DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
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KIRK CALDWELL
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GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2016/ED-2(MT)

March 11, 2016

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

Dear Mr. Glenn:

SUBJECT: Chapter 343, Hawaii Revised Statutes (HRS)
Draft Environmental Assessment (DEA)

Project:	Southeast Asia-United States (SEA-US) Cable System - Makaha Beach Landing
Applicant:	NEC Corporation of America
Landowner:	Hawaiian Telecom SVCS CO Inc. and City and County of Honolulu
Agent:	R.M. Towill Corporation (Brian Takeda)
Location:	84-284 Farrington Highway - Waianae
Tax Map Keys:	8-4-1: 12 and 8-4-2: 59
Proposal:	To allow a transpacific submarine fiber optic telecommunication cable between Southeast Asia and the United States to connect with Hawaii.

With this letter, the Department of Planning and Permitting hereby transmits the DEA and anticipated finding of no significant impact (DEA-AFONSI) for the SEA-US Cable System Project located on Tax Map Keys 8-4-1: 12 and 8-4-2: 59 in the Waianae District on the island of Oahu, for publication of the project summary of the DEA in the next edition of *"The Environmental Notice"* on **March 23, 2016**.

We respectfully request publication. Enclosed are two hard copies and one electronic copy of the DEA and the Publication Form. The Publication Form, including project summary, was also sent via electronic mail to your office.

Should you have any questions, please contact Mark Taylor at 768-8020 or via electronic mail at mtaylor1@honolulu.gov.

Very truly yours,

FOR George I. Atta, FAICP
Director

Enclosure: DEA, two hard copies and one disk
OEQC Publication Form w/hard copy/disk

APPLICANT
PUBLICATION FORM

Project Name:	Southeast Asia-United States (SEA-US) Cable System, Makaha Beach Landing
Project Short Name:	SEA-US Cable System
HRS §343-5 Trigger(s):	Use of state or county lands; Use in the conservation district; Use within shoreline setback area
Island(s):	Oahu
Judicial District(s):	Waianae District
TMK(s):	(1) 8-4-001:012 and (1) 8-4-002: 059 Hawaiian Telcom
Permit(s)/Approval(s):	FEDERAL: Section 7, Endangered Species Act (ESA) Consultation; Magnuson-Stevens Fishery Conservation and Management Act Consultation; Section 106, National Historic Preservation Act (NHPA) Consultation; and Section 404, Clean Water Act (CWA), and Section 10, Rivers and Harbors Act (RHA) Permit Application. STATE: Environmental Assessment (EA) under Hawai'i Revised Statutes (HRS), Chapter 343; Section 401, Water Quality Certification (WQC); Conservation District Use Permit (CDUP); Right-of-Entry and Grant of Submarine Easement within State Waters; Coastal Zone Management Federal Consistency Determination (CZM FEDCON); Section 402, CWA, National Pollutant Discharge Elimination System (NPDES) permit for construction stormwater; permission to discharge construction stormwater into existing Hawai'i Department of Transportation (HDOT) drainage system; and Use and Occupancy of HDOT ROW. CITY AND COUNTY OF HONOLULU (CCH): Shoreline Setback Variance (SSV) Permit; Special Management Area (SMA) Minor Permit and; easement application for use of CCH land.
Approving Agency:	City and County of Honolulu, Department of Planning and Permitting
Contact Name, Email, Telephone, Address	Mark Taylor, mtaylor1@honolulu.gov, (808) 768-8020, 650 South King Street, 7th floor, Honolulu, Hawaii 96813
Applicant:	NEC Corporation of America (NEC)
Contact Name, Email, Telephone, Address	John S. Williams, Manager, john.williams@necam.com, (214) 262-3653, 6535 N. State Highway 16, Irving, Texas 75039
Consultant:	R. M. Towill Corporation (RMTC)
Contact Name, Email, Telephone, Address	Brian Takeda, Planning Project Coordinator, briant@rmtowill.com, (808) 842-1133, 2024 North King Street, Suite 200, Honolulu, Hawaii 96819-3494

Status (select one)	**Submittal Requirements**
__X_ DEA-AFNSI	Submit 1) the approving agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
____ FEA-FONSI	Submit 1) the approving agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the approving agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the approving agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.
____ DEIS	Submit 1) a transmittal letter to the OEQC and to the approving agency, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the approving agency, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.

____ FEIS Acceptance Determination — The approving agency simultaneously transmits to both the OEQC and the applicant a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.

____ FEIS Statutory Acceptance — The approving agency simultaneously transmits to both the OEQC and the applicant a notice that it did not make a timely determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and therefore the applicant's FEIS is deemed accepted as a matter of law.

____ Supplemental EIS Determination — The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.

____ Withdrawal — Identify the specific document(s) to withdraw and explain in the project summary section.

____ Other — Contact the OEQC if your action is not one of the above items.

Project Summary
Provide a description of the proposed action and purpose and need in 200 words or less.

NEC, in partnership with Hawaiian Telcom, proposes to install a submarine fiber optic telecommunications cable at Makaha Beach, Oahu. The cable will be laid on and under the seafloor along a predetermined route from the territorial limit of State of Hawaii waters to the Makaha Beach. Approximately ½ mile offshore installation will require landing the cable via a directional bore beginning at TMK (1) 8-4-002:059, traveling beneath Farrington Highway and Makaha Beach Park, TMK (1) 8-4-001: 012, to daylight in sandy ocean bottom approximately 14 meters below mean sea level. This borehole will be lined with drill pipe, allowing the submerged cable to be pulled underground to the Project site and connected to a proposed beach manhole and cable landing station. The SEA-US cable will provide needed telecommunications capacity in Hawaii: (1) the University of Hawaii and Johns Hopkins University (2012 and 2013) identified Hawaii's broadband demand outpacing supply, SEA-US is designed to meet this need; (2) SEA-US will facilitate new economic growth by connecting Hawaii to more than two-billion people in the Philippines, Indonesia, and Southeast Asia; and (3) SEA-US will provide backup capacity in the event of system failure or damage to other cable systems.

Draft Environmental Assessment

Prepared in Accordance with Hawaii Revised Statutes,
Chapter 343, and Hawaii Administrative Rules, Title 11, Chapter 200

Southeast Asia-United States (SEA-US) Cable System, Mākaha Beach Landing

Mākaha Beach, Waiʻanae, Island of Oʻahu, Hawaiʻi

March 2016

NEC Corporation of America (NEC)
6535 North State Highway 161
Irving, Texas 75039-2402

R. M. TOWILL CORPORATION
SINCE 1930
2024 N. King Street, Suite 200
Honolulu, Hawaiʻi 96819-3494

Project NO. 1-22645-00P

Draft Environmental Assessment

Southeast Asia-United States (SEA-US) Cable System, Mākaha Beach Landing

Mākaha Beach, Waiʻanae, Island of Oʻahu, Hawaiʻi

March 2016

Prepared For:
NEC Corporation of America (NEC)
6535 N. State Highway 161
Irving, Texas 75039-2402

Prepared By:
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaiʻi 96819-3494

Project No. 1-22645-00P

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Appendices

Appendix A — AECOS, Inc., 2015. Reference in Text: (AECOS 2015a), *Marine Biological and Water Quality Surveys off Mākaha Beach, Waiʻanae, Oʻahu*.

Appendix B — AECOS, Inc., 2015. Reference in Text: (AECOS 2015b), *Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002: 059), Waiʻanae District, Island of Oʻahu.*

Appendix C — Cultural Surveys Hawaiʻi, Inc., 2015. Reference in Text: (CSH, 2015a), *Draft Archaeological Assessment for the Southeast Asia – U. S. (SEA-US) Cable Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: [1] 8-4-002: 059*.

Appendix D — Cultural Surveys Hawaiʻi, Inc., 2015. Reference in Text: (CSH, 2015b), *Draft Cultural Impact Assessment for the Southeast Asian – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu TMK: [1] 8-4-002:059.*

Appendix E — Sea Engineering, Inc., 2016. Reference in Text: (Sea Engineering, 2016), *Memorandum: Mākaha Cable Landing – Seafloor Characteristics.* Prepared by Sea Engineering, Inc. Prepared for R. M. Towill Corporation.

Figures

Tables

Acronyms and Abbreviations

AA	Archaeological Assessment
AIS	Archaeological Inventory Survey
ANSI	American National Standards Institute
APE	Area of Potential Effect
BLNR	Board of Land and Natural Resources
BMH	Beach Manhole
BMPs	Best Management Practices
CCH	City and County of Honolulu
CDUP	Conservation District Use Permit
CIA	Cultural Impact Assessment
CLS	Cable Landing Station
CRS	Cable Route Study
CSH	Cultural Surveys Hawaiʻi, Inc.
CWA	Clean Water Act of 1972, as amended
CWB	Clean Water Branch, Hawaiʻi Department of Health
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program, Hawaiʻi Office of Planning
dB	Decibel
dBA	A-Weighted Decibel
DBFS	Department of Budget and Fiscal Services, CCH
DEA	Draft Environmental Assessment
DLNR	Hawaiʻi Department of Land and Natural Resources
DO	Dissolved Oxygen
DOFAW	Division of Forestry and Wildlife, DLNR
DOH	Hawaiʻi Department of Health
DPP	Department of Planning and Permitting, CCH
DPR	Department of Parks and Recreation, CCH
DPS	Distinct Population Segment
DSP	Division of State Parks, DLNR
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act

Acronyms and Abbreviations

FEA	Final Environmental Assessment
ft	Feet
FEMA	Federal Emergency Management Agency
FIRM	Flood Rate Insurance Map
FIS	Flood Insurance Study
F/O	Fiber Optic
FONSI	Finding of No Significant Impact
GP	General Plan (of the CCH)
GPS	Global Positioning System
HAR	Hawaiʻi Administrative Rules
HDD	Horizontal Directional Drilling
HDOT	Hawaiʻi Department of Transportation
HECO	Hawaiian Electric Company
HRS	Hawaiʻi Revised Statutes
LF	Linear Feet
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
msl	Mean Sea Level
MUS	Management Unit Species
NEC	NEC Corporation of America
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service, NOAA
No.	Number
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent to discharge under NPDES regulations
NPDES	National Pollutant Discharge Elimination System
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
OIBC	Oʻahu Island Burial Council
PIRO	Pacific Islands Regional Office
RHA	Rivers and Harbors Act of 1899
RMTC	R. M. Towill Corporation
ROH	Revised Ordinances of Honolulu
ROV	Remotely Operated Vehicle

Acronyms and Abbreviations

SEA-US	Southeast Asia-United States
SHPD	State Historic Preservation Division, DLNR
SHPO	State Historic Preservation Officer
SMA	Special Management Area
SSV	Shoreline Setback Variance
TMDL	Total Maximum Daily Load
TMK	Tax Map Key
TSS	Total Suspended Solids
USACE	U. S. Army Corps of Engineers
USAG-H	U. S. Army Garrison-Hawaiʻi
USC	United States Code
USCG	U. S. Coast Guard
USDA	U. S. Department of Agriculture
USFWS	U. S. Fish & Wildlife Service
USGS	U. S. Geological Survey
WQC	Water Quality Certification
WQS	Water Quality Standards
XTEZ	Extreme Tsunami Evacuation Zone

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1.0 Project Summary

Project:	Southeast Asia – United States (SEA-US) Cable System, Mākaha Beach Landing, Mākaha Beach, Waiʻanae, Island of Oʻahu, Hawaiʻi
Applicant:	NEC Corporation of America (NEC) in Partnership with Hawaiian Telcom, Inc. (Hawaiian Telcom)
Approving Agency:	City and County of Honolulu (CCH), Dept. of Planning and Permitting (DPP)
Agent:	R. M. Towill Corporation (RMTC) 2024 North King Street, Suite 200 Honolulu, Hawaiʻi 96819-3494 Contact: Brian Takeda, Planning Project Coordinator
Tax Map Key (TMK):	(1) 8-4-002: 059, owned by Hawaiian Telcom and (1) 8-4-001: 012 (Mākaha Beach Park) owned by the Department of Parks and Recreation (DPR)
Proposed Action:	NEC proposes the laying of a submarine fiber optic (F/O) telecommunications cable from the territorial limit of State of Hawaiʻi waters and landing and construction of support infrastructure at the Mākaha Beach project site. The preferred alternative to bring the F/O cable from the ocean to the project site is to utilize Horizontal Directional Drilling (HDD) to create a borehole through which the cable can be pulled. The directional bore will daylight in sandy ocean bottom at approximately 14 meters below mean sea level (msl). The cable would be pulled through the borehole and connected to a proposed cable landing station (CLS).
Land Area:	2.82 acres (TMK (1) 8-4-002: 059)
State Land Use District:	Submerged Lands - Conservation District, TMK (1) 8-4-002: 059 and (1) 8-4-001: 012 - Urban
Adjacent County Zoning	General & Restricted Agricultural, Country, Residential, General Preservation
Existing Land Use:	State Highway Right-of-Way (ROW), Beach Park, Telecommunications Facilities (Hawaiian Telcom)
Special Management Area:	Yes
Permits and Approvals that May be Required:	*FEDERAL:* Section 7, Endangered Species Act (ESA) Consultation; Magnuson-Stevens Fishery Conservation and Management Act Consultation; Section 106, National Historic Preservation Act (NHPA) Consultation; and Section 404, Clean Water Act (CWA), and Section 10, Rivers and Harbors Act (RHA). *STATE:* Environmental Assessment (EA) under Hawaiʻi Revised Statutes (HRS), Chapter 343; Section 401, Water Quality Certification (WQC); Conservation District Use Permit (CDUP); Right-of-Entry and Grant of Submarine Easement within State Waters; Coastal Zone Management Federal Consistency Determination (CZM FEDCON); Section 402, CWA, National Pollutant Discharge Elimination System (NPDES) permit for construction stormwater; permission to discharge construction stormwater into existing Hawaiʻi Department of Transportation (HDOT) drainage system; and Use and Occupancy of HDOT ROW. *CITY AND COUNTY OF HONOLULU (CCH):* Special Management Area (SMA) Minor Permit; Shoreline Setback Variance (SSV) Permit; and easement application for use of CCH land.

2.0 Introduction

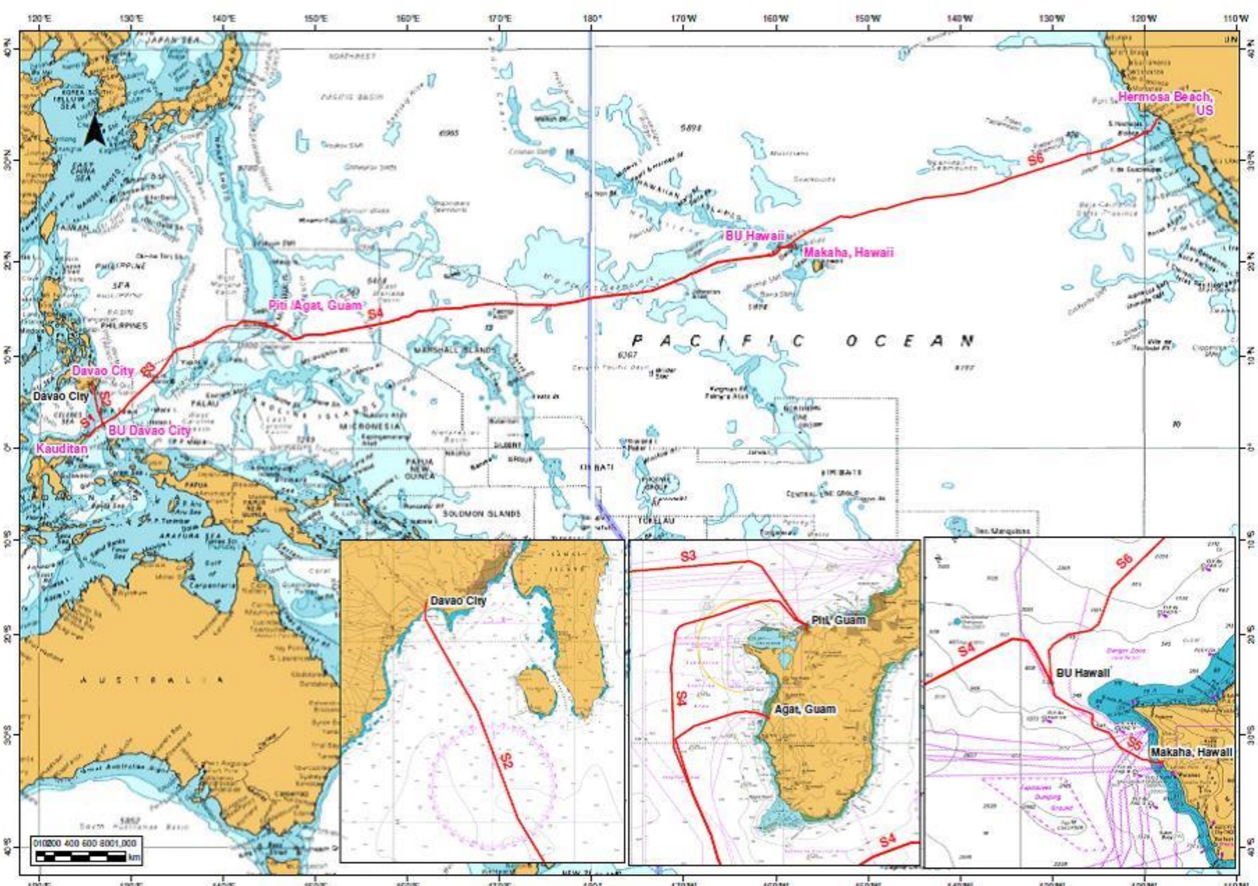
2.1 Project Background

This Draft EA is prepared pursuant to the requirements of HRS, Chapter 343, and assesses the potential for adverse environmental impacts due to installation of a transpacific submarine F/O telecommunications cable and related infrastructure at Mākaha Beach, Island of Oʻahu, Hawaiʻi.

NEC, proposes to construct the SEA-US transpacific submarine F/O telecommunications cable system connecting Indonesia (Kauditan), the Philippines (Davao), Guam (Piti), and the U. S. states, Hawaiʻi (Mākaha) and California (Hermosa). See **Figure 2-1, Overview of SEA-US Cable System**. The proposed cable route was selected based on the results of detailed investigations and surveys. The Hawaiʻi portion of this system will provide for a cable landing at Mākaha Beach, Oʻahu, with the F/O cable extending beyond the territorial limit of State of Hawaiʻi waters. This Draft EA describes the Mākaha Beach, Hawaiʻi portion of the SEA-US cable system.

A consortium of companies will own the SEA-US System, including: Globe Telcom Inc. (Globe, The Philippines); GTI Corporation (GTI, USA); Hawaiian Telcom, Inc. (Hawaiian Telcom, Hawaii); PT Telekomunikasi Indonesia International (Telin, Indonesia); RAM Telecom International, Inc. (RTI, USA); and Teleguam Holdings LLC, dba GTA (GTA, Guam).

Figure 2-1, Overview of SEA-US Cable System



2.2 Project Purpose and Objectives

The purpose of the project is to install a single submarine F/O telecommunications cable at Mākaha Beach. Installation of the cable will require laying the F/O cable along a predetermined route on the seafloor until reaching the nearshore waters of Mākaha Beach. Approximately ½ mile offshore cable installation will require landing the cable via a directional bore beginning at the project site, TMK: (1) 8-4-002: 059, located mauka of the Farrington Highway (Highway 93), which will travel beneath the highway and Mākaha Beach Park (TMK: (1) 8-4-001: 012) at a depth of approximately 80 to 100 ft or more to daylight in sandy ocean bottom. This borehole will be lined with drill pipe, therefore allowing the submerged cable to be pulled underground to the project site.

Ultimately, the final build-out of the SEA-US Cable System will result in telecommunications connectivity between Southeast Asia, Hawaiʻi, Guam, and the U. S. West Coast. The project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided. The proposed SEA-US F/O cable system will serve the present and future population of Hawaiʻi by providing high-speed worldwide internet connections, which is a necessity for education, communities, and businesses in today's global society. The SEA-US cable is especially critical for Hawaiʻi for the following reasons:

- Broadband Exhaust: A series of studies conducted by the University of Hawaiʻi and Johns Hopkins University Applied Physics Laboratory in 2012 and 2013 as part of the Hawaiʻi Broadband Initiative, identified broadband demand outpacing supply in Hawaiʻi. Several factors contributed to this, most notably:
  - Two of the three main F/O cables in Hawaiʻi are beyond the halfway point of their designed life and are not anticipated to meet the forecasted bandwidth demand for Hawaiʻi;
  - Technology has advanced to where a Hawaiʻi landing is no longer necessary or desired for new transpacific cable systems; new systems could bypass Hawaiʻi; and
  - Remaining transpacific systems may charge premium prices knowing no new systems are likely to land in Hawaiʻi.
- Direct Fiber Connection to Southeast Asia: The proposed SEA-US cable system would connect Hawaiʻi to more than two-billion people in the Philippines, Indonesia, and the rest of Southeast Asia providing the infrastructure to facilitate new economic opportunities.

The proposed HDD daylight location for the landing of the SEA-US F/O cable at Mākaha Beach was selected to optimize the approach to infrastructure, minimize interference with other existing cables, and use the seafloor features as a natural corridor. The cable route was engineered to avoid potential hazards, disruption to marine resources, and to secure long-term protection of the cable. The cable route and project design were developed and refined through surveys of the inshore, and deep-water sections of the route to define the optimum route for cable installation.

The submerged landing site was selected to make use of an extensive deep sand-filled channel fronting Mākaha Beach that bisects the nearshore bottom and extends seaward. Extensive coralline limestone fringing reef platforms border both the north and south sides of the sand channel; along this hard substratum are well-developed coral communities. Sea Engineering Inc. (2001) measured the sand thickness in the Mākaha sand channel using a sub-bottom profiler. The survey indicates that the proposed daylight location within the sand channel is composed of sand deposits greater than 1 meter (3 feet (ft)) thick. This horizon layer overlies a dense to very dense mix of rubble/cobble and sand. Because of the shifting nature of this substratum, seasonal movement of sand and scouring that occurs with surf in this area, no corals or other slow-growing sessile species are expected at the proposed landing location (Sea Engineering, 2016).

Cable route reconnaissance and surveys undertaken for the proposed project have confirmed that it is possible to daylight the directional bore in sandy ocean bottom at approximately 14 to 17 meters below msl. It is desirable to locate the bore exit in sand to minimize potential for environmental impacts associated with anchoring, armoring, or trenching to secure the cable. The presence of extensive sand deposits on the ocean bottom will permit the cable to eventually bury itself into the sand, providing maximum protection against wave forces.

Previous survey work conducted by Sea Engineering indicates that the sand channel widens seaward of the proposed landing location. At the 17-meter water depth, the sand channel spans a width of 300 meters. Further offshore it connects to a broad sand deposit that parallels the Waiʻanae Coast. The National Oceanic and Atmospheric Administration (NOAA) benthic maps indicate that the area offshore the proposed exit points is uncolonized sand. Uncolonized habitat is usually found on sand or mud bottoms. This bottom type continues to the 40-meter isobaths, the offshore extent of the NOAA maps (Sea Engineering, 2016). In the event scattered corals are discovered seaward of the landing location during the cable lay, the potential for damage to these corals will be avoided by careful placement of the cable between or around any formations.

Major activities associated with the project will include laying the SEA-US cable along the sea floor via a cable laying ship, preparation of the terrestrial telecommunications infrastructure to accept the cable, HDD to create an approximately 80 to +100 ft deep underground lined borehole into which the F/O cable will be installed from the ocean end, and the installation of the cable upon its arrival. The terrestrial telecommunications infrastructure will include a new beach manhole (BMH) and CLS constructed at the Hawaiian Telcom property, mauka of Farrington Highway (Highway 93). See **Figure 2-2, Project Location**; **Figure 2-3, Nearshore and Terrestrial Project Location**; **Figure 2-4, Horizontal Directional Drilling (HDD) Cross Section**; and **Figure 2-5, Proposed Cable Landing Station Site Plan**.

The proposed project will fulfill the following objectives:

- Provide reliable telecommunications service between Indonesia, the Philippines, Guam, the U. S. West Coast, and Hawaiʻi;
- Enhance service now provided through cable systems that have limited bandwidth capacity. The proposed SEA-US cable system will have a high operating bandwidth enabling more efficient use of high technology services such as telemedicine, real time videotrafficing, and data transmission; and
- Provide a redundant system to existing submarine fiber optic cable systems in the event of system failure or damage.

