions/Regulatory/Permits.aspx

Thank you for your early coordination with the Honolulu District Regulatory Program. Please don't hesitate to contact me if you have any questions regarding the permitting process or our regulatory program. I may be reached at karen.m.urelius@usace.army.mil or (808) 823-0549.

Sincerely,

Karen M. Urelius
Senior Project Manager, Regulatory Branch

Enclosures

Honolulu District

U.S. Army Corps of Engineers

Nationwide Permit Pre-Construction Notification (PCN)

This PCN template integrates requirements of the U.S. Army Corps of Engineers (Corps) Nationwide Permit (NWP) Program with the Honolulu District (POH) NWP Regional Conditions. Boxes 1-10 should be completed to include all information required by NWP General Condition 32. Boxes 11 and 12 (or other sufficient information to show compliance with all NWP General and POH Regional Conditions) is also recommended to be completed for proposed activities seeking verification under the NWP Program. If additional space is needed, please provide as a separate attachment. Please refer to the attached *Instructions for the Honolulu District Nationwide Permit Pre-Construction Notification (PCN)* (Instructions) for instructions on completing the PCN.

To be completed by the Corps – do not fill-in

Application Number:	Date Received:	Date Complete:

1. Prospective Permittee and Agent Contact Information (see Instructions)

a. Prospective Permittee

First - _____ Middle - _____ Last - _____

Company - _____ Email Address - _____

Address - _____ City - _____ State/Territory - _____ Zip - _____

Phone (Residence/Mobile) - _____ Phone (Business) - _____

b. Agent (if applicable)

First - _____ Middle - _____ Last - _____

Company - _____ Email Address - _____

Address - _____ City - _____ State/Territory - _____ Zip - _____

Phone (Residence/Mobile) - _____ Phone (Business) - _____

c. Statement of Authorization: I hereby authorize _____, to act on my behalf as my agent for the proposed activity. (Optional, see instructions)

_____ Signature of Applicant _____ Date

2. Name and Location of the Proposed Activity (see Instructions)

☐ The proposed work would involve multiple-single and complete projects. See attachment for the information required in Boxes 2 through 12, as applicable.

a. Project Name or Title:

b. City, County, Island, State/Territory:

c. Name of Impacted Waterbody(ies):

d. Coordinates (in decimal format):
Latitude - Longitude -

☐ Unknown (please provide other location descriptions below)

e. Other Location Description (optional, see instructions):

f. Directions to the site (optional, see instructions):

3. Specific NWP(s) you want to use to authorize the proposed activity (see Instructions)

4. Description of the Proposed Activity (see Instructions)

a. Complete description of the Proposed Activity:

Impact Quantifications:

For discharges of dredged/fill material (*if more than 3 fill activities proposed, include extended table as an attachment*):

☐ N/A, no discharge of dredged or fill material in waters of the U.S. proposed.

Impacted Water Name (e.g. Aloha Stream)	Impacted Water Type (T-Tributary, W-Wetland, N-Navigable water)	Fill Activity (e.g. sandbag berm, temp access, bank stabilization, etc.)	Fill Dimensions in Waters of the U.S. *Note: Only record fill placed below Ordinary High Water Mark (OHWM) for Stream/Tributary, Wetland Boundary or High Tide Line (HTL) for Navigable Waters*				Impact Duration (T-Temporary, P-Permanent, L-Loss)	Fill Material Type (e.g. boulder, sand, sandbag, soil, etc.)
			Length (ft)	Width (ft)	Area (sq ft)	Volume (cy)		
	☐T ☐W ☐N						☐T ☐P ☐L	
	☐T ☐W ☐N						☐T ☐P ☐L	
	☐T ☐W ☐N						☐T ☐P ☐L	

For structures (*if more than 3 structures proposed, include extended table as an attachment*):

☐ N/A, no structures in navigable waters proposed.

Impacted Navigable Water Name (e.g. Mahalo Bay)	Impacted Water Type (T/W/N)	Type of Structure and Material (e.g. HDPE pipeline, concrete pier, steel cofferdam, etc.)	Structure's Position (I-In/O-Over/U-Under nav water)	Structure's Dimensions in Navigable Waters			Impact Duration (T-Temporary, P-Permanent, L-Loss)
				Length (ft)	Width (ft)	Area (sq ft)	
	☐T ☐W ☐N		☐I ☐O ☐U				☐T ☐P ☐L
	☐T ☐W ☐N		☐I ☐O ☐U				☐T ☐P ☐L
	☐T ☐W ☐N		☐I ☐O ☐U				☐T ☐P ☐L

For dredging activities (*if more than 3 dredge activities proposed, include extended table as an attachment*):

☐ New dredging ☐ Maintenance dredging ☐ N/A, no dredging in navigable waters proposed.

Impacted Navigable Water Name (e.g. Lei Harbor)	Impacted Water Type (T/W/N)	Dredge/Removal Dimensions in Navigable Waters				Impact Duration (T-Temporary, P-Permanent, L-Loss)	Dredged Material Type (e.g. sand, mud, rock, etc.)
		Dredged Area Length (ft)	Dredged Area Width (ft)	Dredged Area (sq ft)	Dredged Volume (cy)		
	☐T ☐W ☐N					☐T ☐P ☐L	
	☐T ☐W ☐N					☐T ☐P ☐L	
	☐T ☐W ☐N					☐T ☐P ☐L	

b. Purpose of the Proposed Activity:

c. Direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure:

d. Description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity:

e. Any other NWP(s), or Individual Permit(s) used or intended to be used to authorize any part of the proposed activity or any related activity including other separate and distant crossings for linear projects that require Department of the Army authorization:

f. Have sketches been provided containing sufficient detail to show that the activity complies with the terms of the NWP and provide an illustrative description of the proposed activity? ☐ Yes, Attached ☐ No

5. Aquatic Resource Delineation (see Instructions)

a. Has a delineation of aquatic resources(wetlands, other special aquatic sites, and other waters, such as perennial, intermittent, ephemeral streams and navigable waters i.e. harbors, shoreline, ocean) been conducted in accordance with the current method required by the Corps? ☐ Yes ☐ No ☐ N/A, project located entirely in marine waters with no associated upland activities (e.g. buoy, marine bore, etc.)

If yes, please attach a copy of the delineation

Note: If no, your PCN is not complete. In accordance with General Condition 32, you may request the Corps delineate the special aquatic sites and other waters on the project site, but there may be a delay. In addition, the PCN will not be considered complete until the delineation has either been submitted to or completed by the Corps, as appropriate.

b. If a delineation has been submitted, would you like the Corps to conduct a jurisdictional determination (preliminary or approved)? ☐ Yes ☐ No

If yes, please complete, sign and return the attached *Appendix 1 – Request for Corps Jurisdictional Determination (JD)* sheet or provide a separate attachment with the information identified in Appendix 1.

6. Compensatory Mitigation (see Instructions)

a. Will the proposed activity result in the loss of greater than 1/10-acre of wetlands? ☐ Yes ☐ No

Note: In accordance with Regional Condition 3, permanent losses of wetlands and other special aquatic sites greater than 1/10-acre are prohibited.

If yes, describe how you propose to compensate for the loss of each type of wetland:

Note: For the loss of less than 1/10 acre of wetlands, or if no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in no more than minimal adverse environmental effects.

b. Will the proposed activity result in the loss of streams or other open waters of the U.S.? ☐ Yes ☐ No

Note: In accordance with Regional Condition 7.2, your PCN must you must provide a written discussion of the on-site design configurations considered to demonstrate avoidance and minimization of impacts was evaluated and that the proposed permanent loss is unavoidable. See Box 12, below.