Figure 2-2, Project Location

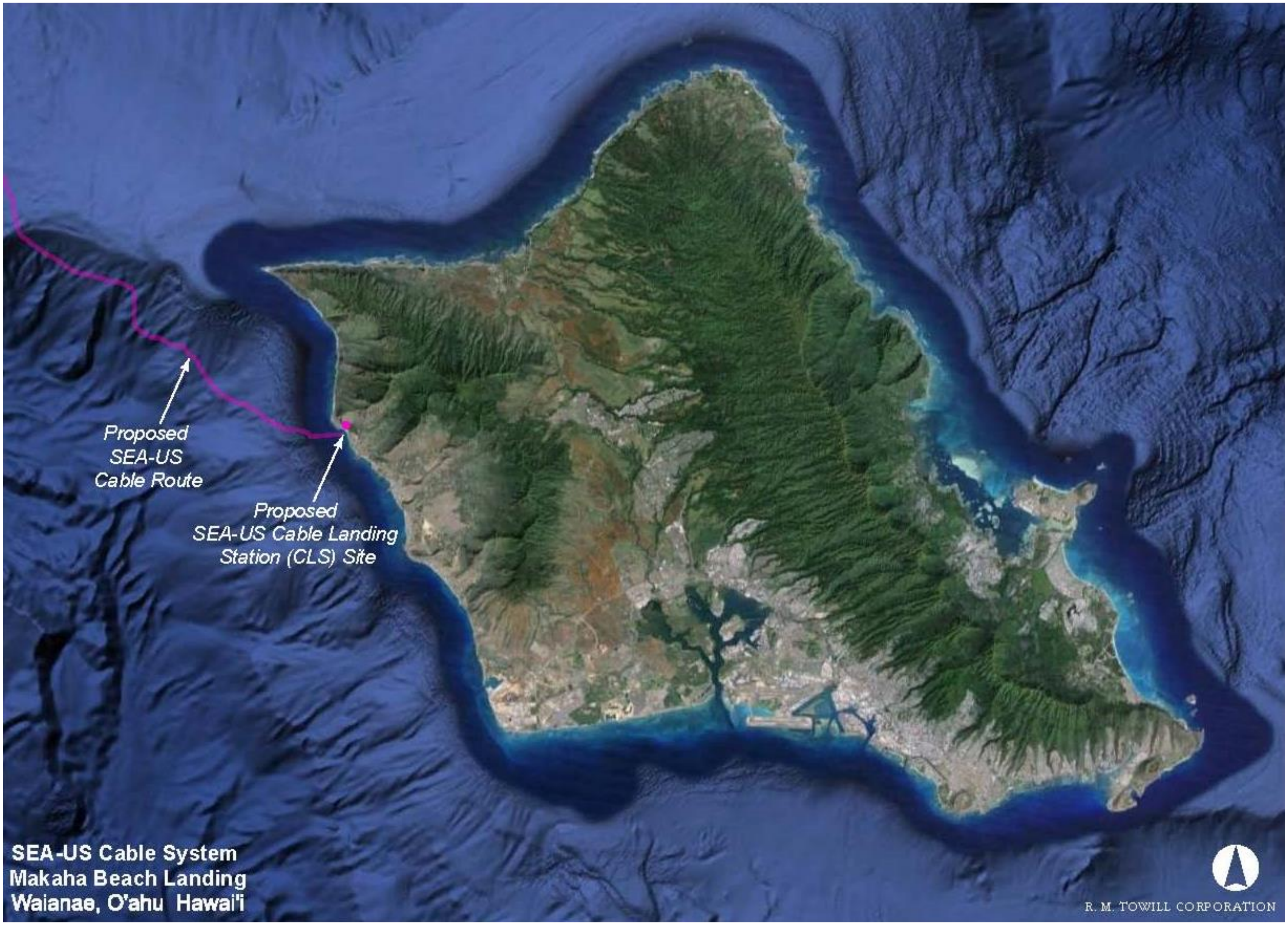
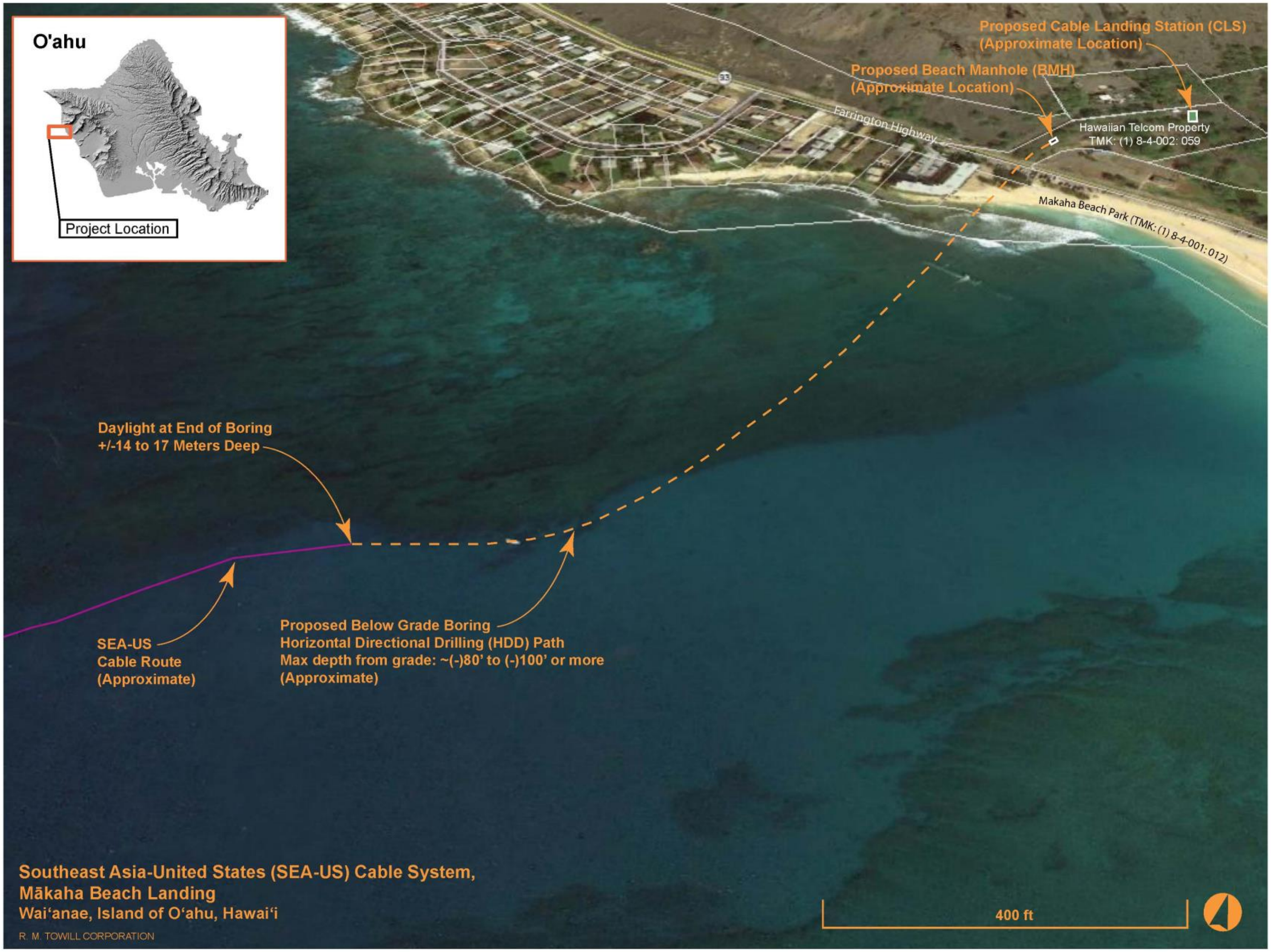
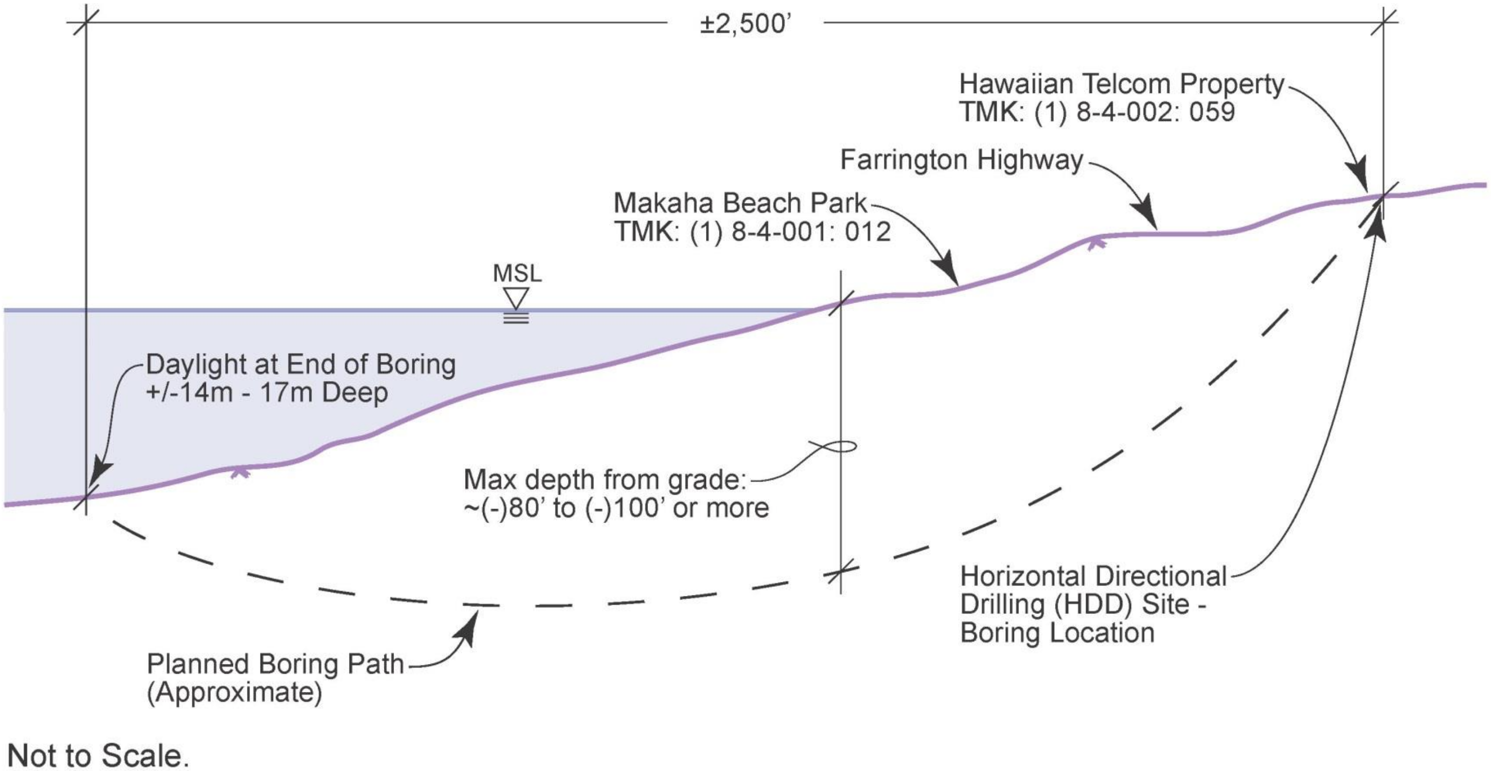


Figure 2-3, Nearshore and Terrestrial Project Location

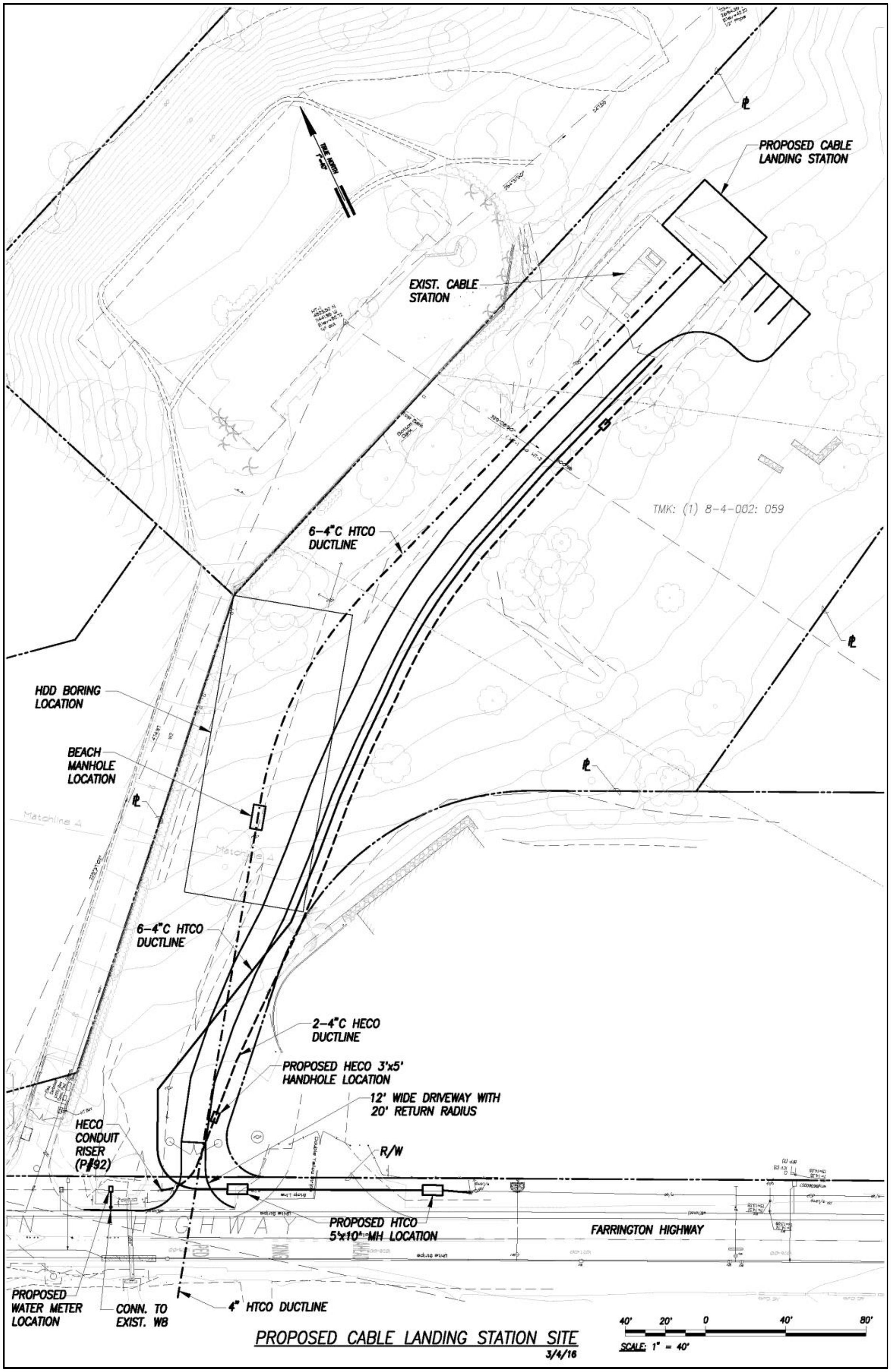


1 Figure 2-4, Horizontal Directional Drilling (HDD) Cross Section

2



1 Figure 2-5, Proposed Cable Landing Station Site Plan

2


2.3 Project Location

The project location is on the west side of the Island of O'ahu in the Wai'anae District of the CCH, and offshore of this location, generally to the northwest of the coast. The submerged cable location will be along a predetermined linear course in the Pacific Ocean beginning at Mākaha Beach (mean high tide: 21° 28' 38.09" N, 158° 13' 30.46"W) and extending beyond the territorial limit of State of Hawai'i waters (three nautical miles: 21° 26' 57.62" N, 158° 16' 03.21"W) (**Figure 2-2**).

Beyond the territorial limit of the State of Hawai'i waters, the Hawai'i (Mākaha) segment of the SEA-US cable system will be connected to the Guam (Piti) and California (Hermosa) cable segments via a submarine branching unit (BU), allowing the cable to split to serve multiple destinations. See **Figure 2-6, BU Hawai'i (Mākaha)**.

Figure 2-6, BU Hawai'i (Mākaha)

The proposed submerged cable "landing" location (i.e., submerged site where the cable will be brought to land) for the Hawai'i segment of the SEA-US cable system will be located approximately ±2,300 linear feet (LF) seaward of the shoreline at Mākaha Beach. The submerged landing location will be at approximately 14 to 17 meters below msl where the ocean bottom possesses extensive sand deposits greater than one meter in thickness. To land the cable, the HDD bore will be initiated mauka of the Farrington Highway from the Hawaiian Telcom property and be directed underground at a depth of approximately 80 to 100 ft or more to the submerged landing location. Drill pipe will be inserted into the borehole as the HDD drill bit progresses toward the submerged site and will serve as a conduit for the installation of the cable and to prevent the borehole from collapse. Following the installation of the drill pipe within the borehole, a pilot line will be placed inside and connected to the submerged cable, allowing the cable to be pulled underground approximately ±2,500 LF, beneath the Mākaha Beach Park (TMK: (1) 8-4-001: 012) and Farrington Highway, to the BMH for eventual connection to the CLS located at the Hawaiian Telcom property (**Figure 2-3**).

Upland project activity mauka of the Farrington Highway will include earthwork for the operation of the HDD equipment, installation of an approximately ±12 ft long by ±6 ft wide by ±7 ft deep BMH at the bore site, and construction of an approximately 1,500 square foot (sf) CLS on the northeast corner of the site. The CLS building height will be approximately ±15 ft, including the building foundation. Routing of the cable from the BMH to the CLS will be accomplished via a ductline installed in a trench with a minimum depth of 36 in. No grading or earthwork on land will be required makai of the Farrington Highway for the proposed project (**Figure 2-5**).

The shoreline at the Mākaha Beach is composed of carbonate sand and limestone and basalt rock. The area is exposed to southerly swells in summer months, northerly swells in winter months, and southerly to westerly waves from Kona storms throughout the year but most often in the winter. Large waves may break on or near the shoreline causing temporary erosion as the deep nearshore reef provides little protection. Both the beach width and slope vary considerably throughout the year due to the seasonally varying wave climate. The beach is composed of medium size, well-sorted calcareous sand, and the nearshore sea bottom is comprised of alternating patches of sand and coralline reef rock. The proposed cable landing will take place within the extensive sand channel offshore of Mākaha Beach beyond the surf zone. Farther offshore, the cable will be placed on the ocean bottom along a predetermined route where sand and uncolonized habitat dominates the seabed (Sea Engineering, 2016).

The State Land Use classification of the proposed terrestrial landing site is in the Urban District. CCH zoning for the project site, TMK: (1) 8-4-002: 059, is Country. CCH zoning for the Mākaha Beach Park, TMK: (1) 8-4-001: 012, and the location for the proposed underground borehole is General Preservation. Submerged lands surrounding the Hawaiian Islands are in the Conservation District to the State of Hawaiʻi territorial limit. All necessary State, Federal, and City and County of Honolulu permits will be obtained prior to start of construction.

3.0 Description of the Proposed Action

3.1 Project Overview

The submerged Hawaiʻi segment of the SEA-US cable system will be installed by a cable laying ship following a prescribed survey route in the Pacific Ocean off the coast of Mākaha Beach. Upon reaching Mākaha Beach, HDD will facilitate the landing of the cable to the terrestrial site. HDD activities will include drilling an approximately 80 to +100 ft deep borehole which will travel underground approximately ±2,500 LF from the Hawaiian Telcom CLS site to the daylight location in sandy ocean bottom approximately 14 to 17 meters below msl. The borehole will be lined with drill pipe allowing the cable to be pulled from the submerged waters off the coast of Mākaha Beach to the terrestrial HDD site. A BMH will be constructed at the borehole site to facilitate the landing of the cable and a CLS will be constructed to accept the cable telemetry. The cable will be routed from the BMH to the CLS via a ductline installed below grade within a trench. The trench will have a minimum depth of 36 in. The subground installation of the cable to the BMH and CLS will provide physical security from natural disasters, potential accidents, and tampering. The CLS accepting the cable telemetry will interpret and distribute the signal to existing terrestrial F/O cable infrastructure located along the Farrington Highway ROW owned by telecommunications providers such as Hawaiian Telcom.

Project work will consist of the following:

- Main cable laying and installation by cable ship;
- Nearshore landing and terrestrial site works; and
- Operation of the cable system.

These elements of the project are described in more detail below.

3.2 Main Cable Lay and Installation

The main cable installation will involve laying the SEA-US F/O cable along a surveyed route in the Pacific Ocean between Indonesia (Kauditan), the Philippines (Davao), Guam (Piti), and the U. S. states, Hawaiʻi (Mākaha) and California (Hermosa) using a special purpose cable ship, referred to as a “cableship” vessel to distinguish it from support boats.

The Hawaiʻi segment of the SEA-US cable system will be laid by cableship from the Hawaiʻi BU, where it will join the Guam (Piti) and California (Hermosa) cable segments, to Mākaha Beach through Hawaiʻi State territorial waters. The cableship will range from approximately 95 to 124 m (312 to 407 ft) in length. During the main cable lay, the cableship will operate at relatively low speeds of up to approximately 4 knots as it approaches Mākaha Beach, Oʻahu. The main cable lay will be conducted 24 hours per day until the ship reaches shallow water where the nearshore landing operation will be carried out.

The cableship will approach the landing site using a satellite based global positioning system (GPS). Up to two support boats may be required to assist the cableship during the nearshore landing operation. The support boats will be smaller vessels typically ranging from approximately 5 to 9 m (18 to 30 ft) in length. On-station positioning at the submerged landing site will be accomplished using tugboats or side thrusters. Other methods to maintain position, including the temporary use of anchors, may also be used provided that the method used does not destroy or damage corals. Once the cableship is properly positioned it will begin laying out cable while personnel attach suspension floats at regular intervals, as required, to allow the cable to be guided toward the daylighted borehole using divers or remotely operated vehical (ROV), a small motor boat, and/or other means. The duration of the main cable lay operation once the ship is on-station fronting the Mākaha Beach will not be more than approximately one to three days. The cableship will wait for daylight hours and suitable conditions (calm weather and minimal swell) before initiating the nearshore cable landing operations.

The cableship and support vessels will comply with applicable federal and state regulations and conventions addressing navigational safety, safe operations, and pollution prevention measures. The location and duration of the cableship and support boats present in the project area will be provided in a Notice to Mariners submitted in accordance with U. S. Coast Guard (USCG) requirements. The USCG will issue the notice to alert other vessels of the cableship's presence, expected time in the project area, and contact information.

3.3 Nearshore Landing and Terrestrial Site Works

The nearshore landing and terrestrial site works will consist of the following key activities:

- Terrestrial site preparation and equipment staging;
- Construction of the CLS and infrastructure;
- Installation of the HDD boring rig at the landing site;
- Cable landing operations;
- Cable pull to the BMH location;
- Installation of the BMH; and
- Cable connection to the CLS.

See **Figure 2-3** and **Figure 2-5** for the general layout for nearshore and terrestrial site works. Equipment and materials will be staged at the project site, TMK (1) 8-4-002: 059.

Hawaiian Telcom will construct an approximately 1,500 sf single story ±15 ft high modular or concrete CLS structure on the northeast portion of the project parcel. Installation of related infrastructure will be required to support the proposed project. A proposed new access road will replace the existing gravel access road. The new road will provide access to the proposed site via Farrington Highway. The road will be constructed to standards of the CCH and State of Hawaii. Connection to water and electrical facilities within the Farrington Highway ROW will be required.

In anticipation of the cable landing, the proposed area of the BMH will be excavated into a pit to accommodate installation and use of the HDD boring rig. The boring rig will be set into the excavated pit with dimensions of approximately 8 to 10 ft deep by ±10 ft long by ±5 ft wide (**Figure 2-5**). The borehole will be drilled using a 7 to 8 inch diameter drill bit, resulting in an approximately ±12 inch diameter borehole, and will start from the pit and be guided at a depth of approximately 80 to 100 ft or more underground to the target location approximately 14 to 17 meters below msl (**Figure 2-3** and **Figure 2-4**). The boring rig will be powered by an internal combustion engine and direction guided by use of radio transceivers located in the drill head. A ±5 inch diameter steel drill pipe will be installed following the progression of the boring from the BMH location to the submerged "landing" site (approximately ±2,500 LF).

Operation of the drill will involve use of a lubricant such as bentonite, to facilitate passage of the drill bit through the substratum. The actual lubricant selected will be based on need to maintain safety and environmental protection of the water quality of the area. The lubricant used for drilling operations will be recycled using a sump pump located in the drill pit to direct the used lubricant to a slurry separation plant located near the drill pit to process the dirty slurry. Clean lubricant resulting from the processing of the dirty slurry will be reused for drilling and the clean soil by-product stockpiled for use or disposed of off-site. Slurry that cannot be reused will be hauled off site.

As the directional drill bit approaches the submerged target, the drill bit speed will be adjusted to the minimum necessary and use of lubricant terminated approximately ±100 LF prior to daylighting to ensure a clean bore. Divers or ROV will be in the water to observe and remove the drill bit as it daylights from the borehole. See **Section 5.6**, **Surface Water**, for discussion on potential effects and proposed mitigation for work within the Pacific Ocean. Once the drill bit is removed, the remaining drill apparatus will be pulled back through the drill pipe to the terrestrial site.

Following the completion of the drilling operation, pilot line will be placed in the drill pipe to facilitate the installation of the F/O cable. On the day of the cable pull, divers will feed the F/O cable into the open submerged drill pipe. As the cable is being fed, the pilot line previously placed in the drill pipe will be attached to the cable. The cable will then be pulled toward the project site by a winch. Divers monitoring the progress of the cable pull will successively cut the suspension floats as the cable is fed into the drill pipe. Once the cable landing is completed the HDD equipment will be removed from the drill pit, and the new precast approximately ±12 ft x ±6 ft BMH will be installed in its place. The BMH will serve as the primary point of connection for the submarine F/O cable.

Following cable installation in the BMH an approximately 36 in deep trench will be excavated and a ductline installed from the BMH to the CLS to accommodate the F/O cable connection to the CLS (**Figure 2-5**). After installation, the site will be restored to its original condition and all equipment no longer necessary to the site will be demobilized.

Construction activities at the project site are anticipated to take several months (e.g., approximately 10 – 12 months) and will primarily involve the operation of the HDD rig and the construction of the CLS, BMH, access roadway, and supporting utilities including water and power. The period required for the installation of the submarine F/O cable from the cableship to the BMH will be relatively short, and is expected to require not more than approximately one to three days.

The Farrington Highway and Mākaha Beach Park (TMK: (1) 8-4-001: 012) are not expected to be adversely affected by construction activities. Construction equipment and personnel mobilized to the job site may require the use of safety signage and/or the use of flag persons to direct traffic when deliveries to the job site are required. However, the Farrington Highway and beach park will remain open to public use throughout all operations. A security guard may be posted at night and on weekends to ensure public safety and security of the job site.

Nearshore ocean waters may need to be closed to ocean activities (surfing, diving, boating, and swimming) to ensure safety to ocean users during the cable laying process and landing operations. The total area anticipated to be closed will be approximately ±100 ft by ±100 ft. The period when the waters will be closed is not expected to be more than one day, weather permitting, for the cable laying and landing operations. This short term "closure" of nearshore water areas will be achieved by publishing a notice to advise mariners to avoid the area. Further, during the cable laying and landing processes, project personnel will advise beach users to avoid nearshore ocean waters via small powered water crafts.

3.4 Operation of the Cable System

Once installed, Hawaiian Telcom will be responsible for the operation and maintenance of the Hawaiʻi segment of the SEA-US cable system. As required, replacement and maintenance of installed equipment will be performed.

3.5 Ownership and Property Requirements

No property acquisition is required for the proposed project. The 2.82 acre project site, TMK (1) 8-4-002: 059, is owned by Hawaiian Telcom and includes the area required for the proposed HDD work and construction of the CLS and support infrastructure.

Land that is makai of the Farrington Highway along the Mākaha Beach Park, TMK (1) 8-4-002: 012, is under jurisdiction of the DPR, CCH.

Marine waters beyond the state certified shoreline is owned and under jurisdiction of the Department of Land and Natural Resources (DLNR) up to the territorial limit of State of Hawaiʻi waters.

Easements associated with the proposed project will require obtaining easements for the placement of the cable from the HDOT within the ROW along Farrington Highway, and the CCH for cable access beneath the Mākaha Beach Park, TMK: (1) 8-4-001: 012.

3.6 Construction Timing and Valuation

NEC proposes to commence installation of the F/O cable and construction of the site upon approval of all required environmental permits, anticipated to be in late 2016 to early 2017. Approximately 10 - 12 months will be required for construction.

The cost associated with the construction of the proposed project is estimated at $35 million, and will be paid for by NEC/Hawaiian Telcom.

3.7 Environmental Factors

See **Section 5.0**, **Environmental Setting**, **Potential Effects and Mitigation Measures**, concerning the potential for environmental effects including the use of proposed mitigative measures.

3.8 Regulatory and Community Consultations

A number of public and agency coordination activities for the Hawaiʻi segment of the SEA-US cable system will be required. Public involvement in the project will consist of public notice of the proposed action during the EA process in the State Office of Environmental Quality Control (OEQC) Bulletin. See **Section 10.0** for a complete list of agencies, organizations and individuals to be consulted for the EA.