If yes, provide a description of any proposed compensatory mitigation for the loss of each type of stream or other open water:

Note: If no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in no more than minimal adverse environmental effects.

7. Endangered Species Act (ESA) Compliance (see Instructions)

a. For non-Federal permittees (if Federal permittee, check N/A and skip to 7(b)): ☐ N/A

(1) Are there any Federally-listed or proposed endangered or threatened species known or likely to occur within or near the project area? ☐ Yes, see species list below ☐ No (If unknown, contact your local U.S. Fish & Wildlife Service office and/or National Marine Fisheries Service office.)

(2) Is the activity located in designated critical habitat for Federally-listed endangered or threatened species? ☐ Yes, see species list below ☐ No (If unknown, contact your local U.S. Fish & Wildlife Service office and/or National Marine Fisheries Service office.)

If yes to either (1) or (2), include the name(s) of those endangered or threatened species below:

1. 2.
3. 4.
5. 6.
7. 8.
9. 10.

If no to both (1) and (2), proceed to Box 8.

Note: If yes to either (1) or (2), note per General Condition 18(c), you shall not begin work on the activity until notified by the Corps that the requirements of the ESA have been satisfied and that the activity is authorized.

b. For Federal permittees, you must provide documentation demonstrating compliance with ESA as a separate attachment. ☐ Enclosed

8. Historic Properties (see Instructions)

a. For non-Federal permittees (if Federal permittee, check N/A and skip to 8(b)): ☐ N/A

(1) Is there a known historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places within or near the project area? ☐ Yes ☐ No (If unknown, contact your local State Historic Preservation Officer.)

If yes to (1), include the name(s) of historic property(ies) below:

1. 2.
3. 4.
5. 6.

OR

☐ A vicinity map indicating the location of the historic property is enclosed

(2) If no to (1), describe the potential for the proposed work to affect a previously unidentified historic property:

Note: If yes to (1), note per General Condition 20(c), you shall not begin the activity until notified by the Corps that the activity has no potential to cause effects or that consultation under Section 106 of the National Historic Preservation Act (NHPA) has been completed.

b. For Federal permittees, you must provide documentation demonstrating compliance with NHPA in a separate attachment. ☐ Enclosed

9. National Wild and Scenic Rivers

N/A. There are no designated Wild and Scenic Rivers in any state or territory of the Honolulu District

10. Section 408 Permissions (see Instructions)

a. Will the proposed activity also require permissions from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a Corps federally authorized Civil Works project? ☐ Yes ☐ No

If yes, have you received Section 408 permission to alter, occupy, or use the Corps project? ☐ Yes ☐ No

If yes, please attach the Section 408 permission

Note: If yes, note per General Condition 31, an activity that requires Section 408 permission is not authorized by NWP until the Corps issues the Section 408 permission to alter, occupy, or use the Corps project, and the Corps issues a written NWP verification.

11. Compliance with NWP General Conditions (required)

Instructions: To qualify for NWP authorization, your project must comply with the NWP General Conditions. Read the General Conditions. Indicate below your rationale for compliance with each general condition. Conditions are listed below to reflect each corresponding NWP General Condition number.

General Condition	Rationale for Compliance with General Condition
1. Navigation	
2. Aquatic Life Movements	
3. Spawning Areas	
4. Migratory Bird Breeding Areas	
5. Shellfish Beds	
6. Suitable Material	
7. Water Supply Intakes	
8. Adverse Effects from Impoundments	
9. Management of Water Flows	
10. Fills Within 100-Year Floodplains	
11. Equipment	
12. Soil Erosion and Sediment Controls	
13. Removal of Temporary Fills	
14. Proper Maintenance	
15. Single and Complete Project	
16. Wild and Scenic Rivers	*N/A*
17. Tribal Rights	*N/A*

18. Endangered Species	*See Box 7 above.*
19. Migratory Bird and Bald and Golden Eagle Permits	
20. Historic Properties	*See Box 8 above.*
21. Discovery of Previously Unknown Remains and Artifacts	
22. Designated Critical Resource Waters	
23. Mitigation	*See Boxes 4(d) and 6 above.*
24. Safety of Impoundment Structures	
25. Water Quality	State certifying agency contacted? ☐ Yes ☐ No Water quality certification (WQC) status: ☐ Pending; application submitted on _____ ☐ Issued on _____; attached to PCN ☐ Waived on _____; attached to PCN Note: Only the state has the authority to determine whether a WQC is required for your project. You are responsible for obtaining WQC, if required by the state. Refer to the POH website for a current listing of the State and Territories' 401 water quality determinations for the 2017 NWPs. Contact the appropriate certifying agency as early as possible. If an individual 401 WQC is required, the Corps' NWP verification is not valid until you receive a WQC or waiver.
26. Coastal Zone Management (CZM)	State certifying agency contacted? ☐ Yes ☐ No CZM consistency determination status: ☐ Pending; application submitted on _____ ☐ Issued on _____; consistency concurrence attached to PCN. Note: Only the state has the authority to determine whether your project is consistent with the state's CZM plan. It is your responsibility to obtain a CZM consistency determination, if required. Refer to the POH website for a current listing of the State and Territories' CZM consistency determinations for the 2017 NWPs. Contact the appropriate state or territory agency as early as possible. If individual CZM concurrence is required, the Corps' NWP verification is not valid until you receive a CZM consistency concurrence.
27. Regional and Case-by-Case Conditions	
28. Use of Multiple Nationwide Permits	
29. Transfer of Nationwide Permit Verifications	*N/A*
30. Compliance Certification	*N/A*
30. Activities Affecting Structures or Works Built by the U.S.	*See Box 10 above.*
32. Pre-Construction Notification	*Completion of this template complies with this condition and RC 6.*

12. Compliance with NWP Regional Conditions (required)

Instructions: To qualify for NWP authorization, your project must comply with the POH NWP Regional Conditions. Read the Regional Conditions. Complete the sections below to indicate your compliance with each Regional Condition. Conditions are listed below to reflect each corresponding POH NWP Regional Condition number.

Regional Condition	Rationale for Compliance with Regional Condition
1. Revoked Permits	☐ The NWP(s) specified in Box 3, above is/are not revoked from use in the Honolulu District.
2. Limited Use Areas	☐ There are no limited use areas present within or in the vicinity of the project. ☐ The following limited use areas are present within or in the vicinity of the project: _____
3. Acreage Limitation	☐ No permanent discharge of dredged or fill material into wetlands and other special aquatic sites greater than 0.10 acres proposed Note: "Special aquatic sites" include sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes. Refer to definitions in Subpart E at 40 CFR 230.40-45).
4. Stream Channelization and Impoundment Restriction	☐ No permanent stream channelization proposed. ☐ No permanent construction of a dam to impound waters of the U.S. proposed