The project was introduced to permitting and resource agencies to provide early information about the project, and to solicit input. Anticipated permits and approvals for the project include:

- *Section 404, Clean Water Act (CWA), and Section 10, Rivers and Harbors Act (RHA) (also referred to as a Department of the Army Permit)* (see **Section 8.2**): All work in and near the Pacific Ocean and potential mitigation, will be coordinated with the USACE, Honolulu Branch.
    - *Section 7, Endangered Species Act (ESA)* (see **Section 8.2**): Consultation will be conducted by the U. S. Army Corps of Engineers (USACE) with the U. S. Fish and Wildlife Services (USFWS) and the NOAA during the processing of the Department of the Army Permit.
    - *Section 106, National Historic Preservation Act (NHPA)* (see **Section 8.2**): Consultation will be conducted by the USACE with the State Historic Preservation Division (SHPD), Archaeology and Architecture Branches, DLNR, during the processing of the Department of the Army Permit.
    - *Magnuson-Stevens Fishery Conservation and Management Act* (see **Section 5.15** and **Section 8.2**): Consultation will be conducted by the USACE with the NOAA during the processing of the Department of the Army Permit.
- *Section 401, Water Quality Certification (WQC)* (see **Section 5.6**, **Section 5.11**, and **Section 8.3**): All work within state waters will be coordinated with the USACE Regulatory Branch and the Department of Health (DOH), Clean Water Branch (CWB) to identify requirements pertaining to their jurisdiction.
- *Section 402, CWA, National Pollution Discharge Elimination System (NPDES) Notice of Intent (NOI) Form C for Discharges of Storm Water Associated with Construction Activities* (see **Section 5.7** and **Section 8.3**): In accordance with Hawaii Administrative Rules (HAR), Chapter 11-55 Water Pollution Control, a permit application will be prepared and submitted to the DOH, CWB to address runoff of construction stormwater.
- *Discharge Permit to the State of Hawaiʻi Highways Division Strom Drain System:* The subject action requires coordination with HDOT for the discharge construction stormwater into the existing state drainage system.
- *Conservation District Use Permit (CDUP)* (see **Section 8.7**): All work in the Conservation District and in State waters required for the subject action, will be coordinated with the DLNR, Office of Conservation and Coastal Lands (OCCL). A public hearing and a hearing before the Board of Land and Natural Resources (BLNR) will be required for approval.
- *Coastal Zone Management Federal Consistency Determination (CZM FEDCON)* (see **Section 8.8**): All land and water use activities in the State of Hawaiʻi must comply with HRS, Chapter 205A,

Hawaiʻi Coastal Zone Law, therefore the project will undergo review by the Hawaiʻi Office of Planning.

- *Right-of-Entry and Grant of Submarine Easement within State Waters* (see **Section 8.7**): A grant of easement from the BLNR for the proposed project will be required for the placement of the cable in state waters. This will require a public hearing and hearing before BLNR for approval.
- *Application and Permit for the Use and Occupancy of State Highway ROW*: All activities associated with the subject action upon the state highway will be coordinated with the HDOT, Highways Division, ROW Branch.
- *Application and Grant of Easement within CCH Lands*: The subject action requires coordination with the CCH, Department of Budget and Fiscal Services (DBFS) for use of land under ownership of the CCH.
- *Special Management Area (SMA) Minor Permit* (see **Section 8.12**): All work within the SMA will be coordinated with the CCH, DPP, in accordance with Revised Ordinances of Honolulu (ROH), Chapter 25, SMA.
- *Shoreline Setback Variance (SSV) Permit* (see **Section 8.13**): A SSV will be required to address the use of land within the 40 ft setback of the certified shoreline as determined by the State Survey Office, DLNR. A SSV application will be submitted to the CCH, DPP upon release of the Final EA and FONSI, in accordance with ROH, Chapter 23, Shoreline Setback. A CCH, DPP public hearing will be required.

Project scoping and coordination activities will continue to include meetings and correspondence with government agencies, organizations, and individuals throughout the EA and permitting process.

4.0 Alternatives to the Proposed Action

4.1 Introduction

Three alternatives were considered to address the purpose and need for the project: (1) A No Action Alternative; (2) A Delayed Action Alternative; and (3) Build Action Alternatives. The Build Action Alternatives included the development of potential alignments for the cable installation and HDD activities, use of alternative sites, and use of alternative technologies to address the purpose and need for the project.

4.2 No Action Alternative

The no action alternative is not considered a viable alternative because it would not fulfill the objectives of the proposed SEA-US cable system. The proposed project is part of a long range plan to permit F/O telecommunications linkages between the Southeast Asian nations of Indonesia and the Philippines, with the U. S. territory of Guam, and the Western U. S. via Hawaiʻi. The Hawaiʻi portion of this linkage would provide Hawaiʻi with direct, advanced high-speed international data and voice communications. In addition, the improved telecommunications capabilities of SEA-US cable system could be used in the event of international cable failures between Southeast Asia and the U. S. mainland. Under the No Action alternative, the project objectives of increasing access to trans-Pacific telecommunications networks, and improving the diversity and security of existing networks would not be achieved. Because the No Action Alternative would not address the purpose and need for the project, it is not considered a viable or feasible alternative. For this reason, it is eliminated from further consideration.

4.3 Delayed Action Alternative

The Delayed Action Alternative differs from taking no action in that the proposed project would be constructed, but at a later undetermined time. Delayed action to implement the proposed project would adversely affect the project when it is ultimately constructed because:

- Design and construction costs could be expected to increase due to price inflation involving the cost of labor, materials, and equipment; and

- Environmental permitting requirements could be expected to increase with new or more stringent regulatory controls, which would add to the length of time required to obtain approvals, increased project costs associated with the processing of permits, and the potential for new or increased provisions for mitigative measures.

Although the Delayed Action Alternative would eventually address the purpose and need for the project, there would be little to no benefit as it would mean continued reliance on existing but aging cables providing service between Hawaiʻi and Southeast Asia and the U. S. mainland. These cable systems are from providers that have included AT&T Submarine Systems, Tycom, Alcatel and others. Some of these systems were installed decades ago and are comprised of older technology fiber and older coaxial cable with capabilities that are being exceeded by increasing demands for speed and data bandwidth (i.e., the amount of data that can be sent within a signal at a given point in time).

Failure of existing cable systems would involve loss of telecommunications continuity and therefore, commerce, trade, and cultural exchange between Hawaiʻi, Guam, Southeast Asia, and the U. S. mainland. Because delaying the preferred alternative is anticipated to increase the time needed for project design and construction, and add to project costs, it is not considered a viable alternative and is eliminated from further consideration.

4.4 Build Action Alternatives

This section address the Build Action Alternatives considered in the development of the Hawaiʻi segment of the SEA-US cable system, including the use of alternative technology, use of alternative sites, and development of potential alignments for cable installation and HDD activities to address the purpose and need for the project.

Alternative Technology

Use of additional new or existing telecommunications satellites are not a viable alternative based on the level of demand projected for the proposed SEA-US cable system as well as satellite limitations including:

- Transmission delays due to technical and atmospheric limitations involving the use of radio transmissions through the atmosphere;
- Visual and aesthetic intrusion caused by the need for ground stations and radio antennas which would need to be constructed to accept satellite transmissions; and
- Difficulties associated with "double hops" which occur when data must be retransmitted to establish a secure voice or data circuit.

In comparison with satellites, F/O technology is the only means of providing the capacity needed for digital communications without transmission delays and major visual and aesthetic problems.

Alternative Landing Site

Selection of a landing site requires intensive review and evaluation of physical, regulatory and commercial information. The landing site must provide:

- Access to telecommunication markets and users, either directly or through interconnection with other subsea networks;
- Access to onshore infrastructure; and
- A location where the subsea cable can feasibly be landed, with due regard for long-term cable protection, safety and environmental considerations.

The proposed project requires the landing of the SEA-US cable offshore of the Mākaha Beach, at the terrestrial landing site designated as TMK (1) 8-4-002: 059, owned by Hawaiian Telcom. NEC and Hawaiian Telcom have partnered to provide telecommunications infrastructure at this location consisting of a future proposed CLS and cable infrastructure. The placement of submarine F/O cable offshore of this location provides the most expedient and effective means of connection between Hawaiʻi and the U. S. mainland, Guam, the Philippines, and Southeast Asia, and would have minimal potential for impacts to the surrounding environment (see **Section 5.0**). An alternative site for the installation of the F/O cable is not considered feasible as it would not address the project requirement for the use of the joint Hawaiian Telcom/NEC project site.

Marine Cable Route Selection

The selection and optimization of the marine route in the approach to the landing site is a process that takes account of numerous considerations, including the following:

- Access to the selected landing site;
- Seabed characteristics;
- Bathymetry;
- Restricted areas, such as marine sanctuaries and military operation areas;
- Sea uses in the project area, including recreation and fishing;
- Sensitive habitats and resources;
- Natural and man-made hazards;
- Cultural resources such as shipwrecks; and
- Regulatory and permitting requirements.

At the route planning stage, information was obtained from agency contacts, site visits and route surveys to identify and validate information critical to planning the route and landing. The route survey for the SEA-US cable system included scanning, sonar, and video surveys of the nearshore and deep-water areas, and a biological survey to obtain site-specific data used in refining the route and landing.

Alternative HDD Alignment and Daylight Location

Alternative HDD alignments and daylight locations for the landing operations of the SEA-US cable at Mākaha Beach were considered with an exit point between depths of 14 to 17 meters below msl.

Four HDD alternatives were considered in order to optimize the approach to infrastructure and to avoid interference with existing cables, potential hazards, disruption to marine resources, and to secure long-term protection of the cable through use of the seafloor features as a natural corridor. The HDD alternatives considered include:

- HDD Straight Alignment – daylighting at approximately 17 meters below msl;
- HDD Curved Alignment – daylighting at approximately 17 meters below msl;
- HDD Straight Alignment – daylighting at approximately 14 meters below msl; and
- HDD Curved Alignment – daylighting at approximately 14 meters below msl.

The curved alignments each assume a 1000 ft radius and 200 ft straight segment after the curve.

The submerged HDD daylight locations at Mākaha Beach were selected to make use of offshore sand deposits. Cable route reconnaissance and subsequent surveys undertaken for the project have confirmed that it is possible to daylight the directional bore in sandy ocean bottom at approximately 14 to 17 meters below msl.

An existing cable is anticipated near the approximately 17 meters below msl alternative HDD daylight location. Because the existing cable may interfere with the installation of the proposed SEA-US cable at 17 meters below msl alternative HDD daylight location, it is not considered a viable alternative and is eliminated from further consideration.

4.5 Preferred Alternative

Daylighting the HDD bore and landing the SEA-US cable at approximately 14 meters below msl at Mākaha Beach is preferred, and offers an optimal combination of access to telecommunication markets and users, and minimal potential for impacts to the surrounding environment. The factors considered important in the selection of the preferred alternative included:

- The preferred alternative will provide reliable telecommunications service between Indonesia, the Philippines, Guam, the U. S. West Coast, and Hawaiʻi. The proposed SEA-US cable system will have a high operating bandwidth enabling the more efficient use of high technology services such as telemedicine, real time videotrafficing, and data transmission.
- The preferred alternative will provide a redundant system to the existing fiber optic cable systems between the proposed locations in the event of system failure or damage.
- The preferred alternative will use HDD for landing operations that will minimize the potential for ecological disturbance through reductions in environmental pollution, and less restoration and noise over trenching methods.
- The preferred alternative will avoid potential interference with existing cables. An existing cable is anticipated near the approximately 17 meters below msl alternative HDD landing location. Daylighting the HDD drill bit at the preferred daylight location, approximately 14 meters below msl, will avoid potential interference with existing cables.
- The presence of extensive sand deposits on the ocean bottom in the preferred cable landing location will permit the cable to avoid potential hazards and eventually bury itself into the sand, providing maximum protection against wave forces.

Further investigation is required to determine if the curved or straight HDD alignment alternative will be selected to daylight at 14 meters below msl. Analysis and final selection of the preferred alignment alternative will ensure the least possible impact to the surrounding environment and disruption to marine resources, and avoidance of potential hazards.

5.0 Environmental Setting, Potential Effects and Mitigation Measures

5.1 Climate

The climate in the project area is characterized as semi-tropical and is influenced by Hawaiʻi's geographic location southwest of the Pacific High or anticyclone region. The principal features of the climate are the equable temperatures from day to day and season to season, northeasterly trade winds, and a marked variation in rainfall from the wet to the dry season, and from place to place. According to data from Weather Station 738.40, Oʻahu Sugar Company Field 155, average monthly rainfall in the project area varies from a low of 0.8 to 0.9 inches in the summer months to a high of 6.4 inches in January.

The average monthly temperature recorded at the nearby Wheeler Army Airfield ranges from 66 to 80 degrees. Normal annual rainfall is over 40 inches. Three-fourths of this total, on average, falls during the seven-month wet season, which extends from October through April. The dry season includes the months of May through September. Winds are predominantly from the northeast at speeds of 10 to 13 knots. Relative humidity, moderate to high in all seasons, is slightly higher in the wet season than in the dry. The project area is known for relatively high insolation (Juvik and Juvik, 1998).

Potential Effects and Proposed Mitigation

The proposed project will have no impacts to the existing climate of the area. No mitigation measures are required.

Potential Impacts of Alternatives

The proposed project and no alternative considered would affect the climate of the region.

5.2 Geology

The Island of Oʻahu is a volcanic doublet, formed of the Waiʻanae range on the west and the younger Koʻolau Range on the east. Both are eroded remnants of great shield volcanoes. Lava flows from the Koʻolau volcano banked against the already-eroded slope of the Waiʻanae volcano to form the gently sloping surface of the Schofield Plateau.

The Waianae Volcanic Series is divided into lower, middle, and upper members. The lower member is made up of the lava flows and pyroclastics that built the main mass of the Waianae shield; the middle member composed of mainly rocks that accumulated in the caldera, gradually filling it; and the upper member is a thin cap that has covered much of the shield late in its history. The volcano is now extensively eroded, bearing large amphitheater valleys on its western slopes. Streams, most channelized into drainage canals, empty from the deeply incised valleys onto the low-lying and narrow coastal plain of emerged fossil limestone reef rock that formed about 125,000 years ago when sea level on Oʻahu was higher than present.

The project is located west of the Waiʻanae range on the western coastal plains of Oʻahu. Soils in this area, formed in alluvium, consist of well drained, fine textured and moderately fine textured, that are nearly level to moderately sloping. Beach widths at Mākaha can vary by 145 ft annually due to seasonal changes in wave energy. Fossil reefs separated by scattered sand-rich channels and scoured surge channels lie offshore just landward of a relatively extensive fringing reef.

Potential Effects and Proposed Mitigation

No long-term adverse impacts are anticipated to the area geology. Work at the terrestrial site would involve grading and excavation for the construction of the new CLS, BMH, support infrastructure, and landing of the SEA-US cable. Excavation of a boring pit with dimensions of approximately 8 to 10 ft deep by ±10 ft long by ±5 ft wide would be required to accommodate the HDD boring rig for the cable landing operations. HDD will be initiated from the boring pit and be guided underground to the off shore target location approximately 14 to 17 meters below msl.

Prevention of soil erosion would be included in the specifications for construction and erosion control employed during construction. Any excavated material would be disposed of at an approved waste facility in accordance with State and County regulations.

Potential Impacts of Alternatives

The proposed project and no alternative considered would affect the geology of the area.

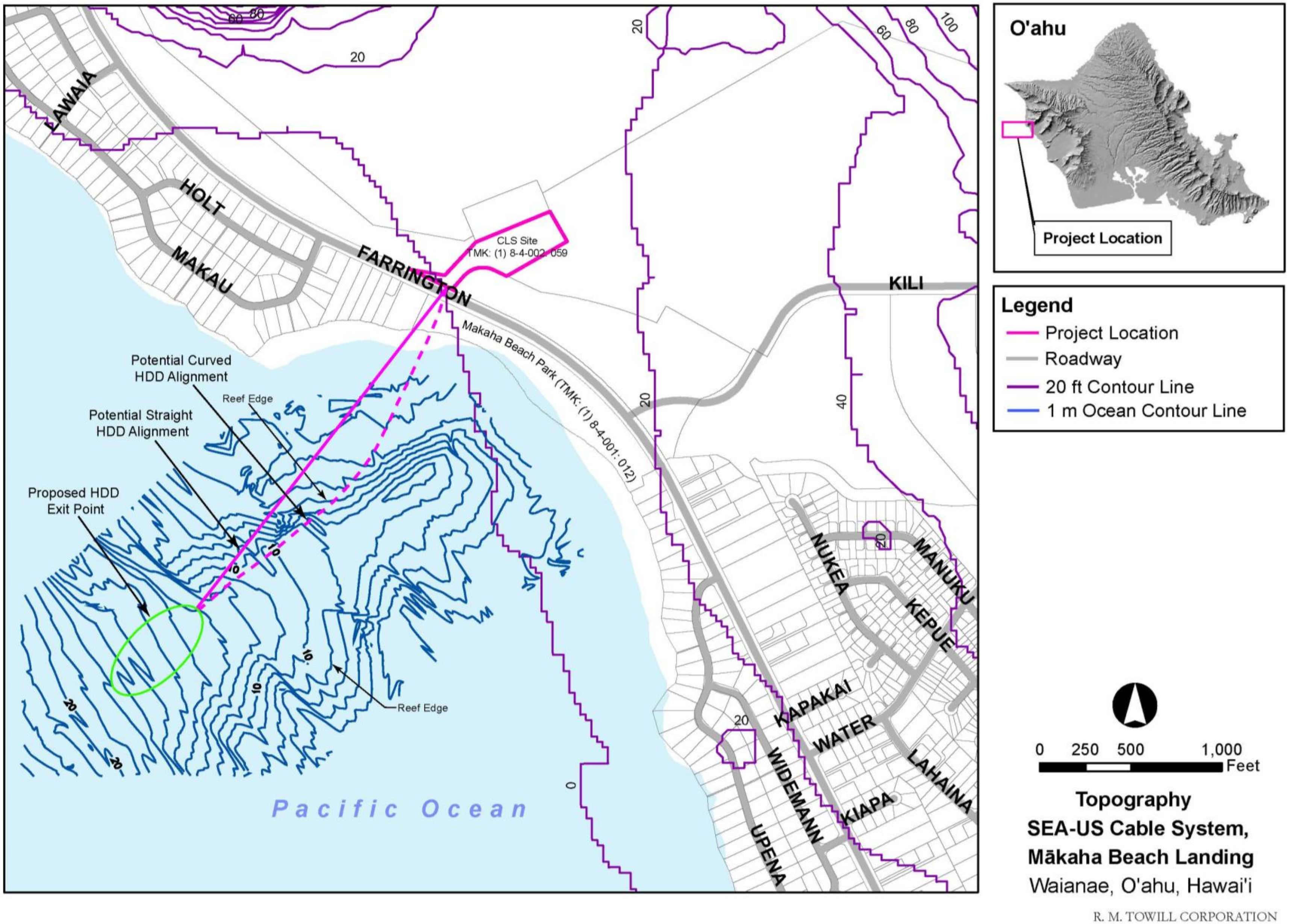
5.3 Topography

The proposed terrestrial landing site, designated as TMK: (1) 8-4-002: 059, mauka of Farrington Highway, is relatively flat in topography. The coastal plain in the vicinity of the project, including the Mākaha Beach Park area, consists of nearly level to gently sloping lands adjacent to the coast. Terrestrial elevations within the project area range from approximately 0 meters to 20meters m (0 ft to 66 ft) above msl. The proposed offshore cable route follows a sand channel before crossing mixed rocky and sandy seabed with well-developed coral mounds. The proposed landing site, approximately 14 to 17 meters below msl, is located within the sand channel fronting the Mākaha Beach. See **Figure 5-1**, **Topography**. Seabed sediments in the sand channel are predominantly composed of well-sorted fine to medium-grained sand. The sand in the sand channel is greater than 1 meter (3 ft) thick. This horizon layer overlies a sequence of dense to very dense sand, gravel, coral, and rock. Seaward of the proposed landing location, sand and uncolonized habitat dominates the seabed cable route. The sand channel present off shore of Mākaha Beach can be seen in aerial photographs.

Potential Effects and Proposed Mitigation

The proposed project would impact the topography of the area by changing the existing landscape through the introduction of new CLS, BMH, and support infrastructure, located at TMK: (1) 8-4-002: 059. The necessary construction of the BMH, CLS and infrastructure would involve excavation and fill in the immediate vicinity of the project thus modifying the existing terrain. HDD utilized to land the cable at the project site will be required for the landing and installation of the SEA-US cable at the project site and would affect a small area of the ocean bottom at the daylight location, approximately 14 to 17 meters below msl. No live corals will be cut or altered.

1 Figure 5-1, Topography

2 

During construction, Best Management Practices (BMPs) would be employed to minimize soil erosion and runoff that may impact the area's topography. Potential for impacts involving soils stability or erosion will be addressed by use of applicable State, Federal, and City and County of Honolulu guidelines governing development, including adherence to grading standards, erosion controls, and CWA regulations.

Upon completion of construction activity, all equipment no longer necessary to the site will be removed and the ground returned, as much as practicable, to existing preconstruction contours.

Potential Impacts of Alternatives

The No Action Alternative would not result in adverse changes to the topography.

The Build Action Alternative would require excavation, grading, and HDD for the installation of the SEA-US F/O cable system, CLS, BMH, and support infrastructure. No adverse effects to topography are anticipated based on adherence to grading standards, erosion controls, and CWA regulations.

5.4 Soils

The land type on which the project site is situated is characterized as the Lualualei-Fill land-Ewa Association. According to the U. S. Department of Agriculture, Soil Conservation Service (SCS) publication, "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, 1972" (USDA, 1972) this association consists of well-drained, fine textured and moderately fine textured soils on fans and in drainage ways on the southern and western coastal plains. Soils found in this association are nearly level to moderately sloping. This association makes up about 14 percent of the land area of Oahu (U.S. Department of Agriculture, Soil Conservation Service, August 1972).

There are two primary soil types for the project area (see **Figure 5-2**, **Soils**):

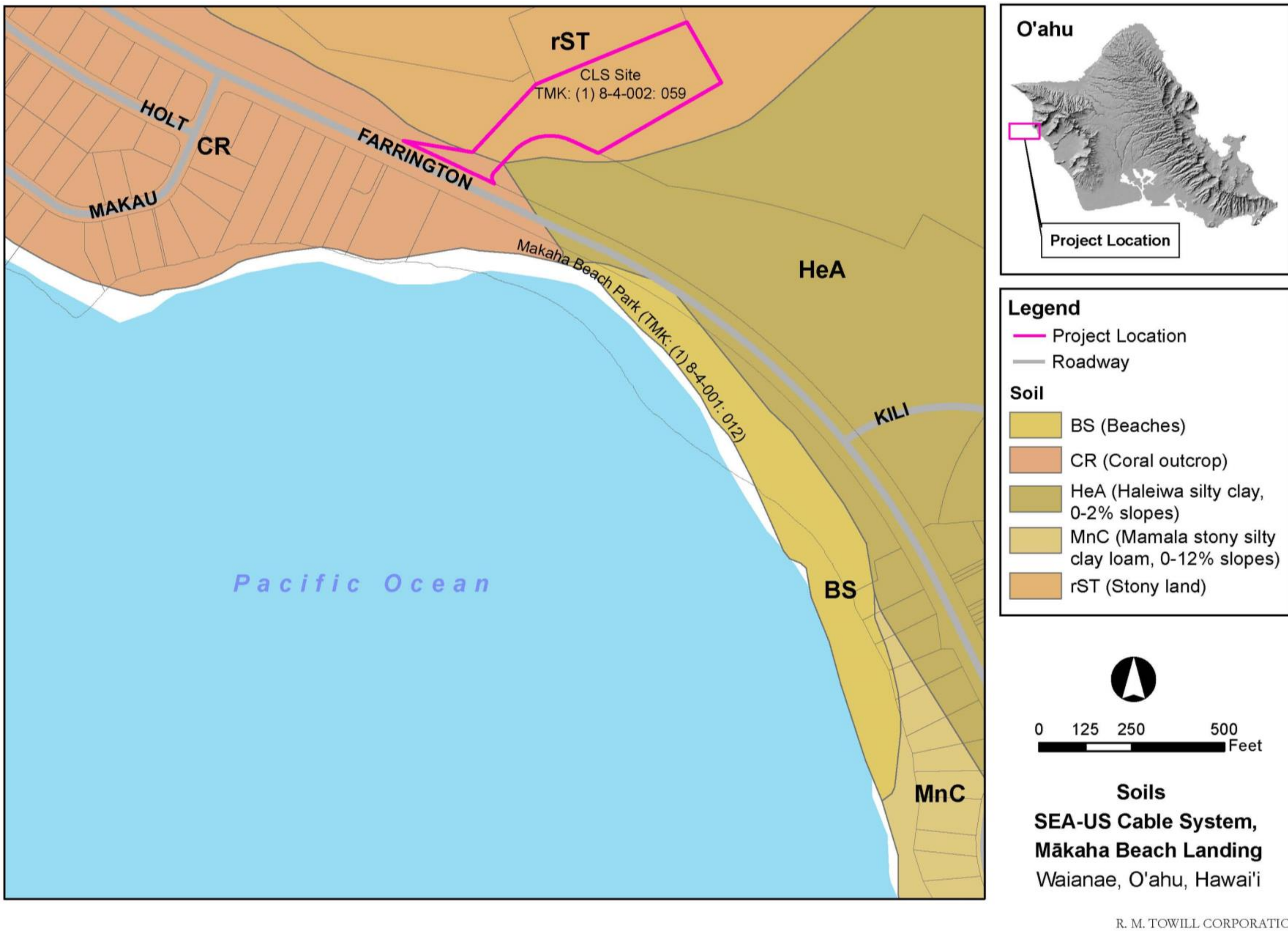
> Coral Outcrop (CR): Consists of coral or cemented calcareous sand. The coral reefs formed in shallow ocean water during the time the ocean stand was at a higher level. Small areas of coral outcrop are exposed on the ocean shore, on the coastal plains, and at the foot of the uplands. Elevations range from sea level to approximately 100 ft.

> Stony Land, 5-40% percent slopes (rST): Occurs in valleys and on side slopes drainage ways on the island of Oʻahu. It consists of a mass of boulders and stones deposited by water and gravity. Elevations range from nearly sea level to 500 ft. The soil among the stones consists of reddish silty clay loam that is similar to ʻEwa soils and very dark grayish-brown clay that is similar to Lualualei soils.

In addition to CR and rST, the following soil types are found southeast of the project site:

> Beach Sand (BS): Found along the shoreline at Mākaha Beach Park. Beaches occur as sandy, gravelly, or cobbly areas washed and rewashed by ocean waves, and consisting mainly of light-colored sands derived from coral and seashells. Beaches have no value for farming. Where accessible and free of cobblestones and stones, they are highly suitable for recreational uses and resort development.

Figure 5-2, Soils



Haleʻiwa Silty Clay, 0-2% percent slopes (HeA): Runoff is very slow, and the erosion hazard is slight. This soil is found on alluvial fans or as long, narrow areas in drainage ways. This soil type generally consists of dark-brown silty clay about 17 inches thick. Permeability is moderate.

Potential Effects and Proposed Mitigation

No significant effects to soils are expected to result from this project. Work at the site will involve construction of the CLS, BMH, and support infrastructure and HDD work for the landing of the SEA-US cable on a portion of the terrestrial project site. Erosion control measures will be employed during construction, and potential for impacts involving soils stability or erosion addressed by use of applicable State, Federal, and CCH guidelines governing development. Upon completion of the construction activity, all equipment no longer necessary to the site will be removed and the ground returned, as much as practicable, to existing preconstruction contours.

Potential Impacts of Alternatives

The No Action Alternative would not result in impacts to soils.

No significant impacts to soils are expected to result from this project or any project alternative.

5.5 Groundwater

An important source of groundwater supply for the Island of Oʻahu is an exceptional lens of basal groundwater in the Honolulu-Pearl Harbor area (USDA, 1972). Southern Oʻahu's coastal plain is underlain by sedimentary deposits that form a caprock which retards the seaward movement of fresh groundwater from the basal aquifer. The caprock extends along the coastline from 800 to 900 ft below sea level.

Oʻahu has been divided into seven major groundwater areas, primarily on the basis of geologic or hydrologic differences (see **Figure 5-3**, **Oʻahu Groundwater**). The entire project area is located within the designated Waiʻanae rift zone groundwater area. The area is characterized by a dike-impounded system, where regional ground-water movement is from areas of dike-impounded water at high altitudes, approximately 1,600 ft above sea level, to downgradient ground-water areas or directly to the ocean. Mean annual predevelopment recharge to the area was about 52 million gallons per day from infiltration of rainfall. Discharge is primarily as ground-water outflow to downgradient ground-water areas and to the ocean (USGS, 1999).

The geology of the project area is composed of a thick layer of alluvium interspersed with layers of fractured basalt (Yogi-Kwong Engineers LLC, 2015). Groundwater for the area is basal in sediments and is not a source for domestic use (Atlas of Hawaiʻi, 1998). A hydrogeological investigation of the project area is currently underway to document the specific soils and non-potable ground water conditions of the project site for environmental disclosure purposes. The results will be included in the Final Environmental Assessment (FEA).

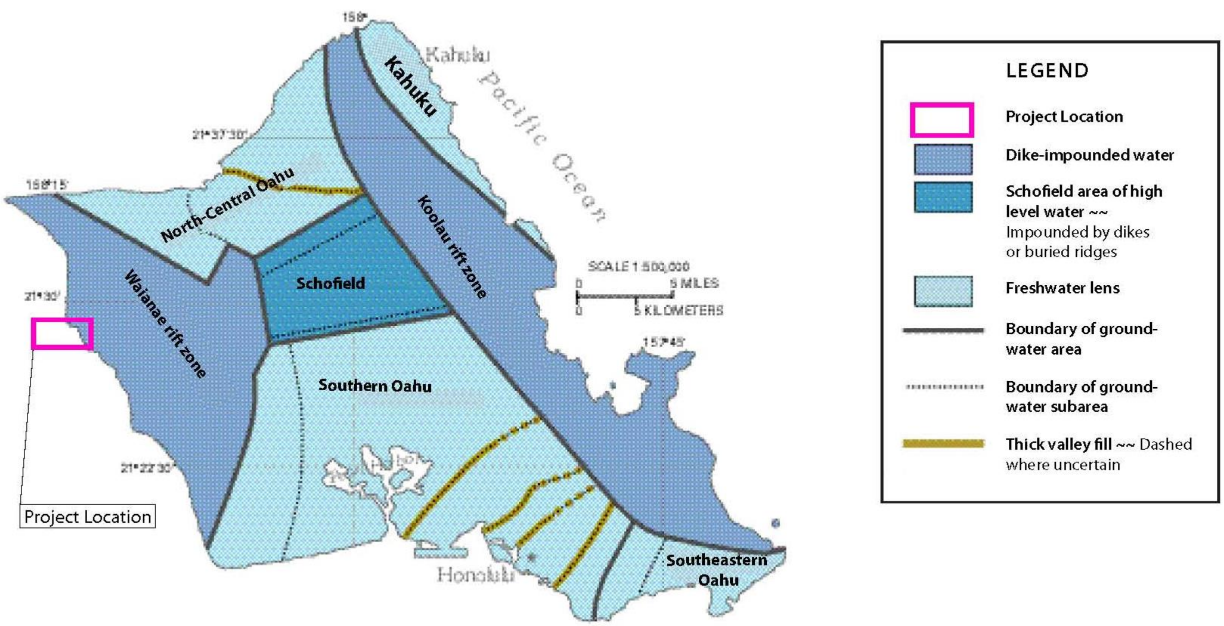
Potential Effects and Proposed Mitigation

No adverse effects to groundwater or hydrogeological resources are anticipated. Appropriate mitigative measures and controls would be applied consistent with sound engineering and operating practices for the protection of groundwater.

Potential Impacts of Alternatives

No significant impacts to groundwater or hydrogeological resources are expected to result from this project or any project alternative.

Figure 5-3, Oʻahu Groundwater



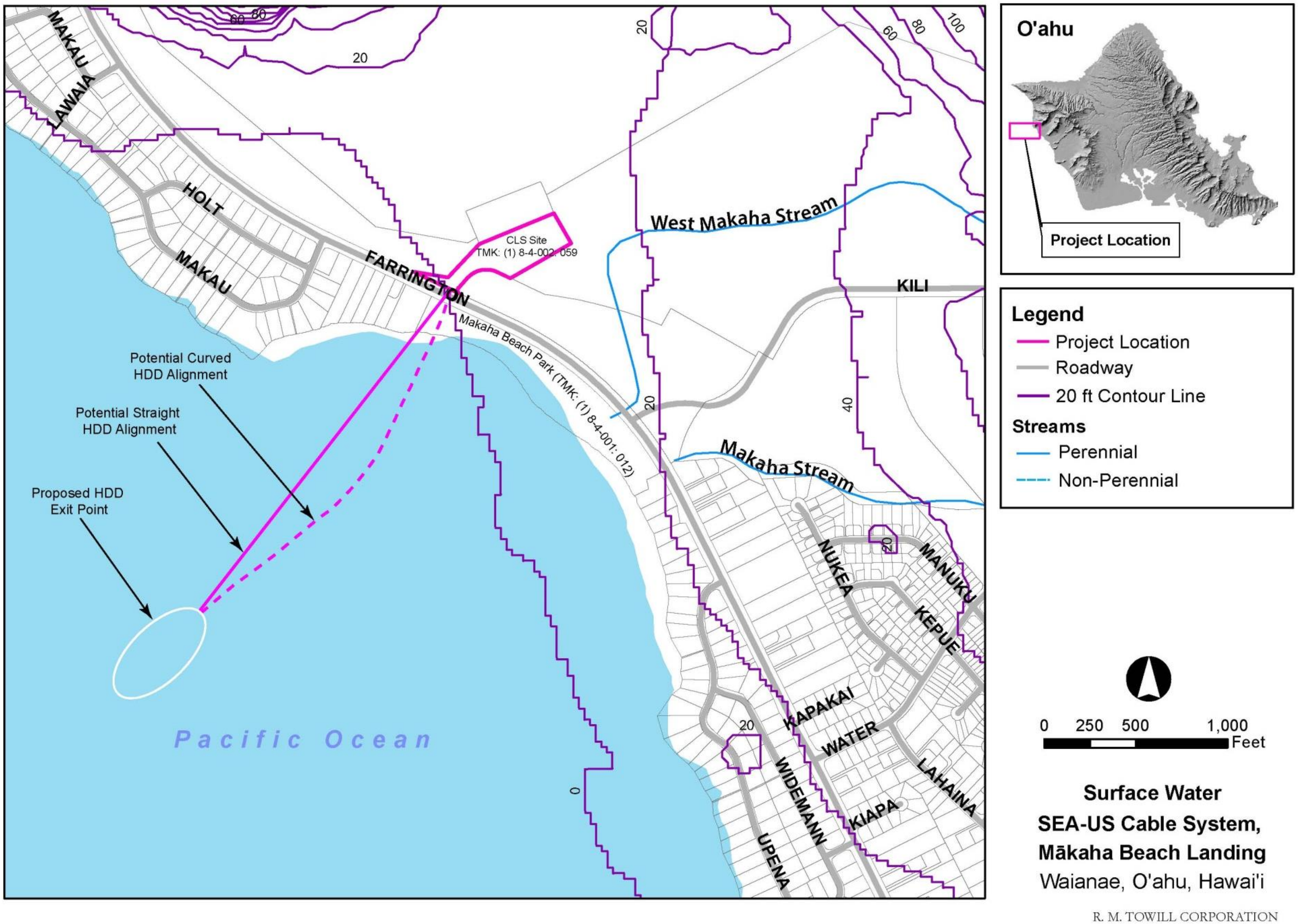
Source: USGS, 1999

5.6 Surface Water

Waters of the Pacific Ocean offshore of the Mākaha Beach and the site of the SEA-US cable landing operations are in the Class A category as defined by the DOH. According to DOH administrative rules, marine waters are categorized as Class AA and Class A. Class AA waters are to “remain in their natural pristine state as nearly as possible.” Class A waters can be used for “recreational use and aesthetic enjoyment,” among other allowable uses compatible with protecting the natural resources in these waters (Hawai’i Administrative Rules Chapter 11-54, Water Quality Standards).

No other surface water bodies or streams exist in the immediate project area. See **Figure 5-4**, **Surface Waters**.

Figure 5-4, Surface Water



The nearest streams to the project site, the West Mākaha Stream and Mākaha Stream, are approximately 280 and 1,320 ft southeast of the proposed CLS site. Mākaha Stream (also known as South Mākaha Stream; State Perennial Stream ID No. 3-5-07) is an intermittent stream that originates on the western slope of the Wai'anae mountain range deep in Mākaha Valley. The upper reaches of the central tributary is the only section of the stream that regularly flows. Mākaha Stream, crosses under Bridge No. 3 on Farrington Highway terminating behind the sand berm at Mākaha Beach Park. West Mākaha Stream (also known as North Mākaha Stream) begins at the south slope of Puʻukeaʻau and ultimately flows under Bridge No. 3A. This relatively short intermittent stream terminates in a muliwai (a coastal estuarine pond) that is approximately 30 meters (100 ft) long.

Neither stream has a permanent surface connection to the ocean. On the makai side of Farrington Highway, the two streambeds connect to each other, though a sand berm at Mākaha Beach Park normally blocks runoff flows from the ocean. Water flows in the Mākaha streambed occur only after heavy rains and rarely breaks through the sand berm to enter directly into the ocean.

Potential Effects and Proposed Mitigation

No adverse effects to surface water resources are anticipated. Project activities potentially affecting water quality are limited to the installation phase when there is the potential for increased turbidity from sediments disturbed in the nearshore cable landing location. Work activities with potential for adverse impacts to water quality will primarily involve operation of the HDD drill bit at the submerged, daylight ocean end; and, cable laying activities to install the F/O cable into the submerged drill pipe. The cable does not contain materials that would be harmful to water quality and will have no effect on water quality.

Work proposed within the Pacific Ocean, off the coast of Mākaha Beach is anticipated to require the filing of a Department of the Army permit. All work in the Pacific Ocean and potential mitigation, will be coordinated with the USACE, Honolulu Branch (see **Section 8.2**). All work within state waters will be coordinated with the DOH, CWB to identify requirements pertaining to their jurisdiction under Section 401, WQC (see **Section 8.3**).

HDD Bore and Drill Pipe Installation

The HDD operation will involve use of a lubricant such as bentonite, a naturally occurring clay, to facilitate passage of the drill bit through the substratum. The directional boring contractor will be directed to prevent and avoid lubricant discharges at the ocean end. Precautions to mitigate the potential for releases will include:

- As the directional drill bit approaches the submerged target site (approximately ±100 LF prior to daylighting) the drill bit speed will be reduced to the minimum necessary. The use of lubricant to the drill head will also be stopped to avoid any releases as the drill bit emerges or "daylights" at the ocean bottom;
- The location where the drill bit will daylight generally consists of hard bottom substrate covered by a sand channel approximately one to three meters in thickness. As the drill bit emerges from the sand covered hard substrate, the blanketing effect of the sand, shutoff of lubricant, and

shutdown of the rotating drill head, will all help to prevent and control the release of any sediments and turbidity; and

- As required, support boats will be used to observe and supervise all operations involving in-water work.

During drilling operations drill pipe will be advanced through the bored hole along with the drill bit. Once the drill bit and attached drill pipe clears the submerged hole, the drill bit will be removed and the drill apparatus and pilot line will be pulled back through the drill pipe. The remaining drill pipe will be capped at the ocean end until the day of the cable pull.

Cable Laying Activities

Cable laying activities will primarily involve laying the cable on the seabed along a predetermined route, installation of the F/O cable into the drill pipe serving as conduit at the ocean bottom, and connection to the terrestrial CLS. No further excavation, trenching, or turbidity generating activities are therefore planned which would result in potential for adverse impacts to water quality.

During the installation of the F/O cable, articulated split pipe may be placed around the cable from the submerged landing site to deeper ocean waters for additional protection. Portions of the split pipe are planned to be secured with the use of mechanically driven bolts into the ocean substrate (rock bottom). This activity is not expected to result in release or generation of additional sediments into the water column. This operation has been applied to previous submarine F/O cable projects, and is similarly not expected to result in potential for adverse impacts to water quality.

Potential for adverse impacts to surface water from construction activities associated with this project will be addressed through the following additional proposed measures and practices:

- Construction will be regulated through adherence to the Department of the Army and NPDES permit conditions (see **Section 8.2** and **Section 8.3**).
- BMPs will be employed to prevent soil loss and sediment discharges from the work site. Project activities and operation of the system following project completion will comply with DOH regulations as set forth in HAR, Title 11 Chapter 54 - WQS, and Chapter 55 - Water Pollution Control.
- Discharge pollution prevention measures will be employed in all phases of the project. Control measures will be in place and functional before construction activities begin, and will be maintained throughout the construction period. A site-specific plan to prevent runoff and discharges of other pollutants into State waters, including removal procedures for the construction site BMPs will be prepared by the construction contractor as part of the project construction plan.
- The BMPs will include guidelines and mitigation measures to prevent runoff, discharge pollution, and other detrimental impacts related to construction activities. In addition, BMPs will include contingency plans to respond to heavy rainfall conditions.

- The project contractor will select locations for stockpiling construction material. Stockpile sites will be identified in the site-specific BMPs and construction plans. A sediment retention berm and/or silt fence will be installed around the down-slope side of stockpile sites to retain sediment discharges during heavy rainfall.
- The contractor, based on professional experience and site conditions, may modify the proposed BMP mitigation measures as necessary to account for unanticipated or site specific conditions.

Potential Impacts of Alternatives

All Build Action Alternatives would require work within the Pacific Ocean due to installation of the F/O cable and use of HDD to land the F/O cable at the Mākaha Beach BMH site. Work proposed within the Pacific Ocean is anticipated to require the filing of a Department of the Army permit, Section 401, WQC, and CDUP. The potential for adverse impacts to the surface waters of the Pacific Ocean will be addressed through adherence to all USACE, DLNR, DOH, and CCH regulatory requirements (see **Section 8.2**, **Section 8.3**, and **Section 8.7**).

5.7 Drainage

There are no perennial streams in the project area. The major drainage features in the project vicinity are within the Mākaha Valley, located on the leeward (west) side of the island of Oʻahu. The Mākaha Valley is approximately 5,914 acres in area and is comprised of two main watersheds, Mākaha and Kamaileʻunu. The Mākaha watershed covers about 4,659 acres—more than three-fourths of the valley—and drains into Mākaha Stream and West Mākaha Stream. A smaller drainage basin, about 1,255 acres in size, drains into Eku Stream (East Mākaha Stream). Mākaha Stream and Eku Stream are the two main streams in the valley, with Mākaha as the primary stream. Mākaha Stream originates in the western slopes of the Waiʻanae mountain range and is fed by water that falls from Mount Kaʻala. The stream flows year-round in its upper reaches and intermittently at lower elevations. Eku Stream originates approximately 9,000 ft mauka (mountainside) of Farrington Highway on the eastern side of the valley from Kamaileʻunu Ridge and flows though the Mākaha East Golf Course (DLNR, 2014a).

Potential Effects and Proposed Mitigation

No adverse impacts are anticipated to surface water or groundwater since the project will not significantly alter existing surface or groundwater drainage patterns, nor have any adverse long tem water requirements. In accordance with State and CCH regulations governing construction, grading, drainage and erosion control, plans shall be submitted to the State and CCH for review and approval prior to construction.

Short-Term Effects and Mitigation

Drainage effects related to construction activities would be of short duration and would cease upon completion of the project. All work proposed would adhere to USACE, DLNR, DOH, and CCH regulatory requirements.

During construction, work activities will be in compliance with HARs 11-54 WQS and 11-55 Water Pollution Control, and all Department of the Army permit requirements. Construction will be subject to a NPDES NOI Form C for Discharges of Storm Water Associated with Construction Activities from the DOH, CWB. Receiving State water classification is Class A marine waters. The NPDES permit requires implementation of BMPs, including site management measures and structural controls (e.g. diversion berms, silt fences, detention ponds) to reduce pollutants in construction storm water runoff from discharging to waters of the state (see **Section 8.2** and **Section 8.3**).

General BMPs for construction activities will include the following:

Construction near storm water drainage conveyances or facilities such as drain inlets or channels will be minimized to avoid the potential for the release of sediments into storm water runoff. Where project activities near such facilities cannot be avoided appropriate mitigative methods, measures or practices shall be implemented, e.g., the use of sock filters, geotextile filter fabric, or berms to direct the flow of water, or the cessation of ground disturbing work during periods of inclement weather. See also discussion below.

Before Construction

Existing ground cover will not be destroyed, removed or disturbed more than 20 calendar days prior to the start of construction.

Erosion and sediment control measures will be in place and functional before earthwork may begin, and will be maintained throughout the construction period. Temporary measures may be removed at the beginning of the work day, but will be replaced at the end of the work day.

During Construction

Clearing will be held to the minimum necessary for grading, equipment operation, and site work, and construction will be sequenced to minimize the exposure time of cleared surface areas. Areas of one phase will be stabilized before another phase may be started. Stabilization will be accomplished by protecting areas of disturbed soils from rainfall and runoff by use of structural controls such as PVC sheets, geotextile filter fabric, berms or sediment basins, or vegetative controls such as grass seedling or hydromulch.

Temporary soil stabilization with appropriate vegetation will be applied on areas that remain unfinished for more than 30 calendar days, and permanent soil stabilization using vegetative controls will be applied as soon as practicable after final grading.

All control measures will be checked and repaired as necessary, e.g., weekly in dry periods and within 24 hours after any heavy rainfall event. During periods of prolonged rainfall, control measures will be monitored daily.

During Adverse Weather Conditions

The contractor will monitor weather reports daily while conducting work. If an emergency weather warning resulting in heavy rainfall is issued, work will cease. All equipment and materials will be secured against wind, rainfall and flooding, and the work area cleared of construction debris to the extent practicable. Work will not resume until conditions improve and weather warnings are rescinded.

Prior to recommencement of work activities following a rainfall event, the contractor will inspect all BMPs, including silt fences, sandbag barriers, and the stabilized construction entrance, to ensure that they are not damaged, and that all BMPs are properly installed and functioning.

Any construction materials and debris dispersed by wind or rainfall will be collected by the contractor and reused or disposed of in compliance with State and County regulations.

Following Construction

All areas of ground disturbance will be stabilized with appropriate materials including the use of vegetative ground cover.

Potential Impacts of Alternatives

The potential for adverse impacts to drainage features will be addressed through adherence to all USACE, DLNR, DOH, and CCH regulatory requirements. No significant long-term impacts to drainage are expected to result from this project or any project alternative.

5.8 Natural Hazards (Floods, Seismic Hazard, Tsunamis, Hurricanes and High Winds)

Floods

The terrestrial project area (parcel and surrounding area) is characterized by the Federal Emergency Management Agency, Digital Flood Insurance Rate Map (FEMA-FIRM) as the following categories:

Zone AE:	Flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by detailed methods.
Zone D:	Flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined but possible.
Zone VE:	Flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves.
Zone X (2 % Chance):	0.2 % Annual Chance Flood Zone is the flood insurance rate zone that corresponds to the areas of 500-year flooding.
Zone X:	Area determined to be outside of the 0.2% annual chance floodplain.

The project site is primarily located within FEMA-FIRM Zone X. This is reflected in FEMA-FIRM map 15003C0177H (HI-NFIP, 2011). See also **Figure 5-5**, **Flood Zones**.

Seismic Hazard

Earthquakes occurring in Hawaiʻi are closely linked to volcanic activity. Numerous earthquakes take place every year, with the majority occurring beneath the island of Hawaiʻi. **Figure 5-6**, **State of Hawaiʻi Seismicity**, illustrates the estimated risk of earthquakes using the measure of ground motion hazard as measured by peak ground acceleration. The color scale shows Oʻahu with reduced risk and the Island of Hawaiʻi with highly increased hazard on its south flank (USGS, 2007).

Structures (buildings) associated with the Build Action Alternative will comply with the Uniform Building Code (UBC), which provides minimum design criteria to address potential for damage due to seismic disturbances. The UBC seismic provisions contain six seismic zones, ranging from 0 (no chance of severe ground shaking) to 4 (10% chance of severe shanking in a 50-year interval). Currently, Oʻahu lies within the UBC seismic risk zone 2A (USGS, 1997).

Tsunamis

Tsunamis are seismic sea waves caused by earthquakes, submarine landslides, and, infrequently, by eruptions of island volcanoes. During a major earthquake, the seafloor can move by several meters and an enormous amount of water is set into motion. The result is a series of waves that move across the ocean at speeds greater than 800 km (497 miles) per hour. In the Hawaiian Islands, both a prehistoric and historic record of locally-generated tsunamis exist. Historic local tsunamis were produced in 1886 and 1975 by large earthquakes that occurred under the island of Hawaiʻi. The earthquakes that produced these tsunamis had magnitudes of 7.2 or greater and were the result of tectonic movement of the island. The proposed CLS site is located outside of the tsunami evacuation zone, as designated by the Department of Permitting and Planning, CCH Oahu tsunami evacuation zone map 15. The CCH have added an Extreme Tsunami Evacuation Zone, or XTEZ, for which in the unlikely event of an extreme tsunami, waves may move significantly inland. The CLS site is located in the XTEZ. (CCH, DPP, 2010).

Figure 5-5, Flood Zones

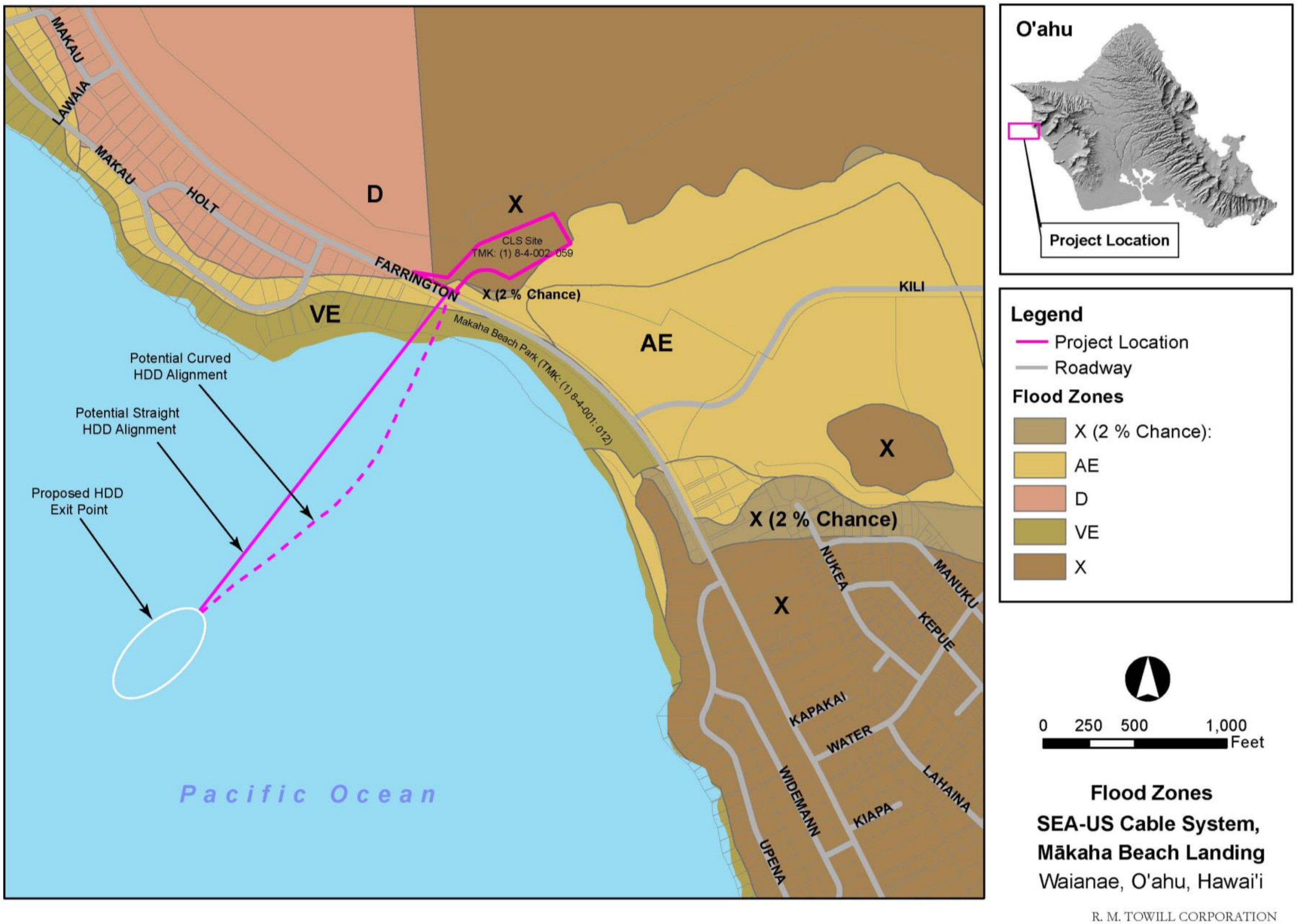
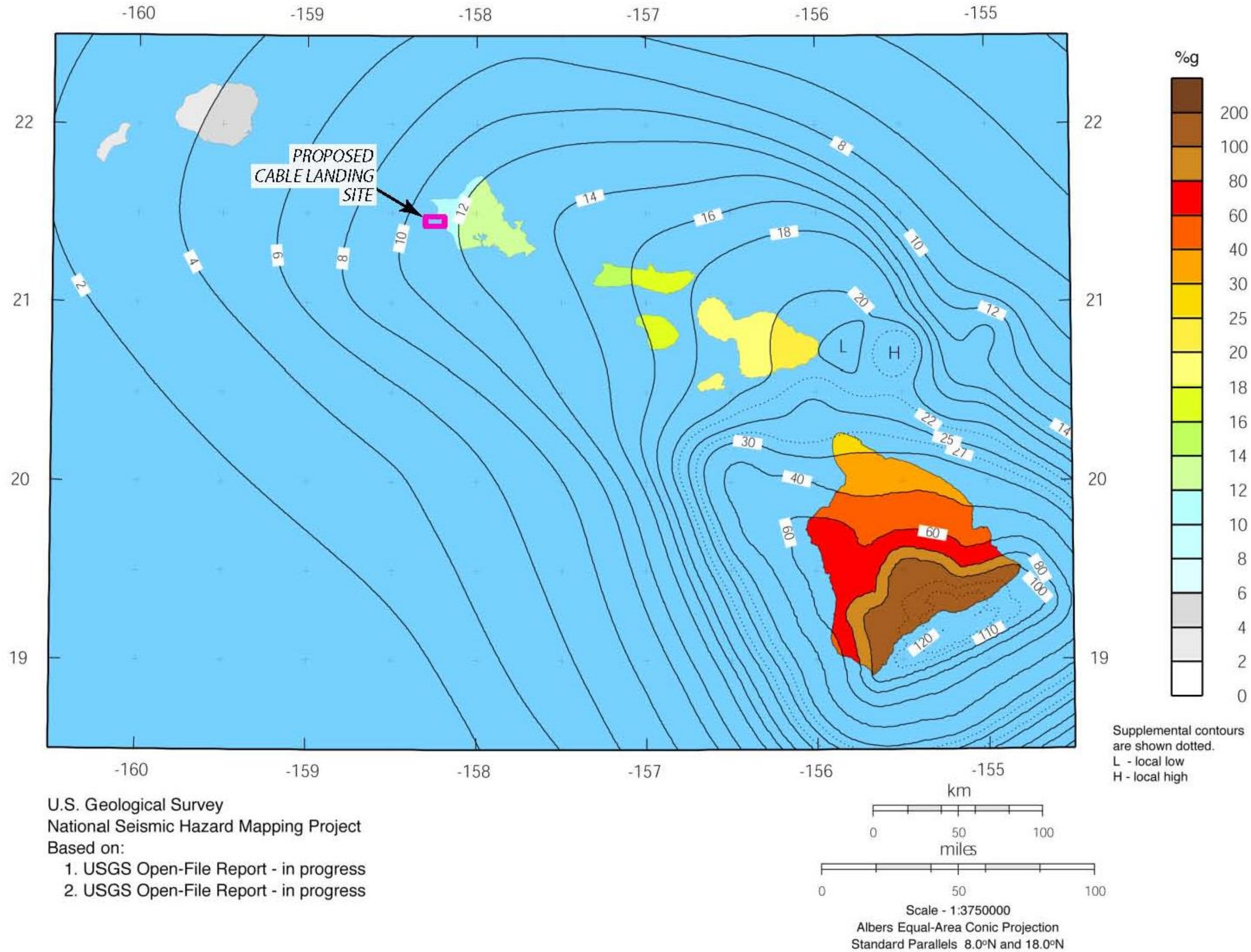


Figure 5-6, State of Hawaiʻi Seismicity



Hurricanes and High Winds

Heavy rains and strong winds associated with tropical storms occasionally impact the Hawaiian Islands and can cause flooding and major erosion. Hurricanes occasionally approach the Hawaiian Islands, but rarely reach the islands with hurricane force wind speeds. The most recent hurricane events included Iniki in 1992 which mainly affected the Island of Kauaʽi, and Iselle in 2014 which mainly affected the Island of Hawaiʻi.