5. NWP Verification	*Submission of this template initiates the process to obtain NWP Verification, per RC 5.*
6. PCN	*Completion of this template complies with RC 6*
7. Additional PCN Information	For Federal permittees, you must provide documentation demonstrating EFH compliance as a separate attachment. ☐ Enclosed For non-Federal permittees, please complete Sections 7.1 (a-c), below.
	7.1(a) ☐ N/A, no listed species known or likely to occur (see box 7(a)(1), above); skip to 7.1(b). i. See species list: ☐ at box 7(a)(2), above; OR ☐ attached ii. ☐ Proposed BMPs to avoid/minimize impacts to listed species are attached. ☐ No BMPs to avoid/minimize impacts to listed species proposed.
	7.1(b) ☐ N/A, No activity in tidal waters proposed; skip to 7.1(c). i. EFH occurs in the project area for the following Management Unit Species: ☐ Bottomfish ☐ Crustaceans ☐ Pelagics ☐ Coral Reef Ecosystem ☐ Seamount Groundfish ☐ Precious Corals (PC) (If unknown, contact your local National Marine Fisheries Service office) ii. Existing environment: Bottom substrate (sand, cobbles, silt, etc.): _____ Water depth: _____ feet Distance from shore: _____ feet Tidal Range: ☐ Intertidal ☐ Subtidal ☐ Submerged Water Quality (clear, brackish, murky, etc.): _____ iii. ☐ Proposed BMPs to avoid/minimize impacts to EFH are attached. ☐ No BMPs to avoid/minimize impacts to EFH proposed.
	7.1(c) ☐ N/A, no historic properties (see box 8(a)(1), above); skip to 7.2. i. Associated upland activities proposed (staging, stockpiling, temporary access, entry/exit pits, etc.): _____ ☐ No activities in uplands associated with this project proposed. ii. See historic property(ies) list ☐ at box 8(a), above OR ☐ attached iii. The following NHOs, community members or other parties may want to provide comment on this project: _____ ☐ No knowledge of any NHOs, community members or others interested in providing comment. iv. ☐ Correspondence with ☐ SHPO, ☐ NHO, ☐ Other _____, attached. ☐ No parties consulted prior to PCN submittal. v. To meet RC 7.1(c), the following documents, libraries or databases were searched: _____ vi. ☐ Proposed BMPs to avoid/minimize/mitigate impacts to historic properties are attached ☐ No BMPs to avoid/minimize/mitigate impacts to historic properties proposed.
	7.2 ☐ N/A, No permanent loss of waters of the U.S. proposed; skip to 8.1(a). ☐ The proposed permanent loss of waters of the U.S. is unavoidable. The following on-site design configurations were considered and deemed infeasible (rationale provided): _____ ☐ See attached sketch depicting other configuration(s) considered (*optional*)
8. Best Management Practices	8.1 (a) ☐ Applicable, will implement or ☐ Not applicable
	8.2 (a) ☐ Applicable, will implement or ☐ N/A (b) ☐ Applicable, will implement or ☐ N/A (c) ☐ Applicable, will implement or ☐ N/A (d) ☐ Applicable, will implement or ☐ N/A (e) ☐ Applicable, will implement or ☐ N/A (f) ☐ Applicable, will implement or ☐ N/A
	8.3 (a) ☐ Applicable, will implement or ☐ N/A
9. Bank Stabilization	9.1 ☐ N/A, No stream bank stabilization proposed. ☐ An environmentally-sensitive stabilization technique is proposed. See box 4, above. ☐ An environmentally-sensitive stabilization technique is not proposed. The following techniques were considered and deemed not practicable (rationale provided): _____
	9.2 ☐ N/A, I am not proposing shoreline stabilization ☐ I am proposing an environmentally-sensitive stabilization technique. See box 4, above. ☐ I am not proposing an environmentally-sensitive stabilization technique because I determined the following techniques I considered below, not practicable: _____

Instructions for the Honolulu District
Nationwide Permit Pre-Construction Notification (PCN):

This PCN template integrates requirements of the U.S. Army Corps of Engineers (Corps) Nationwide Permit (NWP) Program with the Honolulu District (POH) NWP Regional Conditions for regulated activities located within POH's area of responsibility. The Corps recommends this PCN template be used by prospective permittees who are seeking verification under the 2017 NWPs. Should you choose to submit your PCN using an alternate format, it must contain all information requirements identified at NWP General Condition 32(b) and Regional Conditions 2, 7 and 9 (Attachment 1). You may submit the completed PCN and any attachments electronically to CEPOH-RO@usace.army.mil or via conventional mail to U.S. Army Corps of Engineers, Honolulu District, Attn: CEPOH-RO, Building 230, Ft. Shafter, Hawaii 96858-5440.

Boxes 1-10 should be completed to include all information required by NWP General Condition 32. Boxes 11 and 12 (or other sufficient information to show compliance with all NWP General and POH Regional Conditions) should also be completed to facilitate efficient permit evaluation.

If additional space is needed, provide as an attachment to the PCN template.

Box 0: This box is to be completed by the Corps, skip. Continue to Box 1.

Box 1: Box 1 must be completed to provide the contact information of the prospective permittee, as required by General Condition 32.

Box 1(a): As identified in General Condition 32(b)(1), the PCN must contain the name, mailing address, and telephone number of the prospective permittee. The email address of the prospective permittee is not required, but is recommended.

Box 1(b): If the prospective permittee chooses to have an agent, the contact information for the agent may be provided here.

Box 1(c): If the prospective permittee would like to designate his or her agent, identified in Box 1(b), as the primary point of contact for the Corps and to act on his or her behalf in obtaining the NWP, the prospective permittee must fill out Box 1(c). If Box 1(c) is not completed, the Corps will only contact the prospective permittee. The individual identified in Box 1(c) must match the individual identified in Box 1(b)

Box 2: Box 2 must be completed to provide the location of the proposed activity, per General Condition 32(b)(2). If the proposed work would involve multiple single and complete projects, check the box, and provide the location information identified in Boxes 2-10, and 11-12, as applicable, in a separate attachment.

For multiple single and complete projects, a table identifying the location of each project is recommended. Submittal of the GIS shapefiles with the location of each project is recommended, but is not required. "Single and Complete Linear Project" and "Single and Complete Non-Linear Project" are defined in the *Definitions* section of the 2017 NWPs. For questions regarding the definition of single and complete project, please contact the POH Regulatory Office.

Box 2(a): Provide the name of the proposed activity. For example: Makai Harbor Pier A Repair, Mauka Stream Bank Stabilization, Aina Residential Development Project.

Box 2(b): Provide the City, County, Island and State/Territory where the proposed activity is located.

Box 2(c): Provide the name of the nearest waterbody to the proposed activity or the waterbody proposed for impact, if known.

Box 2(d): Provide the coordinates of the proposed activity if known. The coordinates should be provided using NAD 83, and in decimal degrees.

Box 2(e): This box should be completed if the coordinates of the proposed activity are not known, and should be sufficient for the Corps to determine the location of the proposed activity. This may include the project physical address, TMK number, etc. If there is an existing Corps' file or identification number (e.g. POH-2017-00001) for the site, please provide that information here.

Box 2(f): This box should be completed if the coordinates of the proposed activity are not known, and should be sufficient for the Corps to determine the location of the proposed activity.

Box 3: Per General Condition 32(b)(3), the prospective permittee must identify the specific NWPs requested to authorize the proposed activity. You must read the NWP terms to ensure your proposed activity is eligible under your requested NWP, including any applicable general or regional conditions. Please note the Corps will make the final determination on the evaluation of the appropriate NWP to be used, whether the proposed activity meets the terms and conditions of the NWP, and whether the effects of the proposed activity would result in no more than minimal adverse environmental effects, individually and cumulatively. The NWP terms, general and regional conditions are on the Honolulu District Regulatory website at: http://www.poh.usace.army.mil/missions/regulatory/.