Hurricanes are more prone to affect the Hawaiian Islands from the late summer to early winter months. During hurricanes and storm conditions high winds cause strong uplifting forces on structures, particularly roofs. Wind-driven materials and debris can attain high velocity, causing devastating property damage and harm to life and limb. It is difficult to predict when these natural occurrences may occur, but it is reasonable to expect that future events will occur. The project area is, however, no more or less vulnerable than the rest of Oʻahu to the destructive winds and torrential rains associated with hurricanes.

Potential Effects and Proposed Mitigation

Floods – The proposed project would not alter the existing drainage of the area. The risk of erosion during and following construction would be addressed through adherence to appropriate State and CCH guidelines and standards for the construction of telecommunication facilities.

Seismic Hazard – All building structures associated with the proposed project will be compliant with current seismic parameters. All structures proposed for this project, would be built, at a minimum, according to standards for UBC Seismic Zone 2A.

Tsunami – The project site is located outside of the tsunami evacuation zone. All structures associated with the proposed project, and risk of erosion during and following construction would be addressed through adherence to appropriate State and CCH guidelines and standards. In the unlikely event of an extreme tsunami, the potential for damage exists. However, in as much as the facility will be unmanned, the potential for severe risk to life and limb at the facility will be addressed though the absence of personnel.

Hurricanes and High Winds – To mitigate for potential effects of hurricanes the projects associated building structures would be designed to meet or exceed minimum State and CCH requirements.

Potential Impacts of Alternatives

No alternative considered is anticipated to adversely effect, or be adversely affected by natural hazards.

5.9 Scenic and Aesthetic Environment

The general vicinity of the project site includes the Mākaha Beach Park (TMK: (1) 8-4-001: 012), the Waiʻanae Mountains, single and multifamily housing, agricultural lands, and the Mākaha Resort Golf Course.

The Waiʻanae Sustainable Communities Plan (WSCP) notes that views of open spaces, shorelands, valleys, and the Waiʻanae Mountains should be protected. Mākaha Beach is a famous surfing beach that many Waiʻanae residents consider an important community asset. According to the WSCP, the Coastal View Study commissioned by the City Department of Land Utilization and published in 1987 identified the view from Mākaha Beach Park as a "Significant Stationary View" (CCH, DPP, 2012).

Potential Effects and Proposed Mitigation

During construction involving installation of support infrastructure and the F/O cable, there will be a temporary impact on coastal views due to the presence of construction equipment, and a cable ship and smaller support vessels in the water. There will be a temporary impact on views mauka of Farrington Highway due to use of a HDD boring rig. However, the rig will be partially obscured from view since it will be situated within a boring pit approximately 8 to 10 ft below grade, within the project site. Once construction is completed, all equipment no longer necessary to the site will be removed with no further disturbance to the scenic resources of the area.

Infrastructure necessary for the project will either be buried or, in the case of the access road and BMH will be at or near grade. The proposed F/O cable, similarly, is not expected to result in potential for adverse visual impacts. The cable will be buried and therefore, will not constitute a potential source of impact.

The project architect has addressed potential for visual impacts associated with construction of the CLS. The CLS, located mauka and above Farrington Highway, will be partially visible to motorists. Existing vegetation and new landscaping will be used to enhance views of the access road and building. The CLS will be an approximately ±15 ft tall, 1,500 sf modular or typical concrete structure and colored to be consistent with the earth tones of the surrounding site.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on the scenic or aesthetic environment.

5.10 Air Quality

The State of Hawaiʻi currently meets the National Ambient Air Quality Standards established by the Environmental Protection Agency (EPA) to protect human health and welfare. In addition, the State complies with its own set of ambient air quality standards, which are more stringent than are applied by the EPA. Air quality is generally excellent in the project area. Air pollution is mainly derived from volcanic emissions produced on the Big Island of Hawaiʻi consisting of sulfur dioxide which converts into particulate sulfate and produces a volcanic haze (vog) that occasionally blankets parts of the island. Prevailing northeasterly tradewinds keep the project area relatively free of vog for most of the year.

Air quality in the project corridor is generally good. Although information on other pollution sources was not generally available from the DOH for the proposed project site, the DOH in its assessment of statewide air quality has noted, "At most times and in most places in Hawaiʻi, we enjoy some of the best air quality in the nation" (DOH, 2012).

Potential Effects and Proposed Mitigation

Short Term Impacts

During construction, potential pollutants that may affect air quality at the project site include:

- Vehicular traffic traveling to and from the project area (additional sources of CO and CO_2);
- Fugitive dust emissions from excavation and construction;
- Soil and small amounts of concrete/asphalt removal or placement (particulate matter); and
- Removal of sediment (possible odor issues are not anticipated as the sediment is from an aerobic environment).

Because conditions in the project area attain air quality standards, vehicles used during construction activities represent a minor increase in the number of vehicles traversing the area daily. Additionally, the prevailing tradewinds rapidly carry pollutants offshore limiting the effect on receptors.

State air pollution control regulations require that there be no visible fugitive dust emissions at the construction site boundary. Therefore, an effective dust control plan will be implemented by the project contractor to ensure compliance with HAR, Chapter 11-59 and 11-60. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering open-bodied trucks. Dust control measures will include, but not be limited to, the following:

- Planning phases of construction to minimize dust generating activities;
- Minimizing the use of dust generating materials and centralizing material transfer points and on-site vehicle travel ways;
- Locating dusty equipment in areas of least impact;
- Providing an adequate water source at the site for dust control prior to start-up of construction activities;
- Grassing bare areas, including slopes, starting from the initial construction phase which may result in disturbed soils;
- Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction; and
- Mitigating construction-related exhaust emissions by ensuring that project contractors properly maintain their internal combustion engines and comply with HAR, Chapters 11-59 and 11-60, regarding Air Pollution Control.

Long Term Impacts

No long-term negative consequences related to air quality are expected to result from the proposed project. Upon the completion of construction activities all equipment, machinery and personnel no longer necessary for the project will be demobilized and removed from the job site.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on air quality.

5.11 Water Quality

A water quality survey to assess the level of impairment and possible project effects on the aquatic environment, was conducted by AECOS, Inc., and is entitled *Marine Biological and Water Quality Surveys off Mākaha Beach, Waiʻanae, Oʻahu* (AECOS, 2015a). See **Appendix A**.

Waters offshore of Mākaha Beach are designated Class A, open coastal marine waters in the State of Hawaiʻi WQS (DOH, 2014a). Class A marine waters are not to receive discharges that have not received the highest degree of treatment or control compatible with the criteria established for this class. No new industrial discharges are permitted within open coastal marine waters, with the exception of storm water discharges associated with industrial activities and discharges covered by a NPDES permit, approved by the U. S. EPA and issued by the DOH.

Mākaha Beach is currently listed on the state 2014 Final List of Impaired Waters in Hawaiʻi as impaired for nitrate+nitrite, ammonia, turbidity and chlorophyll α (DOH, 2014b). It is also listed as a "Category 5" water body due to impairments, meaning that a Total Maximum Daily Load (TMDL) assessment is needed. Mākaha Beach has been assigned a TMDL priority code of "low". This list was prepared under the Clean Water Act as a §303(d) Listed Watershed, which identifies "waters which will not attain applicable water quality standards with technology-based controls alone (e.g., water quality limited)."

State water quality criteria for open coastal waters incorporate "wet" and "dry" criteria values based on average percent of freshwater inflow: "dry" criteria apply when the open coastal waters receive less than three million gallons per day of fresh water discharge per shoreline mile. Offshore of Mākaha Beach, dry criteria apply based on an absence of perennial stream discharges to the area. Survey salinity results showed no significant dilution (<1%) from oceanic salinity (35.2 PSU; SOEST, 1996) (AECOS, 2015a).

The criteria for temperature, salinity and pH are based on "deviations from ambient conditions"; i.e., pertain essentially to discharges that might cause deviations. The results from the water quality survey would be regarded as measurements of ambient conditions. For certain (mostly physical) parameters (temperature, salinity, dissolved oxygen [DO] saturation and pH), results can be assessed with regard to the state criteria. However, the limited amount of data from samples collected are insufficient to set baseline values for determine compliance with Hawaii WQS in the project area because state criteria for nutrient measurements, turbidity, and chlorophyll α are based upon geometric mean values and a minimum of three separate events per sampling location would be needed to computer a geometric mean (AECOS, 2015a).

Water samples were collected on October 8, 2015 from three locations within the proposed project area. DO, temperature, and pH were measured field meters. Salinity, chlorophyll α, turbidity, TSS, ammonia, nitrate+nitrite, total nitrogen, and total phosphorus were measured in water samples collected in appropriate containers and taken to the AECOS laboratory for analysis (AECOS, Inc.

Laboratory Log No. 31423) (AECOS, 2015a). The results of the water quality sampling are provided in **Table 5-1, Water Quality Results at Mākaha Beach**.

Table 5-1, Water Quality Results at Mākaha Beach

Station	**Time**	**Depth** (ft)	**Temp** (°C)	**Salinity** (PSU)	**DO sat.** (%)	**pH**	**Turbidity** (NTU)
Station 1	1047	1	27.6	35.05	97	8.16	0.22
	1021	27	27.8	35.11	107	8.13	0.22
	1020	54	27.7	35.26	112	8.14	0.26
Station 2	1214	1	27.7	35.26	100	8.03	0.13
	1210	16	27.9	35.12	106	8.05	0.24
	1210	34	27.8	35.13	113	8.02	0.23
Station 3	1430	1	28.1	35.10	95	8.13	0.63

Station	**Depth** (ft)	**TSS** (mg/L)	**NH_3** (µgN/L)	**NO_3+NO_2** (µgN/L)	**Total N** (µgN/L)	**Total P** (µgP/L)	**Chl. α** (µg/L)
Station 1	1	2.4	5	<1	79	11	0.08
	27	2.4	6	1	78	16	0.09
	54	5.4	5	1	84	38	0.13
	1	3.7	5	<1	72	8	0.03
	16	3.3	5	<1	93	8	0.05
	34	3.1	5	<1	85	15	0.10
	1	5.9	8	1	49	6	0.22

Temperature, salinity, DO saturation and pH were in conformance with state standards. The values recorded for turbidity, chlorophyll α, all nutrient moieties (with the exception of ammonia) were characteristic of open coastal waters. There is no criterion for total suspended solids (TSS) in open coastal waters, but this parameter is usually measured when project activities may result in sediment disturbances.

Potential Effects and Proposed Mitigation

See **Section 5.6** for mitigation proposed during HDD operations, drill pipe installation, and cable laying activities. Additional mitigation measures to ensure protection of water quality will be provided through the conditions imposed as part of the water quality associated environmental permit applications that will be filed for this project. The detailed mitigation measures that will be prepared for these permits will be developed during the permitting process that will follow the completion of the subject HRS, Chapter 343, Environmental Assessment. These permit applications include:

- Department of the Army Permit Application, Section 404, CWA and Section 10, RHA of 1899, USACE. This permit application will govern work activities in the water and require review and approval of mitigation measures to address environmental and water quality concerns.
- Section 401 WQC, DOH. This permit application will govern the water quality of discharges associated with construction of the project.

- CZM FEDCON, Hawaiʻi Office of Planning. This application will govern the review of the project in relation to the State of Hawaiʻi coastal zone management law as promulgated in HRS, Chapter 205A. The major concerns will involve the protection, preservation, and/or appropriate management of Hawaiʻi's coastal resources.
- CDUP Application, DLNR. This application will govern the use of land within the State's Conservation District, defined for this project, as all work within the submerged coastal waters.
- NPDES, NOI Form C, Construction Stormwater Permit Application, DOH. This application will govern the generation and management of stormwater associated with the construction of the project. A construction Storm Water Pollution Prevention Plan will be prepared as part of the permit application.

All project activities with the potential for impacts to water quality will be addressed in accordance with regulatory standards. It is therefore anticipated that based on the application of the mitigation measures described above and the additional measures that would be implemented during the environmental permitting process, that any potential for adverse environmental impacts to water quality will be sufficiently mitigated or reduced to ensure adherence to state water quality standards.

Potential Impacts of Alternatives

No significant impacts to water quality resources are expected to result from this project or any project alternative.

5.12 Noise (24 CFR Part 51B)

The project area for noise effects is located in Waiʻanae and is subject to regulation of project activities under HAR, Chapter 11-46, "Community Noise Control" which defines "noise" as:

> *"Noise" means any sound that may produce adverse physiological or psychological effects or interfere with individual or group activities, including but not limited to communication, work, rest, recreation and sleep." Under certain conditions, noise can interfere with human activities at home or work and affect human health and well-being (HAR, 11-46.2, Definitions).*

The accepted unit of measure for noise is the decibel (dB) because it reflects the way humans perceive changes in sound amplitude. Sound levels can be measured, but human response and perception of the wide variability in sound amplitudes is subjective.

Different sounds have different frequency content. When describing sound and its effect on a human population, A-weighted decibel (dBA) sound levels are typically used to account for the response of the human ear. The term "A-weighted" refers to a filtering of the noise signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way the human ear perceives sound. The American National Standards Institute (ANSI) has established this filtering network. The A-weighted noise level has been found to correlate well with a person's judgment of the noisiness of different sounds and is used as a measure of community noise.

The DOH developed objectives and strategies guiding the noise environment of communities in Hawaiʻi. State noise guidelines are outlined in the HAR 11-46. These guidelines identify maximum allowable noise levels within zoning districts. For the zoning districts surrounding the project site the maximum permissible sound levels range from 45 to 70 dBA.

The proposed cable landing site is located primarily in an area zoned "Country." The DOH monitors noise exposure in accordance with HRS, Chapter 342F. Ambient noise in the proposed project area is generated from natural and man-made sources. Ambient noise levels in the nearshore project area are predominantly from local vehicular traffic on Farrington Highway, ocean surf, residential, light commercial, and recreational uses. The nearest sensitive noise receptors (human) to the proposed project include nearby homes in Mākaha (Mākaha Shores Condominium, the nearest residence to the project site, is approximately 340 ft from the proposed HDD bore site) and recreational users of Mākaha Beach Park, TMK: (1) 8-4-001: 012 (approximately 280 ft from the proposed HDD bore site).

Potential Effects and Proposed Mitigation

Short Term Impacts

Construction activities would generate noise, which could impact nearby areas. During the construction phase of this project, excavation, boring, and cable laying equipment will be used which will be sources of increased noise. Noise levels of diesel powered construction equipment typically range from 80 to 90 dBA at 50 feet distance. The actual noise levels produced are dependent on the construction methods employed during each phase of the construction process. Earth-moving equipment, including diesel engine powered HDD boring rig, bulldozers, trucks, backhoes, front-end loaders, graders, etc., would likely be the noisiest equipment used during construction.

Potential for impacts associated with the construction and cable landing phase of work are expected to last approximately 10 to 12 months. Several months (e.g., up to four months) are required for HDD activities, installation of the drill pipe, and removal of the drill apparatus; and, approximately one to three days are needed for landing and installation of the F/O cable.

Noise generated during HDD operations will be intermittent, localized, and temporary. Noise effects will be monitored and controlled in accordance with the State of Hawaiʻi and CCH requirements. To mitigate noise effects produced from the operation of the HDD boring rig, noise attenuation barriers or enclosures baffled to restrict the escape of noise will be placed around the bore site. Placing noisy equipment behind a purpose-built barrier is an effective way of reducing noise at a construction site. The barriers can be constructed on the work site from construction building material (i.e., plywood, block, stacks or soils) or the barriers can be constructed from commercial panels, which are lined with sound absorbing material to achieve the maximum noise reduction possible. With the appropriate mitigation, the noise effects from the HDD boring rig are not anticipated to be significant.

During construction, minor localized vibration may occur proximate to the work area. The primary sources of temporary vibration would be from stationary combustion engine powered HDD equipment. Typically, ground-borne vibrations generated by man-made activities attenuate rapidly with distance from the source of the vibration. Ground vibrations from construction activities do not often reach the levels that can damage structures, but can achieve the audible and feelable ranges in buildings very close to the source. Vibrations produced from the operation of the HDD boring rig area not anticipated to be significant, as they are expected to be localized to the Hawaiian Telcom property.

Boats and other vessels used during installation will also be an additional source of noise. The noise will be temporary (approximately one to three days at the project site, where the public could potentially hear the vessel offshore), and will not be significant. Upon completion of work the cable landing ship and support boats will depart the area.

Adverse effects from construction noise and vibration are not expected to pose a significant impact to public health and welfare due to the localized and temporary nature of work.

All proposed project activities will comply with HAR Chapter 11-46, Community Noise Control. Excessive noise levels generated by construction activities will require that a noise permit be filed with the DOH, Noise, Radiation and Indoor Air Quality Branch. The provisions of the noise permit will require that contractors use mufflers on all combustion powered construction vehicles and machinery, and maintain all noise attenuation equipment in good operating condition. Faulty equipment will be repaired or replaced.

Under current permit procedures, noisy construction activities are normally restricted to the hours between 7:00 AM and 6:00 PM, Monday through Friday, and between 9:00 AM and 6:00 PM on Saturday. Construction activities and the use of heavy equipment will be scheduled as much as possible during daylight hours to avoid disturbing area residents during the evening. If work during the nighttime hours is required, a variance from the existing state noise regulations will be requested from the DOH.

Long Term Impacts

There would be no project-related noise or vibration once construction is completed; therefore no significant increase in noise or vibration levels are expected to result from this project.

Potential Impacts of Alternatives

No alternative considered is anticipated to adversely effect, or be adversely affected by noise or vibration.

5.13 Terrestrial Botanical Resources

A botanical survey to assess possible project effects on botanical resources, was conducted by AECOS, Inc., and is entitled *Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002: 059), Waiʻanae District, Island of Oʻahu* (AECOS, 2015b). See **Appendix B**.

The results of the botanical survey conducted in December 2015 indicate there are no special concerns or legal constraints related to botanical resources in the survey area. No environments of special concern, such as streams or wetlands, occur in the survey area.

The botanical survey concluded that:

> *"No plants of particular interest or conservation value [are] growing on the parcel. The flora is a typical of lowland, leeward Oʻahu assemblage. Native herbaceous species present are common species and no plants listed under either state or federal endangered species programs (HDLNR, 1998; USFWS, 2015) are present on or immediately adjacent to the site"* (AECOS, 2015b).

Vegetation across the site is dense, consisting of grasses with scattered trees (mostly *kiawe* [*Prosopis pallida*]) and moderate coverage with shrubs, mostly *koa haole* (*Leucaena leucocephala*) and *klu* (*Acacia farnesiana*). Several months of unseasonable rainfall contributed to an unusual lushness of the vegetation throughout the leeward Oʻahu coast prior to the survey (AECOS, 2015b).

A total of 25 species of flowering plants were identified in the area in the botanical survey, although five of these are species planted on adjacent properties very close to or along the property line. No ferns or gymnosperms were observed. Three (12%) native plant species were identified during the survey; all three are indigenous herbs (native to Hawaiʻi and elsewhere in the Pacific). None was particularly conspicuous on the property, as two grasses dominate the site: buffelgrass (*Cenchrus ciliaris*) and Guinea grass (*Urochloa maxima*) (AECOS, 2015b).

Potential Effects and Proposed Mitigation

The botanical survey concluded that none of the alternatives for improvements to project site are expected to have a detrimental effect on botanical resources. There are no botanical species present that would impose any restrictions, conditions, or impediments to this project.

During construction, to minimize the potential for harm from invasive species present in the area, the contractor shall employ BMPs to ensure no new introductions or spread of invasive species. The contractor should rely on the State's noxious weed list to define the invasive plants that must be addressed and the measures to be implemented to minimize their harm.

Measures to prevent the introduction and spread of invasive species during construction may include:

- The inspection and cleaning of construction equipment
- Commitments to ensure the use of invasive-free mulches, topsoil and seed mixes
- Use of native species for vegetative ground cover following construction, as much as possible
- Development of eradication strategies should an invasion occur

During construction, BMPs would be employed to minimize the introduction and spread of invasive species that may further impact the area's native populations. Based on the botanical study and BMPs to be employed during construction, the project would have no adverse effects on threatened or endangered plants and no further mitigation is proposed. During interagency consultation pursuant to Section 7 of the ESA, the USFWS will be consulted for concurrence with the botanical survey's determination that the proposed project would not adversely affect threatened or endangered plant species.

Potential Impacts of Alternatives

No significant impacts to botanical resources are expected to result from this project or any project alternative.

5.14 Terrestrial Faunal and Avifaunal Resources

An avifaunal and mammalian survey, to assess possible project effects to faunal resources, was conducted by AECOS, Inc., and is entitled *Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002: 059), Waiʻanae District, Island of Oʻahu* (AECOS, 2015b). See **Appendix B**.

The avifaunal survey concluded that:

> *"The findings of the avian survey are consistent with the location of the property, and the habitats present there. All of the avian species recorded during the course of this survey are alien to the Hawaiian Islands. No avian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected (HDLNR, 1998; USFWS, 2015)"* (AECOS, 2015b).

The results of the avian survey found avian diversity and density consistent with the highly disturbed secondary vegetation present on the site. A total of 18 alien bird species were recorded, with three species – Red-vented Bulbul (*Pycnonotus cafer*), Spotted Dove (*Streptopelia chinensis*), and Japanese White-eye (*Zosterops japonicus*) – accounting for slightly more than 54% of all birds recorded. The most frequently recorded species was the Red-vented Bulbul, which accounted for 19% of the total number of individual birds recorded. The avifaunal survey concluded that there were no resident endemic or indigenous species of birds in the project area (AECOS, 2015b).

Although no seabirds were detected during this survey, it is possible that the threatened endemic sub-species of the Newell's Shearwater (*Puffinus newelli*) and the Wedge-tailed Shearwater (*Puffinus pacificus*), which is protected under the federal Migratory Bird Treaty Act, over-fly the project area between April and the middle of December each year in very small numbers. Newell's Shearwaters are not known to breed on the Island of Oʻahu, though seabirds likely to be this species have been recorded on ornithological radar in low numbers flying over parts of the Island. Wedge-tailed Shearwaters have been picked up as downed birds in the fall months on the Waiʻanae Coast (David, 2015) (AECOS, 2015b).

The primary cause of mortality in Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges 1998; Ainley et al., 2001). Collision with manmade structures is considered to be the second most significant cause of mortality of this seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds may collide with manmade structures, and if not killed outright, become easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003) (AECOS, 2015b).

The mammalian survey concluded that:

> *"No mammalian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected during the course of this survey (HDLNR, 2015; USFWS, 2015)"* (AECOS, 2015b).

The results of the mammalian survey recorded one species, along with scat, tracks, and sign of dogs (*Canis familiaris*) in several locations within the study site. A dog was recorded walking near the entrance to the site, and several were heard barking from locations outside of the survey area. Dogs are alien to the Hawaiian Islands and are deleterious to native species (AECOS, 2015b).

Although no rodents were recorded, it is likely that one or more of the four established alien Muridae found on Oʻahu – roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), black rat (*Rattus exulans hawaiiensis*), and European house mouse (*Mus musculus domesticus*) – utilize resources found within the general project area on a seasonal basis. All of these introduced rodents are deleterious to native ecosystems and native faunal species (AECOS, 2015b).

With the exception of the *ʻōpeʻapeʻa* or Hawaiian hoary bat (*Lasiurus cinereus semotus*), all terrestrial mammals found on the Island of Oʻahu are alien species, and most of these are ubiquitous. No Hawaiian hoary bats were detected during the course of the survey. Given the habitat present on the site, and the lack of suitable roosting trees, any potential usage of the area by this species would be of an incidental foraging nature. It is not expected that this project will result in deleterious impacts to this listed species (AECOS, 2015b).

Potential Effects and Proposed Mitigation

The avian and mammalian survey concluded that no federal jurisdictional waters (streams or wetlands), or federally delineated Critical Habitat for any species is present on or near the project parcel. Thus, modifications of habitats on the site will not result in impacts to federally designated Critical Habitat. In addition, the proposed project is not anticipated to result in adverse effects to any protected (State of Hawaiʻi and Federal listed threatened or endangered) plant or animal species. No negative effect on plant or animal habitats or specific communities is expected.

Based on the information contained in the avifaunal and mammalian surveys, the following mitigation measures will be undertaken:

> Threatened or endangered seabirds that fly over the site in very small numbers between April and the middle of December each year may become disoriented by lighting and collide with man-made structures. Injured and disoriented seabirds that are forced to land are at great risk of predation by cats and dogs or of being hit by automobiles. Although there will be an increase in the amount of lighting as a result of the proposed project, the light fixtures utilized for this project will be designed and installed to reduce glare and shield light from migrating and/or nocturnally flying seabirds. These design features will be based on guidance in the "The Newell's Shearwater Light Attraction Problem, A Guide for Architects, Planners, and Resort Managers."

Potential Impacts of Alternatives

No significant impacts to faunal and avifaunal resources are expected to result from this project or any project alternative.

5.15 Marine and Nearshore Biological Resources

A biological survey to assess possible project effects on marine resources, was conducted by AECOS, Inc., and is entitled *Marine Biological and Water Quality Surveys off Mākaha Beach, Waiʻanae, Oʻahu* (AECOS, 2015a). See **Appendix A**.

The results of the marine survey conducted in October 2015 concluded that:

> *"Due to the project design location of the HDD daylighting in a large sand channel, direct impacts to sensitive marine biota have been avoided. Little, if any, adverse indirect impacts may occur as a result of the HDD corridor. Best management practices (BMPs), including environmental protection specifications and endangered species protection… may be applicable"* (AECOS, 2015a).

The seafloor in the proposed HDD daylight location is sand, with scattered small rocks that host algal growth. Miniature sea urchins (*Echinocyamus sp*.) are common on the sand. One marlinspike auger (*Terebra maculata*) was observed. The sand is pocketed by small burrows, which host spearing mantis shrimp (*Oratosquilla fabricii*) and snake eel (*Callechelys lutea*). An existing cable was observed on the north edge of the HDD daylight area. A green alga (*Caulerpa taxifolia*) and cyanobacteria grow on the exposed parts of the cable. Fishes are rare here; only two were observed: bluefin trevally (*Caranx melampygus*) and blackside razor wrasse (*Iniistius umbrilatus*). Pods of spinner dolphin (*Stenella longirostris*) were seen in this offshore location (AECOS, 2015a).

Landward of the HDD daylight location at depths up to 60 ft (18.2 meters), the ocean bottom is composed of sand. Consolidated limestone bottom begins some 525 ft (160 meters) landward from the HDD daylight location where, at a depth of approximately 45 ft (14 m), the reef slopes upward from the sand bottom. Bottom relief is high, with numerous ledges, caves, and overhangs. Sand in channels that groove the solid bottom are numerous. A moderate amount of coralline algae and algal turfs grows on the limestone. Urchins (*Tripneustes gratilla*, *Echinometra mathaei* and *E. oblonga*) are abundant on the reef, their scouring visible in the limestone surface. Blue soft coral (*Sarcothelia edmondsoni*) is also abundant here. Other, less conspicuous macroinvertebrates include: worms (*Sabellastarte spectabilis*, *Spironbrancus giganteus*, and *Lomia medusa*), bluedragon nudibranch (*Pteraeolidia ianthina*), crabs (*Trapezia* sp., *Alpheus deuteropus*), urchins (*Heterocentrotus mammillatus*, *Diadema paucispinum,* and *Echinothrix calamaris*), and black sea cucumber (*Holothuria atra*). Several green sea turtles (*Chelonia mydas*) were observed around the limestone bottom (AECOS, 2015a).

Coral cover at depths of 25 to 45 ft (8 to 14 meters) is estimated at 50%. At least seven taxa of coral occur. *Pocillopora meandrina*, *Poc. damicornis* and *Porites lobata* are the dominant species. Other less common corals include *Leptastrea bewickensis*, *Montipora capitata*, *M. patula*, and *Pavona varians*. Closer to the shore, the bottom limestone complexity and topographical relief decreases. Expanses of flat limestone dominate here, with low-growing or turf-like algae dominant. The inshore half of the reef is home to conspicuously large numbers of urchins, including red pencil urchin (*H. mammilatus*), banded urchin (*E. calamaris*), and collector urchin. Coral cover in water 15 to 25 ft (4 to 8 meters) deep is estimated at approximately 20% (AECOS, 2015a).

A total of 60 fish taxa were observed during the marine biological survey. Of the 60 taxa, 13 species are endemic to Hawaiʻi (found only in the Hawaiian Islands). The most well-represented genera across the survey area are surgeonfishes (*Acanthuridae*; 10 species), followed by damselfishes (*Pomacentridae*) and wrasses (*Labridae*), with 8 species each, and butterflyfishes (*Chaetodontidae*) and triggerfishes (*Balistidae*), with 6 species each (AECOS, 2015a).

Common fishes are surgeonfishes, including orangeband surgeonfish (*A. olivaceus*), yellow tang (*A. flavescens*), and brown tang (*A. nigrofuscus*); goatfishes, including square-spot goatfish (*Mulloidichthys flavolineatus*), yellowfin goatfish (*M. vanicolensis*), and manybar goatfish (*Parupeneus multifasciatus*); bluestripe snapper (*Lujanus kasmira*) and parrotfishes, including stareye parrotfish (*Calotomus carolinus*) and palenose parrotfish (*Scarus psittacus*). Wrasses are also common, with numerous saddle wrasse (*Thalassoma duperrey*), and bird wrasse (*Gomphosus varius*) recorded (AECOS, 2015a).

Observed high in the water column feeding on plankton are various damselfish, including bright-eye damselfish (*Plectroglyphidodon imparipennis*), Hawaiian gregory (*Stegastes marginatus*), oval chromis (*Chromis ovalis*) and blackfin chromis (*C. vanderbiliti*), milletseed butterflyfish (*Chaetodon miliaris*) and black triggerfish (*Melichthys niger*). Hawkfish (*Paracirrhites arcatus*, *P. forsteri* and *Cirrhitus pinnulatus*) occur sheltered in coral heads. Filefish (*Cantherhines dumerilii* and *C. sandwichensis*), boxfish (*Ostracion meleagris*), Moorish idol (*Zanclus cornutus*), bigeye emperor (*Monotaxis grandoculis*), spiny porcupinefish (*Diodon holocantus*), and Pacific trumpetfish (*Aulostomus chinensis*) are present but tend to be rare in the project area (AECOS, 2015a).

Potential Effects and Proposed Mitigation

The project includes work in marine waters where ESA-listed species may be exposed to project-related activity. One listed (endangered or threatened; DLNR, 2015; NOAA-NMFS, 2010a and 2011; USFWS, 2015) species was encountered during the October 2015 survey: green sea turtle (Chelonia mydas). Spinner dolphins, protected under the Marine Mammal Protection Act (MMPA) were also sighted. Other listed and protected marine species (sea turtles, Hawaiian monk seal, and humpback whale) are known to occur in the general vicinity.

Sea turtles and marine mammals typically avoid human activity, so exposure to such activity and equipment operation would be infrequent and non-injurious, resulting in insignificant effects on the ESA-listed marine species. Additionally, protected species BMPs will be followed by the project manager and contractor to reduce the likelihood of interactions, and will include watching for and avoiding protected species before commencing work and postponing or halting operations when protected species are within 50 yards of project activities. Protected and/or listed species that may occur within the project vicinity are discussed further below:

Sea Turtles

Of the sea turtles found in the Hawaiian Islands, only green sea turtle is likely in the project vicinity. The green sea turtle was listed as a threatened species under the ESA in 1978 (ESA; USFWS, 1978, 2001).

Since protection, the green sea turtle has become the most common sea turtle in the Hawaiian Islands with a steadily growing population. On February 16, 2012, the National Marine Fisheries Service (NMFS) and the USFWS received a petition from the Association of Hawaiian Civic Clubs to identify the Hawaiian green turtle population as a distinct population segment (DPS) and delist the Hawaiʻi DPS under the ESA of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.). In March 2015, NOAA-NMFS published a proposed rule to reclassify the green sea turtle into 11 DPS, but continue protection of the Hawaiʻi DPS as a threatened species under the ESA (NOAA & USFWS, 2015a). The public comment period for this proposal ended September 25, 2015 (NOAA & USFWS, 2015b).

Shellfishes

Shellfishes, including pearl oyster (*Pinctada margaritifera*), are regulated throughout the State of Hawaiʻi, where it is prohibited to *"catch, take, kill, possess, remove, sell or offer for sale",* without a permit, pearl oysters and six other shellfishes (DLNR, 2009). No pearl oysters were observed in the survey.

Monk Seal

The endangered Hawaiian monk seal (*Monachus schauinslandi*) is known to occur in the waters off Mākaha Beach. Critical habitat for Hawaiian monk seals has been designated (NOAA-NMFS, 2015) and includes the seafloor and marine habitat to 10 m above the seafloor from the 200 m depth contour through the shoreline and extending into terrestrial habitat 5 m inland from the shoreline between identified boundary points. These terrestrial boundary points define preferred pupping areas and significant haul-out areas. (NOAA-NMFS, 2015). Mākaha Beach does not fall within assigned boundary points, therefore is excluded from monk seal critical habitat designation. However, critical habitat starts at the waterline and extends from there out to the 200-m depth contour, including the seafloor and marine habitat 10 m in height (NOAA-NMFS, 2015). The Project occurs in a designated marine critical habitat area.

Spinner Dolphin

The spinner dolphin (*S. longirostris*) gained protection under the MMPA in 1972, yet they are not considered depleted in waters of the Pacific Islands Region. Spinner dolphins are frequently encountered around the main Hawaiian Islands. Currently, the Protected Resources Division of the NOAA-NMFS Pacific Islands Regional Office (PIRO) is working on an Environmental Impact Statement (EIS) on the potential rulemaking under the MMPA to provide more protection to Hawaiian spinner dolphins (NOAA-NMFS, 2006). The MMPA states that the essential habitats used by marine mammals should be protected, and marine mammals should be protected from the harmful actions of man. NOAA-NMFS PIRO recommended guidelines for interactions with spinner dolphins include: (1) remain at least 50 yards from dolphin; 2) limit observation time to ½ hour; 3) if approached by a spinner dolphin while on a boat, put the engine in neutral and allow the animal to pass. Boat movement should be from the rear of the animal (NOAA-NMFS, 2011).

Humpback Whale

The humpback whale or *koholā* (*Megaptera novaeangliae*) was listed as endangered in 1970 under the ESA. In 1993 it was estimated that there were 6,000 humpback whales in the North Pacific Ocean, and that 4,000 of those regularly came to the Hawaiian Islands. The population is estimated to be growing at between 4 and 7% per year. Today, as many as 10,000 humpback whales may visit Hawaiʻi each year

(HIHWNMS, 2014).Humpback whales typically arrive in the Hawaiian Islands as early as October and may stay as late as May or early June. The waters off Mākaha Beach are not included in the Humpback Whale National Marine Sanctuary.

Coral

Coral species are protected under Hawaiʻi state law, which prohibits "*breaking or damaging, with any implement, any stony coral from our waters, including any reef or mushroom coral*" (HAR §13-95-70; DLNR, 2014b). It is also unlawful to take, break or damage with any implement, any rock or coral to which marine life of any type is visibly attached (HAR §13-95-71, DLNR, 2014b). On August 27, 2014, NOAA issued a final rule for listing 20 coral species as threatened under ESA (NOAA-NMFS, 2014). None of these newly listed corals occurs in Hawaiʻi.

Essential Fish Habitat

The 1996 Sustainable Fishery Act amendments to the Magnuson-Stevens Fishery Conservation and Management Act and subsequent Essential Fish Habitat (EFH) Regulatory Guidelines (NOAA, 2002) describe provisions to identify and protect habitats of federally-managed marine and anadromous fish species. Under the various provisions, federal agencies that fund, permit, or undertake activities that may adversely affect EFH are required to consult with the NMFS.

Congress defines EFH as *"those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."* (MSFCMA, 1996; NOAA, 2002). EFH provisions in MSFCMA designate that species harvested in sufficient quantities to require fisheries management are to be subdivided into similar Management Unit Species (MUS). Five MUS groups are currently managed in Hawaiian waters: bottomfish, pelagics, precious corals, crustaceans, and coral reef ecosystem. In the waters surrounding the Hawaiian Islands, EFH for coral reef ecosystem MUS as defined by the Final Coral Reef Ecosystem Fishery Management Plan (WPRFMC, 2001) and subsequent Fishery Ecosystem Plan for the Hawaiian Archipelago (WPRFMC, 2005), *"includes all waters and habitat at depths from the sea surface to 50 fathoms extending from the shoreline (including state and territorial land and waters) to the outer boundary of the Exclusive Economic Zone".* The proposed Project is located within waters designated as EFH (including water column and all bottom areas) for coral reef ecosystem, bottomfish, pelagic and crustacean MUS. Of the thousands of species which are federally managed under the coral reef Fishery Management Plan, at least 61 (juvenile and adult life stages; MRC, 2005) are known to occur in waters off Mākaha Beach Park.

Proposed Mitigation

Construction activities from the proposed project are not anticipated to negatively impact the green sea turtles or marine mammals given that the existing conditions of the site involve human presence and regular boating traffic that may deter regular use of the shoreline and nearshore waters. See **Section 5.6** for mitigation proposed during HDD operations, drill pipe installation, and cable laying activities. Additional mitigation measures to ensure protection of endangered species will include:

- Each day, conduct a survey for marine protected species before any work starts, and postpone work if a species is observed. If a marine protected species is in the area, observe a 150-ft (46-meters) buffer with no human encroachment. If a monk seal/pup pair is seen, a 300-ft (92-meters) buffer must be observed.

- Monitor for marine protected species 30 minutes prior to, during, and 30 minutes after any in-water project activity. Record information on the species, numbers, behavior, sex or age class (if possible), location, time of observation, start and end times of project activity and any other disturbances (visual or acoustic).
- In the event a marine protected species enters the project area and activity cannot be halted, conduct observations and immediately contact NOAA/NMFS. For monk seals contact Marine Mammal Response Coordinator at (808) 944-2269 and the monk seal hotline at (888) 256- 9840. For turtles, contact the turtle hotline at (808) 983-5730.

Potential Impacts of Alternatives

All Build Action Alternatives would require work within the Pacific Ocean due to installation of the F/O cable and use of HDD to land the F/O cable at the Mākaha Beach BMH site. Work proposed within the Pacific Ocean is anticipated to require the filing of a Department of the Army permit and Section 401, WQC. The potential for adverse impacts to the surface waters of marine ecosystems will be addressed through adherence to all USACE, DOH, and CCH regulatory requirements (see **Section 8.2** and **Section 8.3**). The project will also undergo review through a CZM FEDCON Determination by the Hawaiʻi Office of Planning (see **Section 8.8**).

6.0 Public Services, Potential Impacts and Mitigation Measures

6.1 Transportation Facilities

The project site is currently served by a gravel access driveway along Farrington Highway. Construction activities with potential to impact traffic include increased construction traffic traveling to and from the terrestrial project site. Traffic impacts associated with the operation of the CLS are not expected. The CLS will not require staffing during normal 24-hour per day operations and will only require periodic maintenance to upkeep and replace equipment as needed. Visits to the site by one or more maintenance personnel that would generate traffic are not planned to exceed once per week, unless required due to major damage or replacement of equipment. All vehicles and personnel conducting maintenance will park on-site within the property.

Potential Effects and Proposed Mitigation

Short-term impacts associated with construction of the proposed project may include temporary closure of one or both directions of travel along Farrington Highway. As required, traffic controls such as safety cones, signage, and/or flag personnel would be implemented to alert motorists and the public to the presence of construction workers and personnel, and to exercise caution. Impacts to traffic and circulation during construction would be temporary and will not adversely affect access to the Mākaha Beach Park. No further mitigative measures are anticipated to be required. Once construction is complete, all personnel and equipment necessary to the project, including the traffic controls, would be removed.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on transportation.

6.2 Recreational Facilities

Recreational facilities in the vicinity of the project site primarily consist of shoreline resources such as Mākaha Beach Park, located to the southwest, approximately 140 ft from the project site; Keaʻau Beach Park, located approximately 0.8 miles northwest of the project site; Makua Keaʻau Forest Reserve, located directly northeast of the projct site; Mākaha Golf Course and Mākaha Valley County Club, located approximately 2 miles east of the project site; Waiʻanae Regional Park, located approximately 2.4 miles southeast of the project site; Pokai Bay Beach Park, located approximately 3.4 miles southeast of the project site; Lualualei Beach Park, located approximately 3.7 miles southeast of the project site; Māʻili Beach Park, located approximately 4.9 miles southeast of the project site; and, Keawaula (Yokohama Beach), located approximately 5.6 miles northwest of the project site.

Potential Effects and Proposed Mitigation

No adverse impacts to beach and shoreline resources are anticipated. This is because the use of HDD will permit the underground installation of the cable within a borehole/drill pipe conduit with no disturbance or effect to the surface.

Some disruption to ocean users in the water beyond the surf zone, may occur when the HDD drill bit daylights at the ocean end and during installation of F/O cable by the cable ship. This will take place approximately ¼ to ½ miles from shore and in deeper ocean waters up to the State territorial limit from the shoreline. During daylighting of the drill bit, there will be support boats and divers and/or ROV in the water. It is anticipated that during daylight activities and cable installation, that the area immediately surrounding the ocean end of the borehole will have to be closed off to maintain public safety and security.

Ocean closure of the area is expected to include only the submerged landing site with a total area of approximately ±100 ft by ±100 ft. Closure of nearshore waters will be accomplished by publishing a notice advising mariners to temporarily avoid the area on days when the ship will lay cable.

The period of time involving closure of the nearshore waters is expected to be temporary and will last only for the duration that the cableship is on station at the site, approximately one to three total days. Should it become necessary to further temporarily close the ocean area during daylighting activities, sufficient notice to mariners will also be provided. It is expected that closure of the area surrounding the HDD boring operation at the ocean end will be similarly temporary lasting only approximately one to three total days. Once the cable is installed, there will be no further disruption to the area's recreational resources.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on recreational facilities.

6.3 Wastewater

Portable toilets would be provided for use by construction workers and project-related personnel.

Potential Effects and Proposed Mitigation

Portable toilets will be maintained by the contractor in accordance with State DOH and CCH health regulations. No impact to wastewater facilities is anticipated and no mitigation measures are recommended. The operation of the CLS will not require wastewater treatment as it will be an unmanned facility.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on wastewater.

6.4 Potable Water

Potable water serving the project area is provided by the Honolulu Board of Water Supply (BWS). The project is not anticipated to adversely affect the demand for potable water. The incidental use of water may be required for operation of the site involving fire control to supplement the CLS fire suppression system (Halon or similar system).

Potential Effects and Proposed Mitigation

No adverse effect on potable water resources or infrastructure is expected and no mitigation measures are planned.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on potable water.

6.5 Solid Waste

Solid waste will be generated during construction. Once installed, operation of the site for telecommunications purposes will require infrequent maintenance to replace or repair equipment as needed. Operation of the site is not expected to generate solid waste. Any waste that is generated in the course of CLS maintenance and upkeep activities will be either hauled for disposal by Hawaiian Telcom technical personnel, or placed into a suitable waste receptacle (dumpster or waste bin brought to the site) for removal by a waste disposal company. Disposal of the solid waste will be to an acceptable waste disposal facility in accordance with state and CCH regulations.

Potential Effects and Proposed Mitigation

Solid waste generated during construction activities will be disposed of in accordance with applicable rules and regulations governing solid waste disposal. It is expected that the waste generated from construciton of the facility would be similar to that from a small commercial business. During the operational phase of the CLS building, disposal of solid waste will be handled by a solid waste collection and disposal service. Sizing of waste dumpsters will be based on need. This waste would primarily include paper products, plastics from used containers such as soda bottles, parts boxes, and take out lunches. No hazardous wastes are anticipated to be generated from operation of the CLS building. Disposal of used or spent telecommunications equipment will be handled in accordance with applicable Federal, State, and CCH rules and regulations.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect to the handling and/or management of solid waste on O‘ahu.

6.6 Power and Communications

Power to the project site is provided by the HECO. Current electrical facilities are a mixture of overhead and underground transmission lines. Other utilities, including telephone lines and telecommunications cables, are on pole lines and underground along the Farrington Highway.

Potential Effects and Proposed Mitigation

Ultimately, the final build-out of the SEA-US project will result in improved telecommunications connectivity between Southeast Asia, Hawai‘i, Guam, and the U. S. West Coast. The project will further benefit Hawai‘i with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided. The proposed project would have minimal to no effect on existing power facilities. As required, coordination with the appropriate utilities would be organized to maintain continuity of service during construction. No mitigative measures are anticipated to be required.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on power and communications.

6.7 Police Protection

The project area is identified by the Honolulu Police Department as District 8, Kapolei/Waiʻanae. The main police station in this area is the Waiʻanae Substation, located at 85-939 Farrington Highway, Waiʻanae, Hawaiʻi.

Potential Effects and Proposed Mitigation

The project is not expected to result in an increase in demand for police protection. Traffic controls during construction, however, may employ the services of off-duty police personnel. No other mitigation measures are necessary or recommended.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on police protection.

6.8 Fire Protection

The project alignment is served by the Honolulu Fire Department, Waiʻanae Fire Station No. 26, located at 85-645 Farrington Highway, Waiʻanae, Hawaiʻi.

Potential Effects and Proposed Mitigation

The major on-site structure requiring fire protection is the CLS. The potential for fire from operation of the CLS is expected to be from electronic equipment in need of replacement or repair, and the backup emergency generator and stored fuel supply. Vegetation within the boundaries of the Hawaiian Telcom property could also constitute a potential fire hazard:

- CLS Electronic Plant – An automated CLS fire detection and suppression system will protect sensitive electronic equipment and prevent the spread of fire. The principal fire inhibiting agent will be halon or other inert gas widely used in this and similar applications to protect and reduce damage to electronic equipment. The system will be subject to regular maintenance and upkeep to maintain operational performance.

- Backup Emergency Generator and Fuel Supply – The backup emergency power and fuel supply for the CLS will be protected from the elements and from tampering by placement within a locked security fenced enclosure and the use of equipment designed for remote unattended operation. This will include the provision for automated fire detection and suppression. The backup emergency power and fuel supply will be subject to regular maintenance and upkeep.

- Vegetation and Fire Control of Property – Portions of the Hawaiian Telcom property used for the project will be landscaped with xeriscape plantings to reduce the need for water usage. As required, fire protection requirements of the Honolulu Fire Department will be implemented, including the possible need for the placement of a fire hydrant in proximity to the property.

The potential for fires at the project site are expected to be significantly reduced with the use of the proposed mitigation measures. As noted, the Honolulu Fire Department will be consulted to identify and meet fire standard requirements.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on fire protection.

6.9 Health Care and Emergency Services

The nearest hospital with an emergency room is Queen's Medical Center. Emergency transport (ambulance) services are provided by CCH's Department of Emergency Services.

Potential Effects and Proposed Mitigation

The potential need for health and emergency services would be principally during construction from personnel operating equipment and vehicles, and during F/O cable laying activities when there will be divers and work boats installing the F/O cable. The operation of the CLS and telecommunication facilities at the Hawaiian Telcom site will be principally unmanned so health care or emergency services are not expected to be required.

Worker safety during construction activities will be the responsibility of the prime contractor. As required, a worker Health and Safety Plan supplemented by safety briefings prior to the start of the work will advise workers of conditions warranting caution and/or the use of safety practices, procedures, and equipment. Further, as required by federal, state, and CCH regulations, workers engaged in specific construction trades or work activities will be properly certified or trained to engage in the work.

The adherence to the safety measures described above are expected to result in no major increases beyond the existing level of healthcare or emergency services provided to the project site and region.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on health care and emergency services.

7.0 Socioeconomic and Related Environment, Potential Impacts and Mitigation Measures

7.1 Population and Demographics of the Project Area

According to the 2014 State of Hawaiʻi Data Book the resident population of the Waiʻanae region of Oʻahu numbered 48,519 persons in 2010. This represents approximately five percent of the Oʻahu resident population of 953,207 (DBEDT, 2014). The proposed project is expected to have no adverse impact on the existing population of Waiʻanae. Some employment will be required during construction activities. However, all employment associated with the proposed project will be short term and will only last until completion of the cable installation.

Maintenance and upkeep of the unmanned F/O cable, CLS, and associated facilities will be provided by Hawaiian Telcom staff and cable vendor suppliers. The number of personnel associated with the operation of the Hawaiʻi segment of the SEA-US cable system is expected to be relatively small, and can be expected to be less than approximately 12 to 24 persons. Although some new employment may be required, this increase is expected to be small and with little to no adverse impact to regional employment within the project site region.

Potential Effects and Proposed Mitigation

The proposed project is not expected to adversely affect the regional or local area population.

Potential Impacts of Alternatives

No alternative considered is anticipated to have an adverse effect on the population or demographics of the region.

7.2 Historic and Archaeological Resources

An Archaeological Assessment (AA), originally termed an Archeological Inventory Survey (AIS), of the project area was undertaken by CSH, in consultation with the SHPD, Archaeology and Architecture Branches, DLNR. No historic properties were identified within the project area during the initial AIS investigation; therefore, the report is termed an archaeological assessment, per HAR §13-284-5(b)(5)(A):

> *"Results of the survey shall be reported through an archaeological assessment, if no sites were found, or an archaeological survey report which meets the minimum standards set forth in chapter 13-276-5."*

The AA was prepared to support the proposed project's historic preservation review under Section 106, NHPA[1]; National Environmental Policy Act (NEPA); HRS Chapter 6E-42; HAR Chapter 13-13-276; and HAR Chapter 13-284. The AA also supports project-related historic preservation consultation among stake-holding federal and state agencies, interested Native Hawaiian organizations, groups and individuals, and community groups. **Appendix C** contains a full copy of the November 2015 draft report entitled,

[1] Consultation will be conducted by the USACE during the processing of the Department of the Army Permit application for the proposed project.

Archaeological Assessment for the Southeast Asia – U. S. (SEA-US) Cable Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu TMK: [1] 8-4-002: 059 (CSH, 2015a).

The project's Area of Potential Effect (APE) with regard to possible cultural resources is approximately 2.82-acres, and encompasses the entire Hawaiian Telcom property, TMK: (1) 8-4-002: 059. The project area is located within the ahupuaʻa (land division) of Mākaha, which extends from the leeward Waiʻanae Range to the coast between Waiʻanae Ahupuaʻa to the southeast and Keaʻau Ahupuaʻa to the northwest.

Scope of Work

To document all cultural resources within the APE and comply with both federal and Hawaiʻi State historic preservation legislation, in accordance with the requirements outlined in HAR Chapter 13-13-276, the following scope of work was implemented by CSH to prepare the AA:

1. Historic and archaeological background research including a search of historic maps, written records, Land Commission Award documents, and the reports from prior archaeological investigations.
2. A complete (100% coverage) systematic pedestrian inspection of the project area to identify any potential surface cultural resources. No surface historic properties were identified within the project area.
3. Subsurface testing consisted of five test excavations conducted using a backhoe to identify and document subsurface historic properties that would not be located by surface pedestrian inspection (particularly in potential archaeological sites). Documentation included photographs, scale drawings, and location of the test excavations and significant features recorded using Global Positioning System (GPS) survey equipment.
4. As appropriate, consultation with knowledgeable individuals regarding the project area's history, past land use, and the function and age of the cultural features.
5. Preparation of an AA report including treatment recommendations to mitigate the project's potential adverse effect on cultural resources identified in the project area that are recommended eligible to the Hawaiʻi Register of Historic Places.