Box 4: General Condition 32(b)(4) requires the PCN contain the following:

> *a description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);*

If the proposed activity would involve multiple single and complete projects, provide the information identified in Boxes 4(a) – (e) for each single and complete project in a separate attachment. For multiple single and complete projects, a table identifying the impacts to waters of the U.S. for each single and complete linear project should be submitted, which may be done by creating a table or similar format. "Single and Complete Linear Project" and "Single and Complete Non-Linear Project" are defined in the *Definitions* section of the NWPs. For questions regarding the definition of single and complete project, please contact your District regulatory office.

Box 4(a): This box should include a complete description of the proposed activity, identifying especially those actions in waters of the U.S. that require authorization from the Corps (discharge of dredged or fill material in waters of the U.S.; work and/or structures in, over, under or affecting navigable waters). The Corps evaluates the proposed activity, to include the means and methods, the construction window and sequence, associated upland activities (staging, stockpiling, temporary access, dewatering, disposal and borrow sites, etc.) and any other information that identifies activities that require a permit.

You may complete the table in this box as is applicable to your proposed activity to document impact quantifications. The first table is for discharges of dredged or fill material in waters of the U.S., the second table is for structures in navigable waters and the third table is for dredging activities in navigable waters. For each impact you are proposing, fill out a corresponding row in the applicable table. For example, a tidally influenced streambank stabilization project may involve the following three activities: sandbag berm for stream diversion (temporary discharge of fill material in navigable waters of the U.S.), excavated revetment toe (dredging in navigable waters), boulder revetment (permanent discharge of fill material in navigable waters of the U.S.), therefore you would complete two separate entries in the first table for each fill activity and a single entry in the

third table for the dredging work. For those tables that are not applicable because you are not proposing that type of regulated activity, do not complete and indicate by checking "N/A".

For the first table, you must identify the impacted water name and type, the activity resulting in the discharge of dredged or fill material, the dimensions of the fill within the jurisdictional limits of a water of the U.S., whether the discharge is temporary or permanent, and if permanent, whether there is an anticipated loss of waters of the U.S. and the type of fill material being discharged.

For the second table, you must identify the impacted navigable water name and type, the type of structure and its material, the structures' position relative to the navigable water, either in, over or under, the dimensions of the structure within the jurisdictional limits of a navigable water, and whether the structure is temporary or permanent.

For the third table, you must identify whether your proposed action involves new dredging or maintenance dredging, the impacted navigable water name and type, the dimensions of the dredge removal area and the volume and type of material to be dredged.

Note for impacted water type, more than water type may describe the impacted water. For example, the tidally influenced mouth of Aloha Stream would be both a tributary and a navigable water and tidal wetlands would be both a wetland and a navigable water. Select all that apply.

Note for permanent losses of waters of the U.S., a loss of waters of the U.S. occurs when a discharge of dredged or fill material permanently converts a water of the U.S., or a portion of a water of the U.S. to a non-water of the U.S. i.e., upland). The activity results in permanent loss of that water of the U.S., in terms of area and function. Conversion of one AR type to another is not considered a "permanent loss". Temporary conversion of a water of the U.S. to uplands with removal and restoration back to a water of the U.S. is not considered a "permanent loss". An "impact" refers to a broader category of effects on or changes to waters of the U.S. Impacts may be permanent or temporary and do not necessarily convert an aquatic resource to uplands. Not all impacts are permanent losses. A temporary impact will never result in a permanent loss of waters of the U.S.; therefore, permanent losses will ONLY be associated with permanent impacts.

Box 4(b): This box should describe the purpose of the proposed activity. For example: The purpose of a culvert replacement may be to restore drainage or hydraulic capacity.

Box 4(c): This box should describe the direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of each type of water of the U.S. expected to result from the NWP activity. "Loss of waters of the U.S." and "loss of stream bed" are defined in the *Definitions* section of the 2017 NWPs. For questions regarding the definition "loss of waters of the U.S." or "loss of stream bed," please contact the POH Regulatory Office. For activities that would result in the discharge of dredged and/or fill material into waters of the U.S. subject to Section 404 of the Clean Water Act, include in this box the acreage (and linear feet for streams or other linear aquatic resources) of each aquatic resource type that would be filled.

Your discussion of direct and indirect adverse environmental effects should reflect your consideration of the anticipated impacts the proposed activity could have on the impacted water and on the resources identified in Boxes 7, 8 and 12, Regional Conditions 2 and 7. If you are proposing measures to avoid and/or minimize impacts to such resources, you may discuss the avoided or minimized impacts in Box 4(d).

Identify for each discharge whether the fill would be permanent or temporary (i.e. fill would be removed following construction and the fill area would be restored to pre-activity contours and conditions). For temporary fills, identify when the fill in waters of the U.S. is proposed to be removed, and the methods proposed to remove the fill/restore the area to pre-activity contours and conditions. In addition, identify the adverse environmental effects outside of the direct impact area that would occur, including the acreage of each type of water.

For activities that would result in work or the placement of structures in, over, under or affecting a navigable water of the U.S. subject to Section 10 of the Rivers and Harbors Act, include a description of the proposed work and the adverse environmental effects, including the acreage of the navigable water(s) that would be directly affected and the adverse effects cause by this activity. Identify for each structure, whether use in navigable waters would be permanent or temporary (i.e. structure would be removed from navigable waters following construction or structure is permanent). In addition, identify the indirect effects that would occur to the navigable waterway outside of the direct impact area.

Box 4(d): Include in this box any proposed mitigation measures intended to reduce adverse environmental effects caused by the proposed activity. Measures may include, a description of any best management practices

(BMPs) proposed to minimize effects to downstream waters of the U.S., avoidance and/or preservation of waters of the U.S. on the project site; installation and maintenance of erosion control measures; and any other measures proposed. Do not include compensatory mitigation proposed to compensate for the loss of waters of the U.S., as this will be identified in Box 6.

Box 4(e): Identify any other NWP(s), Regional/Programmatic General Permit(s), or Individual Permit(s) used or intended to be used to authorize any part of the proposed activity or any related activity. If the proposed activity is part of a larger overall project that would require authorization under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act, identify the other permits proposed to be used here. This includes other separate and distant crossings for linear projects that require DA authorization but do not require pre-construction notification.

Box 4(f): Identify if sketches have been provided containing sufficient detail to provide an illustrative description of the proposed activity. Please note that specific requirements for drawings are required by the POH and are available on the Honolulu District Regulatory website.

Box 5: Regional Condition 32(b)(5) requires the PCN include a delineation of wetlands, other special aquatic sites, and other waters.

Box 5(a): Identify whether a delineation of the jurisdictional limits and boundaries of aquatic resources has been conducted in accordance with the current method required by the Corps. Wetland delineations must be conducted in accordance with the technical procedures and guidance described in the 1987 *Corps of Engineers Wetlands Delineation Manual* (Technical Report Y-87-1) and the 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai'i and Pacific Islands Region*, Version 2.0. If a delineation of aquatic resources has been completed, a copy should be attached. If a delineation of aquatic resources has not been completed, the PCN is not complete. You may request the Corps delineate the special aquatic sites and other waters on the project site, but there may be a delay. In addition, the PCN will not be considered complete until the delineation has either been submitted to or completed by the Corps, as appropriate.

Note, the Corps' jurisdictional limits are as follows:

For Section 10 of the Rivers and Harbors Act of 1899: Mean High Water Mark elevation (33 CFR 329.12).