Summary of Findings

In compliance with and to fulfill applicable Hawaiʽi State historic preservation requirements, CSH completed the AA for the SEA-US Cable project Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: (1) 8-4-002:059.

According to the archaeological and historical research, Mākaha Valley supported dryland cultivation of crops such as sweet potatoes and taro during the pre-Contact and early historic periods. The development of a dryland agricultural system made it possible for the expansion of settlements into the upper valley of Mākaha. By the mid-1800s, the traditional way of life changed when the lands within Mākaha were transformed into a ranch by the Holt family. The Holt Ranch began selling its lands in the early 1900s, and these lands were used for sugar cultivation. After sugar cultivation came to end in the mid-1950s, further development activities occurred within Mākaha such as the construction of recreational facilities, condominiums, resorts, and golf courses.

The results of pedestrian survey of the project site revealed that no surface traditional Hawaiian cultural materials or significant historic properties were present. Modern raw material stockpiles and push piles were observed along with a modern circular enclosure and adjacent modern rock constructions.

Based on the subsurface testing program, stratigraphy within the project area consists of thick fill sediment comprised primarily of boulders and cobbles. Natural sediment or substrate observed within the project area included the decomposing coral shelf observed within test excavation 1 (T-1) and clay observed at the base of excavation in test excavation 2 (T-2). The remainder of sediment within the project area was identified as fill sediment based on inclusions of foreign material and modern trash such as concrete rubble, rebar, plastic sheets, and machine-crushed basalt. No subsurface historic properties were identified.

The project area had been graded and cleared by 1960 to 1970. The complete clearing and grading of the project area explains the absence of surface and subsurface traditional Hawaiian cultural materials and historic properties within the project area (CSH, 2015a).

Potential Effects and Proposed Mitigation

In accordance with Hawaiʽi State historic preservation review legislation HAR §13-284-7, CSH's project-specific effect recommendation is "no historic property affected." No evidence of traditional Hawaiian cultural materials was observed and no significant historical properties were present. The proposed project will not have any adverse effects on traditional Hawaiian cultural materials or deposits and historic properties (CSH, 2015a).

As required under the provisions of HRS §6E, in the unlikely event that human burials or significant cultural finds are encountered during ground disturbance/construction activities, all work should cease immediately and the SHPD immediately notified at (808) 692-8015. Work may only be resumed upon authorization of the SHPD following the appropriate treatment of the find.

Potential Impacts of Alternatives

The results from the AA show the project area contains no significant historic properties; therefore, no further mitigation in the form of archaeological historic preservation work is recommended. No adverse impacts to historic resources are anticipated to result from the alternatives considered for this project.

7.3 Traditional Cultural Practices

Cultural Impact Assessment (CIA)

The project requires compliance with the State of Hawaiʻi environmental review process (HRS, Chapter 343, and Session Laws of Hawaiʻi, Act 50), which requires consideration of a proposed project's effect on cultural practices and resources. **Appendix D** contains the 2015 CIA, performed by CSH, and entitled, *Draft Cultural Impact Assessment for the Southeast Asian – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu TMK: [1] 8-4-002:059* (CSH, 2015b). The CIA provides information pertinent to the assessment of the proposed project's impacts to cultural practices and resources and supports the project's historic preservation review under HRS Chapter 6E-8 and HAR Chapter 13-275.

The scope of the CIA (**Appendix D**) included:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports for 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 within and near the subject parcel that may be relevant to reconstructing 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.

In preparing the CIA, CSH researched Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli* (chants), *mele* (songs), traditional *mo‘olelo* (stories), traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focused on land transformation, development, and population changes beginning with the early post-Contact era to the present day. Presented below are results of the background research for the entire *ahupua‘a* of Mākaha, including the current project area:

1. Mary Kawena Pukui translates Mākaha as "fierce" in reference to the inhabitants of the land (Pukui et al. 1974:139). Alexander (1902 in Sterling and Summers 1978:60) interprets Mākaha as "robbery" in reference to a well-known *mo‘olelo* (story) regarding cannibal robbers who threatened travelers on the coastal trail through Wai‘anae Moku.
2. Older families from Wai‘anae Moku believe these negative interpretations of the meaning of the place name Mākaha and the inhabitants of the area being robbers and/or cannibal robbers are propaganda intended to discredit Native Hawaiians who continue to have a stronghold of residency on the coast (Monahan and Silva 2007).
3. The demi-god Māui is said to have spent a great deal of time on the Wai‘anae coast. Two *ka‘ao* (legend) are associated with the demi-god. The first is Māui's mother, Hina, encourages him to find the birds who have the power to make fire. Māui captures the *alae ‘ula* (Hawaiian gallinule or mudhen; *Gallinula chloropus sandvicensis*) and obtains the secret from it. The mudhen explains "that fire is in the water" and shows Māui how to obtain it (Beckwith 1970:229–230). The second *ka‘ao* is of how Māui slowed the sun for Hina. Māui and Hina lived at Kāne-ana (Kāne's cave) at Pu‘u-o-hulu. Hina was skilled in tapa making. To dry Hina's tapa, Māui found a way to slow the sun (Westervelt 1910:199).
4. Several *heiau* (pre-Christian place of worship) stood in Mākaha Ahupua‘a including Kamaile Heiau, Kāne‘aki Heiau, and Laukīnui Heiau. Other important *wahi pana* (storied places) include

Mauna Lahilahi; Malolokai Cave; Pōhaku o Kāne ("stone of the god Kāne"); the *pōhaku* (rock, stone) known as Pāpale o Kāne ("hat of Kāne"); Pōhaku o Kīkēkē ("clapping" or "knocking" rock), which produces a sound when you clap 4 to 5 ft away from it (Clark 1977:94); and a talking stone at Malolokai.

5. Early foreign accounts describe Waiʻanae Moku as rocky and barren (Vancouver 1798:217). Captain George Vancouver places a village south of Mauna Lahilahi situated in a coconut grove. The village is most likely Kamaile, as the beach and off-shore fishery were adjacent to the area. Behind the village was a freshwater spring where extensive taro lands existed.
6. According to Māhele documentation, Land Commission Awards (LCAs) were awarded in the *mauka* (toward the mountain) sections and along Mākaha Stream. No LCAs were found in the vicinity of the project area.
7. Chief Abner Pāki, father of Bernice Pauahi, was given the entire *ahupuaʻa* of Mākaha by Liliha after her husband, Boki, disappeared in 1829 (Green 1980). Pāki died in 1855 and the administrators of his estate sold his Mākaha lands to James Robinson and Company. Later, one of the partners, Owen Jones Holt, bought out the shares of the others (Ladd and Yen 1972). The Holt family dominated the economic and social scene in Mākaha until the end of the nineteeth century. From 1997 to 1899, Holt Ranch raised horses, cattle, pigs, goats, cattle, and peacocks (Ladd and Yen 1972:4).
8. In 1880, the Waianae Sugar Company cultivated cane in three valleys: Mākaha, Waiʻanae, and Lualualei. During this time they also altered the Waiʻanae coastline by constructing a railroad. The railroad impacted the natural features of the area such as sand dunes and man-made features such as fishponds and salt ponds.
9. Holt Ranch began selling off its land in the early 1900s (Ladd and Yen 1972). The Waianae Sugar Company moved their operations to Mākaha and by 1923, the lower portion of Mākaha Valley was under sugarcane cultivation. For half a century, Mākaha was predominantly sugarcane fields until 1946 a manager's report announced plans to liquidate due to increased wages making operations no longer profitable (Condé and Best 1973:358).
10. Lack of water played a role in Waianae Sugar Company's liquidation. In the 1930s the plantation sold out to American Factors Ltd. (Amfac, Inc.). Amfac initiated a geologic study of the ground water in the mountain ridges in the back of Mākaha and Waiʻanae valleys. In 1945, James W. Golver, Ltd. was contracted to create a tunnel into the ridge in back of Mākaha Valley. Approximately 700,000 gallons of water was pumped daily for the irrigation of sugar. The following year the plantation liquidated all of its acres of land to the Honolulu Stock Exchange. Parts of the property were sold off as beach lots, shopping centers, and house lots.
11. Previous archaeological studies locate several cultural sites northwest of the project area (Site 173, *pōhaku*; Site 174, Laukinui Heiau; Site 175, Mololokai; McAllister 1933) and human remains (State Inventory of Historic Properties [SIHP] # 50-80-07-4527) with staghorn coral at major joints and a possible *niho palaoa* (whale tooth pendant worn by *aliʻi* [chief]) (Kawachi 1992). Southeast of the project area includes a pre-Contact cultural layer (SIHP # -6572); the Mākaha Bridge 3A constructed in 1937 (-6823); a subsurface cultural layer (-7031); Mākaha Bridge 3 (-6822); remains of the OR&L railroad infrastructure (-9714); a culturally enriched A horizon with a previously disturbed burial (-6825); and Farrington Highway (-6824) (McDermott and Tulchin

2006). Two burials were found farther south at Mauna Lahilahi (-3704) in addition to artifacts and sites associated to the burials (Kawachi 1990).

Community consultation was undertaken by CSH with Hawaiian organizations, agencies and community members to seek out individuals with cultural expertise and/or knowledge of the project area and the vicinity. Organizations and members/representatives of the organizations consulted included the SHPD, the Office of Hawaiian Affairs (OHA), and the Oʻahu Island Burial Council (OIBC). This effort was made by use of letters, e-mails, telephone, and in-person contact. In the majority of cases, letters along with a map of the project area were mailed with the following text:

At the request of R. M. Towill Corporation, Cultural Surveys Hawaiʻi Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Southeast Asia – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupuaʻa, Waiʻanae Moku, Oʻahu Island, Tax Map Key (TMK) [1] 8-4-002: 059. The project area is approximately 2.823 acres.

The proposed project involves the installation of a submarine fiber optic (F/O) telecommunications cable in offshore waters approximately ¼ to ½ miles seaward of Mākaha Beach, Oʻahu, Hawaiʻi. Installation of the F/O cable will involve use of horizontal directional drilling (HDD) equipment positioned on land owned by Hawaiian Telcom. HDD will be used to create a borehole and will continue beneath the ground until it is ready to daylight in sandy ocean bottom at a depth of approximately 15 to 20 meters. There is no specific timeframe for the period of drilling but it is expected to last several months. Conduit will be placed into the borehole as the drill progresses. Following HDD, the remaining conduit will be used to pull the F/O cable to a specially prepared manhole at the Hawaiian Telcom property. The F/O cable will then be connected to a newly constructed Cable Landing Station at the project site.

The land owned by Hawaiian Telcom and site for the proposed project is north of the existing Mākaha Beach parking lot on the mauka (towards the mountain) side of the Farrington Highway. The location for the daylighting of the borehole and conduit in off-shore coastal waters was selected to minimize disturbance to the environment, disruption to users of Mākaha Beach, interference with existing cables, and to secure long-term protection of the SEA-US Cable System.

Landing and positioning the cable within the extensive sand deposits off-shore of the Mākaha Beach will reduce cable exposure to ocean forces, eventually allowing it to be buried beneath the sand. This is expected to allow for the protection of corals and other marine species that depend on the area for food, foraging, and habitat. Once completed, the location of the cable in 15 to 20 meters of water depth is not expected to affect beach users including surfers, divers, boaters, swimmers, or fishermen.

Ultimately, the final build-out of the SEA-US project will result in telecommunications connectivity between Southeast Asia, Hawaiʻi, Guam, and the U. S. West Coast. The

> *project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided.*
>
> *The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assists us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project.*
>
> *We are seeking your kōkua (assistance) and guidance regarding the following aspects of our study:*
>
> - *General history and present and past land use of the project area.*
> - *Knowledge of cultural sites- for example, historic sites, archaeological sites, and burials.*
> - *Knowledge of traditional gathering practices in the project area, both past and ongoing.*
> - *Cultural associations of the project area, such as legends and traditional uses.*
> - *Referrals of kūpuna or elders and kamaʻāina who might be willing to share their cultural knowledge of the project area and the surrounding ahupuaʻa lands.*
> - *Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.*

Samples of the letters are shown in **Appendix D**.

CSH attempted to contact 35 Native Hawaiian Organizations (NHO), agencies, and community members for the CIA (a list of individuals contacted can be found in **Appendix D**). Below is the *manaʻo* (thought, opinion) and *ʻike* (knowledge) shared by the six individuals who responded regarding the project area and Mākaha Ahupuaʻa:

1. Jan Becket, retired Kamehameha Schools teacher, author, photographer, knowledgeable in cultural sites, Kona Moku Representative for the Committee on the Preservation of Historic Sites and Cultural Properties escorted CSH to several cultural sites within Mākaha Ahupuaʻa and shared the following:

    - Mr. Becket pointed out several significant cultural sites within Mākaha Ahupuaʻa including Mauna Lahilahi, Kamaile Heiau, and Kāneaki Heiau. Mauna Lahilahi consists of several sites including an enclosure, petroglyphs, and a *koʻa*. A stone wall creating a square with several breaks in the wall sits at the bottom of the northern side of the *mauna*. The walls are constructed of basalt and coral, while the floor is completely made up of limestone. The function of the enclosure is undetermined. Mr. Becket recalls being told by cultural practitioners that branch coral at a structure might indicate a ceremonial function or a burial. However, due to the fact that the enclosure is in close proximity to the ocean, it is difficult to determine if the coral used was for construction purposes or placed to indicate a function or purpose.

- To the east of the *mauna* is a pathway made of pōhaku. Looking to the rock wall facing Waiʻanae and Nānākuli are several petroglyphs or *kiʻi pōhaku*. Petroglyphs of dogs and possible *niho* chippings were observed on the wall. On a previous site visit to Kawailoa Ahupuaʻa, Mr. Becket stated *niho* chippings indicated the site of a possible adze quarry.
- Farther past the petroglyphs were several homeless camps. Toward the point of Mauna Lahialahi was the site of a *koʻa*. The large *pōhaku* was said to be brought from Kahiki by ʻAiʻai, son of Ku-ula the fish god. Mr. Becket pointed out that behind the *koʻa* are two adjacent enclosures. However, a homeless camp now occupies the entire area behind the *koʻa* and the walls were modified to create a pathway toward the shoreline making it difficult to determine the original construction, context, and provenance. The *koʻa* faces the Waiʻanae coastline, boasting a commanding view of the Waiʻanae Mountain Range, which includes the many *puʻu* in the forefront spanning from Waiʻanae to Kahe Point.
- Mr. Becket has no concerns or recommendations regarding the project. He did point out that he recalls the project area having enclosures years ago when he was a young child in the 1960s. He remembers driving to Kaʻena with his brother and seeing large site complexes within the HECO property, which are no longer there today.

2. Eric Enos, cultural practitioner and operates Kaʻala Farms states "*I have no special concerns unless something develops needing attention. I assume this area is already heavily impacted with prior work. Let me know what develops*."
3. Paulette Kaʻanohi Kaleikini, descendant, cultural monitor, cultural practitioner, and resident of Nānākuli states "*These are my concerns regarding this project:*
   - *How deep will they need to drill for the submarine F/O beneath the ground before it moves seaward into the sandy ocean bottom.*
   - *How far inland on the Hawaiian Telcom property will the drilling will begin*
   - *Will there be a control station on the property; if yes, how large will it be and where on the property will it be located*
   - *Will the cable run under Mākaha Beach Park or north of it*
   - *Will there be an Environmental Impact Assessment*
   - *Will there be an Archaeological Inventory Survey for the area where drilling will take place*
   - *Makaha was among of the first settlement areas of ancient Hawaiians coming from the Northwestern Hawaiian islands. Anywhere excavations are planned in this sensitive area could impact a cultural layer.*
   - *The project could last several months. Hopefully, there will be minimal disturbance to the environment and Makaha beach users or I would totally object to this project. There needs to be more discussion with the community; to let them know the plans before it happens.*"
4. Shad Kāne, OIBC, ʻEwa moku and Chair for the Committee on the Preservation of Historic Sites and Cultural Properties, founder of the Kalaeloa Heritage & Legacy Foundation states "*Although I appreciate the invitation to comment and I do have a broad knowledge of the cultural landscape of Makaha I think it is much more culturally appropriate for me to defer to friends of*

mine who possess generational, place based knowledge to that parcel. As a suggestion you might want to consider speaking to Eric Enos, Bill Aila, Landis Ornellas, Vince Dodge, Albert Silva or even Representative Jo Jordan. You may even say I suggested you speak to them."

5. Donna LaFrance, Associa Hawaiʻi – property management for Mauna Olu Estates states, "*the Kāneaki Heiau has been closed due to safety issues in relation to a recent rock slide*."
6. Kaʻahiki Solis, Cultural Historian – Oʻahu SHPD states "*I have two people in Makaha that may be interested. I will get back to you today on this or as soon as they respond*."

Potential Effects and Proposed Mitigation

Based on information gathered from the background and community consultation, the proposed project may potentially impact undetected *iwi kūpuna* (ancestral bones). CSH identifies potential impacts and makes the following recommendations:

1. Previous archaeology conducted in the vicinity of the project area has yielded *iwi kūpuna* (SIHP #s 50-80-07-4527 and -6825). In addition, no archaeology has been conducted within the project area.[2] There is also a community concern regarding impact to a possible cultural layer, which may include burials (such as SIHP # -6825). Based on these findings, there is a possibility *iwi kūpuna* may be present within the project area and that land disturbing activities during construction may uncover presently undetected burials or other cultural finds. Should burials (or other cultural finds) be encountered during ground disturbance or via construction activities, all work should cease immediately and the appropriate agencies should be notified pursuant to applicable law, HRS §6E.
2. Another community concern was minimal disturbance to the environment and Mākaha Beach users (which may include cultural practitioners such as surfers and fishermen). The community's recommendation was to have more discussion with the community and to discuss plans prior to construction.

Potential Impacts of Alternatives

No adverse impacts to traditional cultural practices are anticipated to result from the alternatives considered for this project. Surrounding lands may be affected by the temporary generation of noise. Operation of the HDD boring rig is anticipated to be noisy; however, the noise effects will be intermittent, localized, and temporary. To mitigate noise effects produced from the operation of the HDD boring rig, noise attenuation barriers or enclosures baffled to restrict the escape of noise will be placed around the bore site. With the appropriate mitigation, the noise effects from the HDD boring rig are not anticipated to be significant. All work practices will be in accordance with the noise regulations of the State of Hawaiʻi and CCH (see **Section 5.12, Noise**).

During construction involving installation of support infrastructure and the F/O cable, there will be a temporary impact on coastal views due to construction equipment, and a cable ship and smaller support vessels in the water. There will be a temporary impact on views mauka of Farrington Highway due to

[2] See Section 7.2, Historic and Archaeological Resources, which addresses the archaeological investigation of the site.

use of a HDD boring rig. However, the rig will be partially obscured from view since it will be situated within a boring pit approximately 8 to 10 ft below grade, within the project site. Once construction is completed, all equipment no longer necessary to the site will be removed with no further disturbance to the scenic resources of the area. Infrastructure necessary for the project will either be buried or, in the case of the access road will be at or near grade. The proposed F/O cable, similarly, is not expected to result in potential for adverse visual impacts. The cable will be buried and therefore, will not constitute a potential source of impact.

The publication and public dissemination of this EA document will serve to provide information to the community concerning this project. In addition, public information meetings and consultation with the community will continue throughout the EA and environmental permitting process. See **Section 3.8, Regulatory and Community Consultations** for a list of permits and approvals, and public hearings and meetings to be held for the proposed project.

8.0 Relationship to Land Use Plans, Policies and Controls

8.1 Overview

Federal, State and County policies, plans, and land use controls are established to guide development in a manner that enhances the environment and quality of life. Policies, plans, and land use controls at all levels of government are promulgated to help ensure that the long-term social, economic, environmental, and land use needs of the community and region can be met. The proposed project's relationship to land use policies, plans, and controls for the region and proposed activity are as follows.

8.2 Section 404, Clean Water Act (CWA), and Section 10, Rivers and Harbors Act (RHA) (also referred to as a Department of the Army Permit)

The Department of the Army Permit application will include the areas of jurisdictional coverage under CWA, Section 404, and RHA, Section 10. Coordination will be undertaken with the USACE to address the potential for adverse effects to "Waters of the United States".

The CWA, Section 404, requires a permit before dredged or fill material may be discharged into waters of the United States including wetlands. Section 10 of the RHA (33 United States Code [USC] 401 et seq.) requires authorization from the USACE for the construction of any structure in or over any navigable water of the U. S., the excavation/dredging or deposition of material in these water or any obstruction or alteration in a navigable water. Structure or work outside the limits defined for navigable waters of the U. S. require a Section 10 Department of the Army permit if the structure or work affects the course, location, condition, or capacity of the water body.

In Hawai'i, Section 404 and Section 10 are administered by the USACE, Honolulu District. As part of the review, the USACE will assume the role of lead federal agency and consult with other Federal agencies, as required. The major regulatory review requirements include:

- Endangered Species Act of 1973 (ESA), Section 7;
- National Historic Preservation Act (NHPA), Section 106 Consultation; and
- Magnuson-Stevens Fishery Conservation and Management Act (16 USC §1801 et seq.), reauthorized as the Sustainable Fisheries Act.

Endangered Species Act of 1973 (ESA), Section 7, Consultation

The purpose of the ESA, Section 7, is to protect and conserve ecosystems upon which endangered and threatened species are dependent, and to provide for the conservation of endangered and threatened species. The ESA is administered by the U. S. Department of the Interior through the USFWS, and the U. S. Department of Commerce through the NOAA. Other applicable federal laws include:

- MMPA of 1972, as amended (16 USC §§1361-1421(H) et seq.):
  - Reauthorized in 1994, the MMPA establishes a moratorium, with certain exceptions, on the taking of marine mammals in U. S. waters and by U. S. citizens on the high seas and on

importing of marine mammals and marine mammal products into the U. S. The proposed project is not anticipated to have the potential to affect marine mammals.

- Fish and Wildlife Coordination Act of 1934, as amended (16 USC §§661-666[C] et seq.):
  - The Fish and Wildlife Coordination Act provides for consultation with the USFWS and other relevant Federal and State agencies when a Federal action proposes to modify or control U. S. waters for any purpose.
- Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 USC §§703 712 et seq.):
  - The MBTA is a bilateral migratory bird treaty with Canada, Mexico, Japan, and Russia. Sections 703 to 712 of the Act prohibit the taking of migratory birds in the absence of a permit. The proposed project is not anticipated to have the potential to affect migratory birds.

Consultation will be conducted by the USACE during the processing of the Department of the Army, Section 404/10 permit application for the HDD borehole and F/O cable installation. The proposed project is not expected to impact sensitive plants or animals, marine mammals, or migratory birds and is therefore considered consistent with the above-listed policies.

A botanical survey to assess possible project effects on botanical resources, was conducted by AECOS, Inc., and is entitled *Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002: 059), Waiʻanae District, Island of Oʻahu* (AECOS, 2015b). See **Appendix B**. Based on the botanical study the project would have no adverse effects on threatened or endangered plants therefore no mitigation measures are proposed. See **Section 5.13**.

An avifaunal and mammalian survey, to assess possible project effects to faunal resources, was conducted by AECOS, Inc., and is entitled *Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002: 059), Waiʻanae District, Island of Oʻahu* (AECOS, 2015b). See **Appendix B**. The proposed project is not anticipated to result in adverse effects to any protected (State of Hawaiʻi and federal listed threatened or endangered) species. Human-generated disturbance will continue to inhibit potential habitat at a level comparable to the present. No negative effect on plant or animal habitats or specific communities is expected and no mitigation is planned. See **Section 5.14**.

A biological survey to assess possible project effects on marine resources, was conducted by AECOS, Inc., and is entitled *Marine Biological and Water Quality Surveys off Mākaha Beach, Waiʻanae, Oʻahu* (AECOS, 2015a). See **Appendix A**. The results of the marine survey conducted in October 2015 concluded that the project would have no adverse effects on marine resources and would avoid direct impacts to sensitive marine biota through the use of BMPs, including environmental protection specifications and endangered species protection. See **Section 5.15**.

During interagency consultation pursuant to Section 7 of the ESA, the USFWS and NOAA will be consulted for concurrence with the botanical, avifaunal, and marine survey determinations that the proposed project would not adversely affect threatened or endangered species.

National Historic Preservation Act (NHPA), Section 106, Consultation

The NHPA requires that federal agencies consider the effect of their actions on any district, site, building, structure or object that is included or eligible for inclusion in the National Register of Historic Places (NRHP). Such resources are called "historic properties." Under Section 106, a federal action (or undertaking) may involve federally funded projects, activities, or programs, including those carried out with federal financial assistance. Federal actions also include projects requiring a federal permit, license or approval, including those where federal authority has been delegated to a state or local agency.

Section 106 Review refers to the Federal review process designed to ensure that historic properties are considered during Federal project planning and implementation. The goal of the process is to identify historic properties potentially affected by the proposed project, assess the impacts, and seek ways to minimize or mitigate adverse effects. The U. S. Department of Interior, National Park Service, and the Advisory Council on Historic Preservation (ACHP) administer the NHPA. At the State level, the State Historic Preservation Officer (SHPO) implements the NHPA.

An AA, originally termed an AIS, of the project area was undertaken by CSH, in consultation with the SHPD, Archaeology and Architecture Branches, DLNR. No historic properties were identified within the project area during the initial AIS investigation; therefore, the report is termed an archaeological assessment, per HAR §13-284-5(b)(5)(A):

> *"Results of the survey shall be reported through an archaeological assessment, if no sites were found, or an archaeological survey report which meets the minimum standards set forth in chapter 13-276-5."*

The AA was prepared to support the proposed project's historic preservation review under Section 106, NHPA, National Environmental Policy Act (NEPA), HRS Chapter 6E-42, HAR Chapter 13-13-276, and HAR Chapter 13-284. The AA also supports project-related historic preservation consultation among stake-holding federal and state agencies, interested Native Hawaiian organizations, groups and individuals, and community groups. **Appendix C** contains a full copy of the November 2015 draft report entitled, *Archaeological Assessment for the Southeast Asia – U. S. (SEA-US) Cable Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu TMK: [1] 8-4-002: 059* (CSH, 2015a). While no historic properties were identified within the project area, as required, the SHPD will be consulted for the proposed project. A community consultation effort was undertaken as a component of the CIS investigation (**Appendix D**).

Magnuson-Stevens Fishery Conservation and Management Act (16 USC §1801 et seq.)

The Magnuson-Stevens Act (16 USC §1801 et seq.), as amended by the Sustainable Fisheries Act, PL 104-297, calls for action to stop or reverse the loss of marine fish habitat. The waters out to 200 miles around the Hawaiian Islands are under the jurisdiction of the Western Pacific Regional Fishery Management Council (WPRFMC). The WPRFMC has approved a Fisheries Management Plans for Hawaii that designates all the ocean waters surrounding Oahu, from the shore to depths of over 100 ft, including the area that would be affected by the proposed project as "Essential Fish Habitat".