For Section 404 of the Clean Water Act: Ordinary High Water Mark for tributaries (streams, rivers), approved wetland boundary for wetlands, High Tide Line for navigable waters. The terms "Ordinary High Water Mark" and "High Tide Line" are defined in the *Definitions* section of the 2017 NWPs.

Note that the only exception to this requirement are those activities occurring entirely in the Pacific Ocean and that have no associated upland activities. Examples of such activities not requiring a delineation include deployment of buoys for vessel moorage, data collection or similar use, seafloor boring (not to include drilling activities that have an on-land entry or exit pit), or similar independent, marine activities or structures. For activities occurring along the shoreline, in marine waters of the Pacific Ocean, a delineation is required.

Box 5(b): If a delineation of aquatic resources has been submitted, identify whether you would like the Corps to conduct a jurisdictional determination (preliminary or approved). If yes, you must complete, sign, and return the enclosed *Appendix 1 – Request for Corps jurisdictional Determination (JD)* sheet, or provide a separate attachment with the information identified in Appendix 1 (Attachment 2). For questions regarding jurisdictional determinations, please contact the POH Regulatory Office.

Note that a jurisdictional determination is not required to apply for and receive coverage under a NWP.

Box 6: General Condition 32(b)(6) requires, if the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee submit a statement describing how the mitigation requirements of General Condition 23 will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

If the proposed activity would involve multiple single and complete projects, provide the information identified in 6(a) and 6(b) for each single and complete project in a separate attachment. For multiple single and complete projects, a table identifying the proposed compensatory mitigation for each single and complete project should be submitted.

Box 6(a): Identify whether the proposed activity would result in the loss of greater than 1/10-acre of wetlands. The definition of "loss of waters of the U.S." may be found in the *Definitions* section of the 2017 NWPs.

Be advised, POH Regional Condition 3 (Acreage Limitation) prohibits permanent losses of wetlands and other special aquatic sites greater than 1/10-acre resulting from the discharge of dredged or fill material. Note that for the loss of less than 1/10-acre of wetlands, or if no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

Box 6(b): Identify whether the proposed activity would result in the loss of streams or other open waters of the U.S. The definition of "loss of waters of the U.S." and "loss of stream bed" may be found in the *Definitions* section of the 2017 NWPs. If the proposed activity would result in the loss of streams or other open waters of the U.S., provide a description of any proposed compensatory mitigation for the loss of each type of stream or other open water. This includes the type of compensatory mitigation (e.g. purchase of mitigation bank or in-lieu fee credits) or permittee responsible establishment, re-establishment, rehabilitation, enhancement or preservation for each stream or open water type (e.g. intermittent drainage, pond, lake). If preservation is proposed as compensatory mitigation, identify how the proposed preservation meets the 5 criteria listed in 33 CFR 332.3(h). Note that if no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in no more than minima adverse environmental effects.

Box 7: POH Regional Condition 7 requires non-Federal permittees to provide a list of Federally-listed or proposed endangered or threatened species known or likely to occur within or near the project area. Completion of Box 7 fulfills the requirement at General Condition 32(b)(7). Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act (ESA). For questions regarding federally-listed species, critical habitat, or ESA, please contact the local NOAA Fisheries office, U.S. Fish and Wildlife Service, or the POH Regulatory Office Branch.

If the proposed activity would involve multiple single and complete projects, provide the information identified in Boxes 7(a) – (d) (as applicable) for each single and complete project in a separate attachment.

Box 7(a): To be completed by non-Federal prospective permittees. Identify (1) Federally-listed or proposed endangered or threatened species known or likely to occur within or near the project area; (2) if the activity is located in designated critical habitat for Federally-listed endangered or threatened species; and if yes to (1) or (2), identify the name(s) of those endangered or threatened species known or likely to occur within or near the project area or that might utilize the designated critical habitat. If no to both (1) and (2), proceed to Box 8.

Note that if the answer to (1) or (2) is yes, per General Condition 18(c), the non-Federal permittee shall not begin work on the activity until notified by the Corps that the requirements of the ESA have been satisfied and that the activity is authorized.

Box 7(b): Federal permittees should provide documentation demonstrating compliance with ESA as a separate attachment. Per General Condition 32(b)(7), if documentation showing compliance with the ESA is not submitted by the federal permittee, the PCN will not be complete.

Box 8: POH Regional Condition 7 requires non-Federal permittees to provide a list of historic property(ies) listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places within or near the project area or include a vicinity map indicating the location of the historic property. Completion of Box 8 fulfills the requirement at General Condition 32(b)(7). Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act. For questions regarding historic properties, including cultural resources, please contact your State Historic Preservation Officer or the POH Regulatory Office.

If the proposed activity would involve multiple single and complete projects, provide the information identified in Boxes 8(a) – (d) (as applicable) for each single and complete project in a separate attachment.

Box 8(a): To be completed by non-Federal prospective permittees. Identify (1) if there is a known historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places that the NWP within or near the project area. If yes, state which historic property(s) occur within

or near the project area, or check the box and provide a vicinity map of the location of the historic property. If no to (1), describe the potential for the proposed work to affect a previously unidentified historic property, if known.

Note that if the answer to (1) is yes, per General Condition 20(c), the non-Federal permittee shall not begin work on the activity until notified by the Corps that the activity has no potential to cause effects or that consultation under Section 106 of the National Historic Preservation Act (NHPA) has been completed.

Box 8(b): Federal permittees should provide documentation demonstrating compliance with NHPA as a separate attachment. Per General Condition 32(b)(8), if documentation showing compliance with the NHPA is not submitted by the federal permittee, the PCN will not be complete.

Box 9: General Condition 32(b)(9) requires that, for an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the ''study river.'' However, there are no designated Wild and Scenic Rivers in any state or territory of the Honolulu District; accordingly, this condition is not applicable.

Box 10: General Condition 32(b)(10) requires that for an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the PCN must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that Corps project.

If the proposed activity would involve multiple single and complete projects, provide the information identified in 10(a) for each single and complete project in a separate attachment.

Box 10(a): Identify if the NWP will also require permissions from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a Corps federally authorized Civil Works project. If yes, identify if the prospective permittee has received Section 408 permission to alter, occupy, or use the Corps project, and attach the Section 408 permission.

Note per General Condition 31, an activity that requires Section 408 permission is not authorized by NWP until the Corps issues the Section 408 permission to alter, occupy, or use the Corps project, and the Corps issues a written NWP verification.

Box 11: To qualify for authorization under a NWP, your project must comply with all applicable NWP General Conditions. You must read the NWP General Conditions to ensure your project is compliant. Box 11 contains a list of each General Condition, numbered in accordance with the listing in the Federal Register. You must indicate your rationale for compliance with General Conditions 1 through 32 of the NWPs. This information, as applicable, may be provided through completion of Box 11, or as a separate attachment. Those general conditions that have no applicability in the Honolulu District or that are completed elsewhere on the PCN have been completed for you. All others may apply, depending on the proposed activity and should be filled out accordingly. Completion of this information may assist the District in determining whether the proposed activity meets the General Conditions of the NWP, would result in no more than minimal adverse environmental effects and is eligible for authorization under a NWP.

If the proposed work would involve multiple single and complete projects, provide the information identified in Box 11 for each single and complete project in a separate attachment.

Box 12: To qualify for authorization under a NWP, your project must comply with all applicable POH Regional Conditions. You must read the POH Regional Conditions to ensure your project is compliant. Box 12 contains a list of each Regional Condition, numbered in accordance with the listing of POH Regional Conditions. You must indicate your rationale for compliance with Regional Conditions 1 through 9 issued by the Pacific Ocean Division Commander, effective March 19, 2017 and any superseding amendments, as applicable. This information, as applicable, may be provided through completion of Box 12, or as a separate attachment. Those regional conditions that are completed elsewhere on the PCN have been completed for you. All others may apply, depending on the anticipated impacts of your proposed activity and should be filled out accordingly. Completion of this information may assist the District in determining whether the proposed activity meets the Regional

Conditions of the NWP, would result in no more than minimal adverse environmental effects and is eligible for authorization under a NWP. Note Regional Conditions 2, 7 and 9 require additional information to be provided on the PCN; such information is required to constitute a complete PCN.

If the proposed work would involve multiple single and complete projects, provide the information identified in Box 12 for each single and complete project in a separate attachment.

US Army Corps of Engineers ®
Honolulu District

Drawing Checklist

When submitting an application or Nationwide Permit pre-construction notification to the US Army Corps of Engineers, it is helpful to include drawings containing the items described in this checklist. The ultimate objective of a set of drawings is to allow someone who is unfamiliar with the project to quickly obtain a clear understanding of what is proposed and how the impacted waterbody and/or wetlands will be affected. Drawings should be originals and not reduced copies of large-scale plans. Engineering drawings are not required. Existing and proposed site conditions (manmade and landscape features) should be drawn to scale.

Page 1 should be a vicinity map, Page 2 should provide a top-down plan view, Page 3 should show a cross-sectional view; additional pages should be used if needed. Every drawing should have a Title Block.

1. VICINITY MAP

( ) Show and label location of each ***project area*** (e.g. circle the perimeter, use an arrow, etc.)
( ) Show and label location of each ***mitigation site***, if applicable
( ) List latitude, longitude and parcel numbers – a parcel map can be helpful
( ) Show and label all waterways (e.g. ditches, wetlands, ponds, streams, rivers, lakes, inlets, oceans, etc.)
( ) Show roads, streets, and/or mileage to nearest town or city limits
( ) Include an accurate North Arrow
( ) The map should be zoomed out enough to show the area but detailed enough to see landmarks for context

2. PLAN VIEWS

( ) ***Marine/tidal waters:*** Show Mean high water (MHW) and/or High Tide Line (HTL)
( ) ***Freshwater wetlands, lakes, streams, etc:*** Show ordinary high water mark (OHWM)/wetland boundaries
( ) Show waters, including wetlands and other features extending across property boundaries
( ) Show dimensions of proposed and existing structures
( ) Indicate location, quantity, and type of fill and excavation, both temporary and permanent (area and volume)
( ) Show direction of currents, if known (e.g. tidal ebb, drift cells, stream flow, etc.)
( ) Show buffer areas and staging or construction access areas
( ) Label compensatory mitigation areas, if applicable (e.g., structures to be removed, plantings)
( ) Include an accurate North Arrow

3. ELEVATION AND/OR SECTION VIEWS

( ) Label the MHW, HTL, OHWM, and/or wetland boundary, as appropriate
( ) Show original and proposed elevations, water depths, dimensions of proposed structures or fills, and pertinent vertical dimensions to top and base of structure/fill; use the same vertical and horizontal scale

4. GENERAL GUIDELINES AND USEFUL INFORMATION TO INCLUDE ON DRAWINGS

( ) Use clear black lettering and the fewest number of pages necessary; use 8 ½- by 11-inch paper
( ) Even if drawings are created by hand please use a graphic scale
( ) Vertical and horizontal scales should use the same units of measure
( ) Descriptions/types of substrate can be included on drawings along with photographs
( ) A drawing with the existing water features overlaid with the proposed project is helpful

5. TITLE BLOCK EXAMPLES

( ) A completed title block (first example) should be on the first page; for subsequent sheets you can use the smaller abbreviated form (second example)
( ) Ensure that each page of the drawings contains the same date; this helps avoid confusion if there are revisions to the drawings

REFERENCE: *(USACE will provide)*	LOCATION: _____ *(address/intersection/ parcel number)*	PROPOSED PROJECT: *(short description/name)*
APPLICANT: _____		IN: *(waterbody)*
		NEAR/AT: *(closest city or town)*
LAT/LONG: _____	Page # OF # DATE: *(last revised)*	COUNTY: *(county)*
		STATE/TERRITORY:

Reference Number:	
Applicant:	
Proposed Project:	
Location:	
Page # of #	Date:

HHF PLANNERS
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February 23, 2020

Ms. Karen M. Urelius
Senior Project Manager, Regulatory Branch
U.S. Army Corps of Engineers
Fort Shafter, Hawai'i 96858-5440

Dear Ms. Urelius:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated September 30, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project.

We appreciate the information pertaining to permit requirements for Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Following our initial request for comments, the landowner requested a formal determination whether a Department of the Army permit would be required for Proposed Action. Per File No. POH-2019-00189 dated January 24, 2020, the Proposed Action is not subject to the Department of the Army's regulatory jurisdiction and does not require authorization under Section 404 of the Clean Water Act (33 U.S.C. 1344; "Section 404") or Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403; "Section 10").

Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any additional comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

Pacific Guardian Center | 733 Bishop Street, Suite 2590 | Honolulu, Hawaii 96813
Telephone: 808.545.2055 | Facsimile: 808.545.2050 | www.hhf.com | email: info@hhf.com

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

January 24, 2020

SUBJECT: Determination of No Permit Required, Waimanalo Paradise Seawall Repairs, Oahu, HI, Department of the Army File No. POH-2019-00189

Nesbitt HI Holdings LLC
c/o Mr. Martin H. Nesbitt
Vistria Group
300 East Randolph Street, Suite 3850
Chicago, IL 60601

And

Waimanalo Paradise LLC
c/o Mr. John Kevin Poorman
PSP Partners
444 West Lake Street Suite 3500
Chicago, IL 60606

Dear Mr. Nesbitt and Mr. Poorman:

The Honolulu District, U.S. Army Corps of Engineers (Corps), Regulatory Branch has received your request for a determination whether a Department of the Army (DA) permit is required for the repair of spalling and voids along the seaward face of and beneath 585 linear feet of seawall along the shoreline of the Pacific Ocean, including a landward expansion of the seawall, height extension in the existing seawall footprint, and use of a turbidity curtain, all located at 21. 325322, -157. 680110, approximately 430 feet east of Kaiana Beach Park and 1400 feet west of Kaupo Beach Park, on TMKs (1) 4-1-002:021 and 022 in Waimanalo, Island of Oahu, Hawaii in accordance with the project plans (Enclosure 1). Your request has been assigned Department of the Army (DA) file number POH-2019-00189. Please reference this number in all future correspondence with our office relating to this action.

We have reviewed your submittal pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344; “Section 404”) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403; “Section 10”). Section 404 requires DA authorization for the discharge (placement) of dredged and/or fill material into waters of the U.S., including wetlands. Section 10 requires DA authorization for the placement of structures in, under or over navigable waters of the U.S. and/or other work affecting the course, location, condition or navigable capacity of such waters. To determine if a DA permit is required for a proposed action, the Corps must first determine whether the proposed project is located

within the Corps' geographic jurisdiction (i.e., whether the activity is located within a water of the U.S.). If the activity is within a water of the U.S., the Corps must then determine whether the proposed activity is a regulated activity under Section 10 and/or Section 404, or if the activity is exempt under Section 404(f) and is not recaptured. The determination provided in this letter pertains to whether your proposed project is an activity we regulate as well as whether the project falls within the Corps geographic jurisdiction.

Based on the information you provided, we have determined that the proposed in-kind maintenance repairs to the seaward face and area beneath the existing seawall are activities that are exempted under Section 404(f) of the Clean Water Act and therefore, do not require DA authorization under Section 404. Additionally, the proposed in-kind maintenance repairs to the seaward face and area beneath the existing seawall as well as the associated temporary installation of wooden formwork, PVC water-stop barrier, and hydraulic concrete water-stop barrier are not considered the installation of a “structure” as defined by 33 CFR 322.2 nor work subject to the regulatory jurisdiction of the Corps. Furthermore, we determined the proposed expansion of the seawall would not be regulated under Section 404 and Section 10 because the proposed height and landward width expansions of the seawall would occur shoreward of the High Tide Line and mean high water mark, respectively, and therefore, outside the geographic limits of the Corps jurisdiction. Lastly, the temporary deployment of a turbidity curtain in a navigable water of the U.S. is not considered a “structure” as defined by 33 CFR 322.2 nor work subject to the regulatory jurisdiction of the Corps.

While a DA permit is not required for your proposed project, you are responsible for obtaining all other applicable Federal, state, or local authorizations required by law. Be advised, a DA permit may be required if you alter the method, scope, or location of your proposed work. You should contact our office if you are considering modifying your project.

Thank you for your cooperation with the Honolulu District Regulatory Program. If you have any questions related to this determination, please contact me at 808-835-4310 or via e-mail at Vera.B.Koskelo@usace.army.mil. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Office by accessing our web-based customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

For additional information about our Regulatory Program, please visit our web site at http://www.poh.usace.army.mil/Missions/Regulatory.aspx.

Sincerely,

Vera B. Koskelo
Project Manager, Regulatory Office

Enclosure

From: McCarthy, Nadiera
To: Leslie Kurisaki
Cc: Dan Polhemus
Subject: Comments: Waimanalo Paradise Seawall Repairs
Date: Wednesday, September 25, 2019 9:34:32 AM

This email originated from a non-HHF email address

Aloha Ms. Kurisaki-

The U.S. Fish and Wildlife has received the notification for the preparation of a Draft Environmental Assessment for repair and modification to an existing seawall in Waimanalo, Oahu. The seawall is 585 feet long, with differing elevations and levels of damage, and is broken into 7 segments.

For the Draft EA we would recommend that each segment be presented and described separately, as the construction will most likely occur in stages over time along the entire seawall length. There are also different needs for each segment, in terms of repair, fill, and design. Figure 3 that was provided in the notification letter is a good start on the presentation of the structural engineering plan for each segment. For the Draft EA, all plans and designs that could be considered for each segment should be included in the document for evaluation.

Impact assessment - as recommended above, the biological information collected along the entire seawall should be presented by segment in the document as the construction most likely will not be completed in one action. Cumulative impacts would be determined by combining all of the benthic areas together for a latter section the Draft EA. By separating out the segments, it would also identify any sensitive areas that may need additional attention due to any State or Federal protected resources that are encountered there. If there are any invasive species in the area, those should be identified by species (if possible) and with an abundance or density measurement. Marine taxa encountered should also be identified to species (if possible), along with a size estimate of individuals, and an estimate of density.

The letter also mentions the use of sedimentation and turbidity control devices such as silt curtains. Those should also be explained in more detail in the Draft EA.

At this time, those are the only comments that our agency has until we are able to review the Draft EA. Thank you for early coordination on this project.

-Nadiera Sukhraj

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Nadiera Sukhraj, Ph.D
Aquatic Ecosystems Conservation
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Rm 3-122
Honolulu, HI 96850
E-mail: Nadiera_McCarthy@fws.gov
Phone: 808-792-9410
http://www.fws.gov/pacificislands/
><> ><> ><> ><> ><>

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February 23, 2020

Ms. Nadiera Sukkhraj, Ph.D
Aquatic Ecosystems Conservation
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Rm 3-1222
Honolulu, Hawai'i 96850

Dear Ms. Sukkhraj:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the email dated September 25, 2019 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project. We appreciate your efforts to review the project information and offer the following responses to each comment.

Description of Proposed Improvements. A full description of the Proposed Action's technical characteristics is a prerequisite for the environmental review process. As such, the description of the Proposed Action in Section 2.4 of the Draft EA includes the improvements specific to each individual wall segment. The drawing of each wall segment that was provided in the notification letter is also presented in the Draft EA, along with a proposed construction sequencing schedule.

Impact Assessment. A survey to assess the physical, chemical and biological composition of the nearshore marine environment was completed for the proposed project. The survey report, *Baseline Assessment of the Marine Environment* (Marine Research Consultants, Inc. 2019), is appended to the Draft EA and a summary of findings is presented in Section 3.4 Marine Water Quality and Section 3.6 Marine Biota of the Draft EA. Distinct habitats that occur in the marine environment have been delineated based on physical and biotic composition.

Sedimentation and Turbidity Control Devices. The use of best management practices (BMPs) will minimize sediment runoff and demolition debris from inadvertently entering the water. Proposed sedimentation and turbidity control devices may include a biosock filter placed around the terrestrial work areas and a turbidity curtain and wooden form around in-water work areas. The contractor will be responsible for ensuring that adequate protective measures are in place during construction to protect water quality and minimize adverse environmental effects (per Sections 3.4.2 and 3.6.2 of the Draft EA).

Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any additional comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

In Reply Refer To:
01EPIF00-2019-TA-0490

September 26, 2018

Mr. Scott Ezer
HHF Planners
733 Bishop Street, Suite 2590
Honolulu, Hawai‘i 96813

Subject: Technical Assistance for the Proposed Seawall Repairs for Waimanalo Paradise, 41-505 Kalaniana‘ole Hwy, Waimānalo, O‘ahu

Dear Mr. Ezer,

Thank you for your recent correspondence requesting technical assistance on species biology, habitat, or life requisite requirements. The Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) appreciates your efforts to avoid or minimize effects to protected species associated with your proposed actions. We provide the following information for your consideration under the authorities of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq*.), as amended.

Due to significant workload constraints, PIFWO is currently unable to specifically address your information request. The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. Based on your project location and description, we have noted the species most likely to occur within the vicinity of the project area, in the ‘**Occurs In or Near Project Area’** column. Please note this list is not comprehensive and should only be used for general guidance. We have added to the PIFWO website, located at https://www.fws.gov/pacificislands/promo.cfm?id=177175840 recommended conservation measures intended to avoid or minimize adverse effects to these federally protected species and best management practices to minimize and avoid sedimentation and erosion impacts to water quality.

If you are representing a federal action agency, please use the official species list on our web-site for your section 7 consultation. You can find out if your project occurs in or near designated critical habitat here: https://ecos.fws.gov/ipac/.

Under section 7 of the ESA, it is the Federal agency’s (or their non-Federal designee) responsibility to make the determination of whether or not the proposed project “may affect” federally listed species or designated critical habitat. A “may affect, not likely to adversely affect” determination is appropriate when effects to federally listed species are expected to be discountable (*i.e*., unlikely to occur), insignificant (minimal in size), or completely beneficial.

This conclusion requires written concurrence from the Service. If a “may affect, likely to adversely affect” determination is made, then the Federal agency must initiate formal consultation with the Service. Projects that are determined to have “no effect” on federally listed species and/or critical habitat do not require additional coordination or consultation.

Implementing the avoidance, minimization, or conservation measures for the species that may occur in your project area will normally enable you to make a “may affect, not likely to adversely affect” determination for your project. If it is determined that the proposed project may affect federally listed species, we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. If the proposed project is funded, authorized, or permitted by a Federal agency, then that agency should consult with us pursuant to section 7(a)(2) of the ESA. If no Federal agency is involved with the proposed project, the applicant should apply for an incidental take permit under section 10(a)(1)(B) of the ESA. A section 10 permit application must include a habitat conservation plan that identifies the effects of the action on listed species and their habitats, and defines measures to minimize and mitigate those adverse effects.

We appreciate your efforts to conserve endangered species. We regret that we cannot provide you with more specific protected species information for your project site. If you have questions that are not answered by the information on our website, you can contact PIFWO at (808) 792-9400 and ask to speak to the lead biologist for the island where your project is located.

Sincerely,

Island Team Manager
Pacific islands Fish and Wildlife Office

cc: Ms. Kathy Sokugawa, Department of Planning and Permitting, City and County of Honolulu

The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. For your guidance, we‘ve marked species that may occur in the vicinity of your project, this list is not comprehensive and should only be used for general guidance.

Scientific Name	**Common Name / Hawaiian Name**	**Federal Status**	**Occurs In or Near Project Area**
Mammals			
Lasiurus cinereus semotus	Hawaiian hoary bat/ ‘ōpe‘ape‘a	E	☐
Reptiles			
Chelonia mydas	Green sea turtle/honu - Central North Pacific DPS	T	☒
Erectmochelys imbricata	Hawksbill sea turtle/ Honu ‘ea	E	☒
Birds			
Anas wyvilliana	Hawaiian duck/ koloa	E	☐
Branta sandvicensis	Hawaiian goose/ nēnē	E	☐
Fulica alai	Hawaiian coot/ ‘alae kea	E	☐
Gallinula galeata sandvicensis	Hawaiian gallinule/ ‘alae ‘ula	E	☐
Himantopus mexicanus knudseni	Hawaiian stilt/ Ae‘o	E	☐
Oceanodroma castro	Band-rumped storm-petrel/ ‘akē‘akē	E	☐
Pterodroma sandwichensis	Hawaiian petrel/ ‘ua‘u	E	☐
Puffinus auricularis newelli	Newell’s shearwater/ ‘a‘o	T	☐
Ardenna pacificus	Wedge-tailed Shearwater/ ‘ua‘u kani	MBTA	☐
Gygis alba	White Tern/ manu-o-kū	MBTA	☐
Buteo solitarius	Hawaiian hawk/ ‘io	E	☐
Insects			
Manduca blackburni	Blackburn’s sphinx moth	E	☐
Megalagrion pacificum	Damselfly, Pacific Hawaiian	E	☐
M. xanthomelas	Damselfly, Orangeblack Hawaiian	E	☐
M. nigrohamatum nigrolineatum	Damselfly, Blackline Hawaiian	E	☐

Plants				
Scientific Name	**Common name**	**Status**	**Locations**	**May Affect**
Abutilon menziesii	Ko‘oloa‘ula	E	O, L, M, H	☐
Achyranthes splendens var. *rotundata*	‘Ewa hinahina	E	O	☐
Bonamia menziesii	No common name	E	K, O, L, M, H	☐
Canavalia pubescens	‘Āwikiwiki	E	Ni, K, L, M	☐
Colubrina oppositifolia	Kauila	E	O, M, H	☐
Cyperus trachysanthos	Pu‘uka‘a	E	K, O	☐
Gouania hillebrandii	No common name	E	Mo, M	☐
Hibiscus brackenridgei	Ma‘o hau hele	E	O, Mo, L, M, H	☐
Ischaemum byrone	Hilo ischaemum	E	K, O, Mo, M, H	☐
Isodendrion pyrifolium	Wahine noho kula	E	O, H	☐
Marsilea villosa	‘Ihi‘ihi	E	Ni, O, Mo	☐
Mezoneuron kavaiense	Uhiuhi	E	O, H	☐
Nothocestrum breviflorum	‘Aiea	E	H	☐
Panicum fauriei var. *carteri*	Carter’s panicgrass	E	Molokini Islet (O), Mo	☐
Panicum niihauense	Lau‘ehu	E	K	☐
Peucedanum sandwicense	Makou	E	K, O, Mo, M	☐
Pleomele (Chrysodracon) hawaiiensis	Halapepe	E	H	☐
Portulaca sclerocarpa	‘Ihi	E	L, H	☐
Portulaca villosa	‘Ihi	E	Le, Ka, Ni, O, Mo, M, L, H, Nihoa	☐
Pritchardia affinis (maideniana)	Loulu	E	H	☐
Pseudognaphalium sandwicensium var. *molokaiense*	‘Ena‘ena	E	Mo, M	☐
Scaevola coriacea	Dwarf naupaka	E	Mo, M	☐
Schenkia (*Centaurium*) *sebaeoides*	‘Āwiwi	E	K, O, Mo, L, M	☐
Sesbania tomentosa	‘Ōhai	E	Ni, Ka, K, O, Mo, M, L, H, Necker, Nihoa	☐
Tetramolopium rockii	No common name	T	Mo	☐
Vigna o-wahuensis	No common name	E	Mo, M, L, H, Ka	☐

Location key: O=O‘ahu, K=Kaua‘i, M=Maui, H=Hawai‘i Island, L=Lāna‘i, Mo=Moloka‘i, Ka=Kaho‘olawe, Ni=Ni‘ihau, Le=Lehua

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February 23, 2020

Mr. Aaron Nadig
Island Team Manager
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Rm 3-1222
Honolulu, Hawai'i 96850

Dear Mr. Nadig:

Waimanalo Paradise Seawall Repair
Draft Environmental Assessment Pre-Assessment Consultation
41-5-5 Kalaniana'ole Highway, Waimānalo, O'ahu, Hawai'i
TMKs: (1) 4-1-002:021 and 022

Thank you for the letter dated September 26, *[sic]* 2018 providing comments as part of pre-assessment consultation efforts conducted to prepare the Draft Environmental Assessment (Draft EA) for the subject project.

Based on your letter, we understand that federally listed species may occur in the project vicinity, including the threatened green sea turtle *(Chelonia mydas)* and the endangered Hawksbill sea turtle *(Erectmochelys imbricate).* A survey of the nearshore marine environment completed for the proposed project will be included in the Draft EA, with a discussion of the project's potential impacts and proposed mitigation measures to address such impacts, as appropriate.

We appreciate the background information describing the compliance requirements for Section 7(a)(2) of the Endangered Species Act. The Department of the Army has determined that the Proposed Action is not subject to their regulatory jurisdiction and does not require authorization under their permitting system. As such, this determination obviates the requirement to consult with federal regulatory agencies such as yours.

Your letter and this response will be included in the Draft EA. We appreciate your participation in this review process, and look forward to any additional comments you may have on the Draft EA. If you need additional information, please contact Corlyn Orr, project planner, at (808) 545-2055 x168 or by email at colsonorr@hhf.com.

Sincerely,

HHF Planners
Scott Ezer, Principal

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