The WPRFMC has also identified "Habitat Areas of Particular Concern". As defined in the 1996 amendments to the Act, these habitats are a subset of EFH that are "rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area."

A biological survey to assess possible project effects on marine resources, was conducted by AECOS, Inc., and is entitled *Marine Biological and Water Quality Surveys off Mākaha Beach, Waiʻanae, Oʻahu* (AECOS, 2015a). See **Appendix A**. The proposed project is located within waters designated as EFH (including water column and all bottom areas) for coral reef ecosystem, bottomfish, pelagic and crustacean MUS. Of the thousands of species which are federally managed under the coral reef Fishery Management Plan, at least 61 (juvenile and adult life stages; MRC, 2005) are known to occur in waters off Mākaha Beach Park. See **Section 5.15** for proposed mitigation.

Discussion

Installation of the F/O cable will involve use of HDD equipment to create an approximately 80 to +100 ft deep underground borehole daylighting in sandy ocean bottom at a depth of approximately 14 to 17 meters. Drill pipe will be placed into the borehole as the drill bit progresses and the generation of drilling fluid controlled. Following HDD, the remaining drill pipe will be used as conduit to pull the F/O cable to a specially prepared BMH located at the Hawaiian Telcom property. The F/O cable will then be connected to a newly constructed CLS at the project site. The main F/O cable lay will require use of a cableship and smaller support vessels in the water. During daylighting of the drill bit there will be support boats and divers and/or an ROV in the water. It is anticipated that during daylight activities and cable installation, that the area surrounding the ocean end of the borehole will have to be closed off to the public. Ocean closure of the area will be to ensure safety of the public and is expected to include only the submerged landing site with a total area of approximately ±100 ft by ±100 ft. Closure of nearshore waters will be accomplished by publishing a notice advising mariners to temporarily avoid the area on days when the ship will lay cable (see also **Section 6.2**).

Sediments removed from the earth during HDD will be hydraulically suspended by drilling fluid as the drill bit progresses. The drilling fluid containing sediments (spoils) will be returned to the drilling pit for processing in a slurry separation plant to process and reuse the drilling fluid. Waste sediments that result from the process will be collected and disposed of at an appropriate disposal site (e.g., PVT Construction and Demolition Landfill) or reused for construction purposes (e.g., backfill or fill/cover material based on the use of inert bentonite mixed with sediments).

The use of drilling fluid will cease prior to the daylighting of the drill bit or head, on the ocean bottom. This will significantly reduce or eliminate the release of the bentonite-based drilling fluid into the water column and maintain clear visibility conditions for the divers who will be prepared to remove the drill head.

Work proposed within the Pacific Ocean is expected to require the filing of a Department of the Army permit. The permit preparation, related regulatory review, and filing will be coordinated with the

USACE, Honolulu Branch and will include the provision of appropriate mitigation measures and controls for the protection of the environment (see **Section 5.6, Section 5.14** and **Section 5.15**).

8.3 Section 401, Water Quality Certification (WQC)

The CWA is the key legislation governing surface water quality protection in the United States. Sections 401 and 402 of the Act require permits for actions that involve wastewater discharges or discharge of dredged or fill material into waters of the United States. The EPA is responsible for administering the CWA. In Hawaii, the U.S. EPA has delegated responsibility for implementing the Act to the State. States can use their WQS in Section 401 WQC to review and approve, condition, or deny all federal permits or licenses that may result in discharges to state waters, including wetlands. States and tribes make decisions to deny, certify, or condition permits or licenses primarily to ensure that the activity will comply with State WQS. In addition, states and tribes look at whether the activity will violate effluent limitations, new source performance standards, toxic pollutants, and other water resource requirements of state/tribal law or regulation.

Discussion

The placement of the proposed F/O cable within the ocean constitutes fill as defined in the CWA and may be subject to regulations implementing Section 401 of the CWA. A Section 401 WQC Application for this project, if determined applicable by USACE, will be submitted to the State DOH.

The USACE Regulatory Branch and the DOH, CWB will be consulted to identify permitting requirements pertaining to their jurisdiction under the CWA, Section 401. In addition, a NPDES permit pursuant to the CWA, Section 402, will be filed for construction storm water discharges.

8.4 Hawaiʻi State Plan

The Hawaiʻi State Plan, HRS, Chapter 226, serves as a guide for future long-range development of the state. It consists of comprehensive goals, objectives, policies, and priorities for all areas of government functions. These functions include the protection of the physical environment, the provision of public facilities systems, and the promotion and assistance of socio-cultural advancement. Policies applicable to the proposed project are listed below.

§226-10 Objective and policies for the economy--potential growth activities.

(a) Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.

(b) To achieve the potential growth activity objective, it shall be the policy of this State to:

(3) Enhance and promote Hawaii's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts.

(8) Develop, promote, and support research and educational and training programs that will enhance Hawaii's ability to attract and develop economic activities of benefit to Hawaii.

(11) Increase research and development of businesses and services in the telecommunications and information industries.

Discussion:

The proposed project will facilitate expanded access to telecommunications services necessary to enhance and promote Hawaii's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts. The project is intended to improve the long-distance transmission of domestic and international F/O signals and reinforce Hawaiʻi's position as a hub in trans-Pacific submarine telecommunications networks, which will facilitate the future economic growth of the State. The anticipated entry of new capacity by the SEA-US cable system will promote telecommunications services and increase accessibility and use of telecommuting for business, commerce and cultural exchange. This will primarily be from Southeast Asian nations including Indonesia and the Philippines, the U. S. territory of Guam, and the Western U. S., which will be directly connected with the cable system in Hawaiʻi.

The proposed project serves to promote and expand research and development of businesses and services in the telecommunications and information industries. The proposed SEA-US cable system will have high operating bandwidth enabling the use of high technology services such as telemedicine and real time videotrafficing.

§226-10.5 Objectives and policies for the economy--information industry.

(a) Planning for the State's economy with regard to the information industry shall be directed toward the achievement of the objective of positioning Hawaii as the leading dealer in information businesses and services in the Pacific Rim.

(b) To achieve the information industry objective, it shall be the policy of this State to:

(1) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawaii to accommodate future growth in the information industry.

(4) Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people.

(5) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the information industry.

(6) Foster a recognition of the contribution of the information industry to Hawaii's economy.

(7) Assist in the promotion of Hawaii as a broker, creator, and processor of information in the Pacific.

Discussion:

The proposed project may encourage development and expansion of the telecommunications infrastructure serving Hawaiʻi to accommodate future growth in the information industry. This would provide opportunities for Hawaiʻi's people to obtain job training and education that would allow for upward mobility within the information industry. The project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided. The planned project would benefit both the resident and visiting populations on Oʻahu, and will enable Oʻahu to continue to be a desirable place to live and visit.

§226-14 Objective and policies for facility systems--in general.

(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.

(b) To achieve the general facility systems objective, it shall be the policy of this State to:

(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.

(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.

(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.

Discussion:

The proposed project would result in long-term positive impacts in the areas of social benefit for residents and visitors. Long-term gains resulting from development of the proposed project include provision of more effective State telecommunications capabilities (by means of transmission from the F/O cable). The proposed project will maintain and enhance economic productivity by increasing telecommunications service between the State and international (Southeast Asian nations and Guam) and domestic (Western U. S.) locations.

§226-18.5 Objectives and policies for facility systems--telecommunications.

(a) Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people.

(b) To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand.

(c) To further achieve the telecommunications objective, it shall be the policy of this State to:

(1) Facilitate research and development of telecommunications systems and resources.

(2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning.

Discussion:

The proposed project is intended to improve telecommunications capabilities between the Southeast Asian nations of Indonesia and the Philippines, the U. S. territory of Guam, Western U. S., and Hawaiʻi. The project will enhance telecommunications speed and reliability by providing a high operating bandwidth cable system. This will enable the use of high technology services such as telemedicine and real time videotrafficing, and serve to promote telecommunications services and increase accessibility and use of telecommuting for business, commerce and cultural exchange. The proposed project will also serve to provide an alternative to the existing F/O cable systems between the proposed locations in the event of system failure or damage and ensure adequate and dependable telecommunications services to accommodate demand.

8.5 Hawaiʻi State Functional Plans

The Hawaiʻi State Functional Plans (Chapter 226) provides a management program that allows for use of Hawaii's natural resources to improve current conditions and attend to various societal issues and trends. The following objectives of the Functional Plans are relevant to the proposed project:

A(4): Services and Facilities:

Policy: Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs. [Hawaii State Plan, Socio-cultural advancement-Education 226-21(b)(21)].

Goal: Provide facilities that are sufficient in number, functional, well-paced and compatible with the physical surroundings. [Working Together Toward Excellence D-I-2].

Education Implementing Action A(4)(c): Pursue actions with other agencies which will insure adequate and appropriate services and facilities on a timely basis.

Discussion:

The proposed project will facilitate expanded access to telecommunications services necessary for Hawaii's schools. This will primarily be from Southeast Asian nations including Indonesia and the Philippines, the U. S. territory of Guam, and the Western U. S., which will be directly connected with the cable system in Hawaiʻi.

B(3): Increased Use of Technology:

Policy: Increase and improve the use information technology in education and encourage programs which increase the public's awareness and understanding of the impact of information technologies on our lives. [Hawaiʻi State Plan, Quality Education 226-107(5)].

Goal: Develop a plan to pinpoint, analyze and use technology to improve classroom instruction. [Working Together Toward Excellence C-I-2]

Education Implementing Action B(3)(d):
Promote and expand the appropriate use of technology (e.g., telecommunications, computers) to deliver distance education as well as enhance the learning process and communication competencies of students.

Discussion:

The proposed project serves to promote and expand the appropriate use of telecommunications to deliver distance education as well as enhance the learning process and communication competencies of students.

Education Implementing Action B(3)(e):

Enable school library media centers to effectively manage and provide access to information and knowledge through telecommunication, computer and other technologies that can:

(a) Link public schools for purposes of cooperative information retrieval;
(b) Create essential statewide databases;
(c) Gateway to national and international databases and distance learning opportunities.

Discussion:

The proposed project enables school library media centers to effectively manage and provide access to information and knowledge through telecommunications.

8.6 Hawaiʻi State Land Use Law

The Hawaiʻi State Land Use Law, entitled "State Land Use Commission," HRS, Chapter 205, was adopted in 1961. The law is meant to preserve and protect Hawaiʻi lands, and encourage the uses to which the lands are best suited. All land in Hawaiʻi is classified as one of the four districts: Urban, Rural, Agricultural or Conservation. The proposed terrestrial project site is located within the State Land Use Urban District. The submerged portion of the project is designated within the State Conservation District, Resource Subzone, and will require filing of a CDUP Application. See **Figure 8-1**, **State Land Use Districts**. The Conservation District is generally intended to protect and preserve lands with natural resource and other values necessary to the future welfare of the State. This would include lands on which the F/O cable would be placed having an elevation below the shoreline such as marine waters, fish ponds, and tide pools of the State.

According to Chapter 13-5, Section 22, HAR, which governs uses in the State Conservation District, public purpose uses may be permitted as identified by the letter "D". Public purpose uses may require a BLNR permit, and where indicated a management plan. According to Chapter 13-5, Section 22, HAR:

"*P-6 Public Purpose Uses*

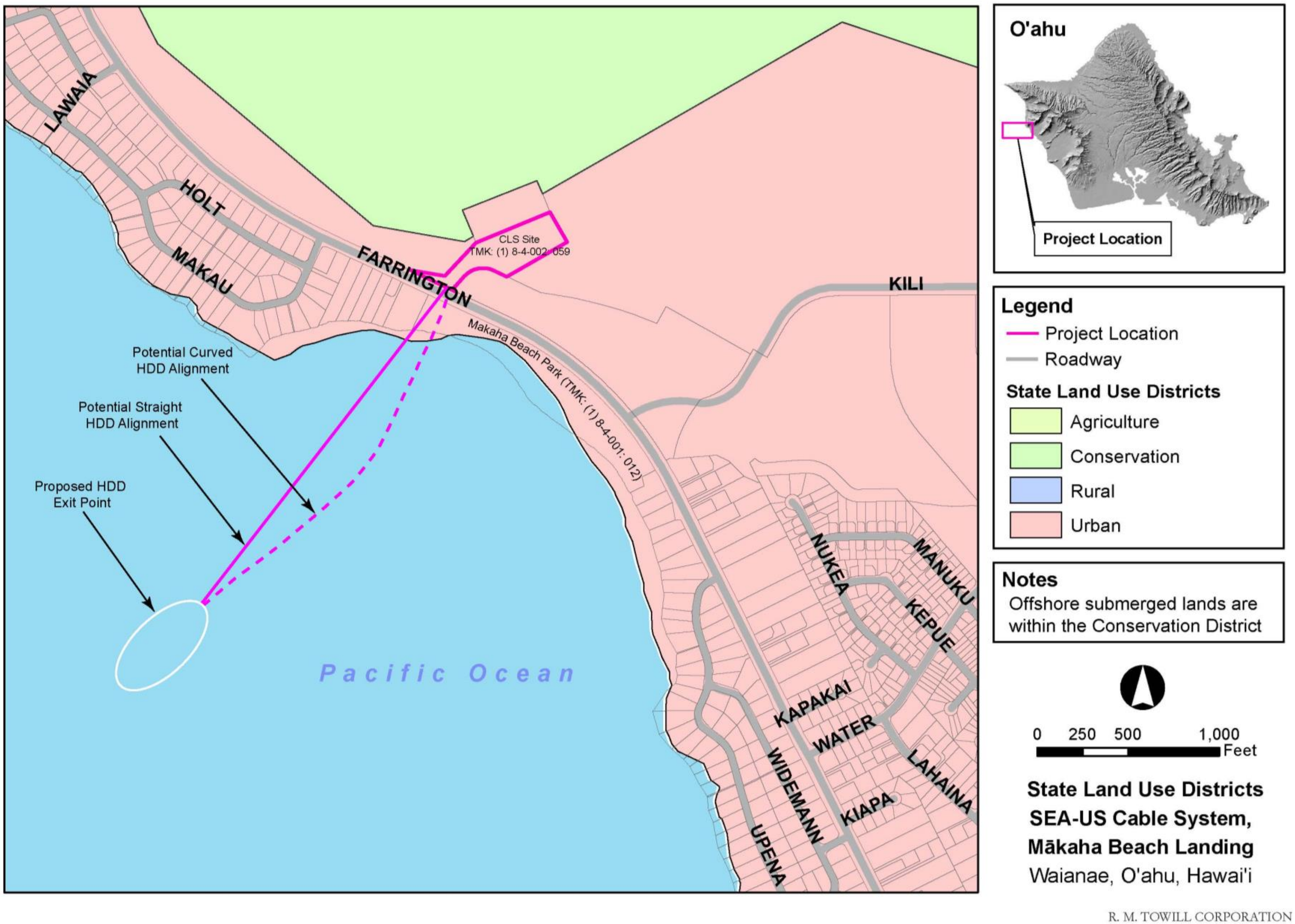
(D-1) Land uses undertaken by the State of Hawaiʻi or the counties to fulfill a mandated governmental function, activity, or service for public benefit and in accordance with public policy and the purpose of the conservation district. Such land uses may include transportation systems, water systems, communications systems, and recreational facilities."

No land use change is required for the cable landing.

Discussion

The project is consistent with the State Land Use Urban District. For work required in the Conservation District a CDUP will need to be obtained (see **Section 8.7**). No changes to State Land Use Districts within the project boundaries are required.

Figure 8-1, State Land Use Districts



8.7 Conservation District Use Permit (CDUP)

HRS, Chapter 183C, Conservation Districts, directed the DLNR and the BLNR to manage and regulate the Conservation District. The Conservation District includes all submerged lands from the shoreline to a distance of 12 miles offshore. Therefore, the project area required seaward of the shoreline would be within the Conservation District, Resource Subzone, and subject to CDUP requirements.

According to HRS, Section 13-5-22, Identified Land Uses in the Protective Subzone, P-6, Public Purpose Uses, (D-2), “communication systems and other such land uses which are undertaken by non-governmental entities which benefit the public” are allowed with a CDUP. HAR, Section 13-5.23, Identified Land Uses in the Resource Subzone, states that “all identified land uses and their associated permit or site plan approval requirements listed for the protective subzone also apply to the resource subzone unless otherwise noted.”

Discussion

The project area seaward of the shoreline is located within the Conservation District. To address state requirements for uses in the Conservation District and use of State waters for the HDD boring and installation of the F/O cable a CDUP application will be filled with the DLNR, OCCL. A public hearing and a hearing before the BLNR will be required for approval. A right-of-entry and grant of submarine easement within state waters will be required from the BLNR for the proposed project for the placement of the SEA-US F/O cable in state waters. This will require a public hearing and hearing before BLNR for approval. The grant of easement and CDUP will be sought contemporaneously.

8.8 Coastal Zone Management Act (CZMA)

The proposed project is located within the Coastal Zone as defined by the State of Hawaiʻi. The CZM area encompasses the entire state and extends seaward to the limit of the State’s police power and management authority, to include the territorial sea. The CZMA, enacted 1972, provides states with financial incentives for the development and implementation of CZM practices, and limited review power over federal actions affecting the State’s coastal zone. Hawaiʻi’s Coastal Zone Management Program (CZMP) was enacted to provide a common focus for State and County actions dealing with land and water uses and activities. Projects needing federal permits are required by the CZMA to be consistent with Hawaiʻi’s CZMP objectives and policies. The project will undergo review through a CZM FEDCON Determination by the Hawaiʻi Office of Planning.

The proposed project will be designed and constructed in conformance with the goals, policies, and objectives of the Hawaiʻi CZMP. The State of Hawaiʻi designates the CZMP to manage the intent, purpose and provisions of HRS, Chapter 205(A)-2, as amended, for the areas from the shoreline to the seaward limit of the State’s jurisdiction, and any other area which a lead agency may designate for the purpose of administering the CZMP. All land and water use activities in the State must comply with HRS, Chapter 205A, Hawaiʻi Coastal Zone Law.

Discussion

The following is an assessment of the project with respect to the CZMP objectives and policies set forth in SMA, HRS Chapter 205, section (A)-2.

1. Recreational resources

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

A) Improve coordination and funding of coastal recreational planning and management; and

B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.

Potential Impacts of Alternatives

During HDD operations when the drill bit daylights at the ocean end and during installation of the F/O cable by the cable ship the contractors will control access to the work area near the vessels to maintain safe distances between the public and the active area of work. Closure of nearshore waters will be accomplished by publishing a notice advising mariners to temporarily avoid the area on days when the ship will lay cable. The period of time involving closure of the nearshore waters is expected to be temporary.

The project activity will not preclude use of the Mākaha Beach Park, TMK: (1) 8-4-001: 012, and the beach will remain open during the activity. This is because the use of HDD will permit installation of the cable within an underground drill pipe at a depth of approximately 80 to 100 ft or more with no disturbance to the fast land or portions of the park. The drill pipe will extend from the CLS project site beneath Mākaha Beach Park and Farrington Highway to the submerged landing site. No adverse impacts to beach and shoreline resources are anticipated. The project is not expected to affect any public recreational facilities or opportunities.

2. Historic resources

Objective: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archaeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Potential Impacts of Alternatives

An AA, originally termed an AIS, of the project area was undertaken by CSH, in consultation with the SHPD, Archaeology and Architecture Branches, DLNR. No historic properties were identified within the project area during the initial AIS investigation; therefore, the report was termed an AA, per HAR §13-284-5(b)(5)(A). No further mitigation in the form of archaeological historic preservation work is recommended. No adverse impacts to historic resources are anticipated to result from the alternatives considered for this project. No mitigation is needed or recommended (see **Section 7.2**).

In accordance with HRS, Chapter 6E, and the requirements of the SHPD, DLNR, should any historic resources, including human skeletal and significant cultural remains, be identified during project activities: (1) work will cease in the immediate vicinity of the find; (2) the find will be protected from any additional disturbance; and (3) the SHPD, will be contacted immediately at (808) 692-8015 (Main Office, Oʻahu) for further instructions including the conditions under which project activities may resume.

3. Scenic and open space resources

Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural land forms and existing public views to and along the shoreline;

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments that are not coastal dependent to locate in inland areas.

Potential Impacts of Alternatives

The proposed project conforms to the CZMP Objective 3, Scenic and Open Space, by ensuring that the new development is compatible with the visual environment by designing and locating the project to minimize the alteration of natural landforms and existing public views to and along the shoreline. The project design encourages the protection and preservation of the quality of coastal scenic and open space resources. The major identified view planes in the project area are the views from Farrington Highway of the Waiʻanae Mountains, Mākaha Beach, and Lahilahi Point. The proposed project should not be considered as particularly obtrusive, unusual, or adverse to any view plane.

4. Coastal ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Potential Impacts of Alternatives

The proposed project is not expected have any adverse effects on coastal ecosystems. Potential short-term and temporary impacts on marine biological resources from the proposed project could occur during the cable laying and nearshore landing operations. Marine surveys undertaken for the proposed project were used in identifying a route and design to minimize the potential for impacts to coral reefs and disruption or degradation of coastal water resources. The proposed project will take place within the extensive sand channel offshore of Mākaha Beach beyond the surf zone. Farther offshore, the cable will be placed along a predetermined route on the ocean bottom where sand and uncolonized habitat dominates the seabed.

During landing operations the drill bit will daylight within sandy ocean bottom to avoid impacts to coral reefs. Although HDD would require daylighting at the ocean end, the potential for increased turbidity generated by the drill bit can be more readily controlled at a specific, localized point. To minimize turbidity in submerged waters during daylighting operations, the drill bit will be slowed or stopped completely. Operation of the drill will involve use of a lubricant such as bentonite to facilitate passage of the drill bit through the substratum. The HDD contractor will be directed to avoid lubricant discharges, as much as is practicable, at the ocean end. The use of lubricant will cease approximately ±100 LF prior to daylighting to avoid any discharges to State waters.

During construction, BMPs will be employed in compliance with applicable permit requirements to prevent pollutant discharge in storm water runoff. Measures to prevent sediment discharge in storm water runoff during construction will be in place and functional before project activities begin and will be maintained throughout the construction period. Runoff and discharge pollution prevention measures will be incorporated into a site-specific BMP plan. The potential for adverse impacts to the coastal ecosystems will be addressed through adherence to all USACE, DOH, and CCH regulatory requirements.

5. Economic uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Potential Impacts of Alternatives

The proposed project is for the installation of a transpacific F/O cable for which landing operations are coastal dependent. Ultimately, the final build-out of the SEA-US project will result in improved telecommunications connectivity between Southeast Asia, Hawaiʻi, Guam, and the U. S. West Coast. The project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided. The project is designed to minimize adverse social, visual, and environmental impacts in the coastal zone management area and to locate the proposed cable at Mākaha Beach, one of the major international subsea cable landing sites in Hawaiʻi. The project will not conflict with policies regarding economic use. There are no adverse economic effects resulting from the project.

6. Coastal hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Potential Impacts of Alternatives

The project site is primarily located within FEMA-FIRM Zone X, an area determined to be outside of the 0.2% annual chance floodplain. This is reflected in FEMA-FIRM map 15003C0177H (HI-NFIP, 2011). The proposed CLS site is located outside of the tsunami evacuation zone, as designated by the CCH, DPP Oʻahu tsunami evacuation zone map 15 (CCH, DPP, 2010). The CLS site is located in the XTEZ, for which in the unlikely event of an extreme tsunami, waves may move significantly inland. See **Section 5.8**, **Natural Hazards**.

The project is not expected to exacerbate flooding or affect flood zone areas. Erosion control measures will be employed during construction. Following project completion, permanent soil stabilization will be achieved through the use of grassing and ground cover vegetation.

7. Managing development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Potential Impacts of Alternatives

This EA has been prepared under the procedural provisions of HRS, Chapter 343, and HAR, Title 11, Chapter 200, which allows for public review and participation. Accordingly, the preparation of this EA, and disclosure of anticipated effects of the project, will comply with the policy on managing development.

8. Public participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

(A) Promote public involvement in coastal zone management processes;

(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific mitigation to respond to coastal issues and conflicts.

Potential Impacts of Alternatives

Public involvement in the project will consist of public notice of the proposed action during the State EA process in the State Office of Environmental Quality Control (OEQC) Bulletin. See **Section 10.0** for a list of the agencies, organizations and individuals that have been or will be consulted for this project. All written public comments will be provided with a written response. Where appropriate, mitigation measures will be developed to address issues and concerns raised during public review of the project.

9. Beach protection

Objective: Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Potential Impacts of Alternatives

The project site will be located inland and will not affect beach processes. HDD will be utilized in order to avoid surface disturbance to roads and beaches. The process of HDD will allow the cable to be installed by drilling to a depth of 80 to 100 ft or more under the beach area to the offshore landing site in the sandy ocean bottom; therefore, limiting impacts at the bore exit point and avoiding disturbance to the beach and coastal resources. BMPs will be used during construction and any excavated unusable material will be transported off site to prevent discharges of sediments to State waters.

10. Marine resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

> *(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and*
>
> *(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

Potential Impacts of Alternatives

Marine biological and water quality assessments were conducted to determine the effects of the proposed project on marine and coastal resources. These studies are included in this EA (see **Appendix A**). See **Section 5.15** for further discussion on marine and nearshore biological resources occurring in the vicinity of the project and proposed mitigation.

During the construction phase, potential for impacts to marine resources from the HDD operation, and installation and landing of the F/O cable at a depth of approximately 14 to17 meters below msl, may result as the drill bit emerges from the submerged bottom. This activity could temporarily generate increased levels of turbidity, which would affect surrounding benthic communities. Management and construction work practices to prevent and avoid lubricant discharges at the ocean end will include:

- As the directional drill bit approaches the submerged target site (approximately ±100 LF prior to daylighting) the drill bit speed will be reduced to the minimum necessary. The use of lubricant to the drill head will also be stopped to avoid any releases as the drill bit emerges or "daylights" at the ocean bottom;
- The location where the drill bit will daylight generally consists of hard bottom substrate covered by a sand channel approximately one to three meters in thickness. As the drill bit emerges from the sand covered hard substrate, the blanketing effect of the sand, shutoff of lubricant, and shutdown of the rotating drill head, will all help to prevent and control the release of any sediments and turbidity; and
- As required, support boats will be used to observe and supervise all operations involving in-water work.

The proposed use of HDD for the installation of the SEA-US cable system is expected to be an improvement over trenching methods within the nearshore cable alignment. Although directional boring would require daylighting at the ocean end, the potential for increased turbidity generated by the drill bit can be more readily controlled at a specific, localized point.

The scope and scale of the project will be limited to the installation of a F/O cable, BMH, and CLS. Following construction, the cable and CLS will not affect marine or aquatic resources. The CLS site and BMH will be located inland and will not impact the marine environment. BMPs will be employed during construction and excavated material transported off site to prevent discharges of sediments into State waters that could affect marine or aquatic environments.

The USACE, NOAA, USFWS, and USCG will be consulted for the proposed project. All necessary permit applications and environmental and building permit approvals will be secured prior to the initiation of construction activities. See **Section 9.0**, **Permits and Approvals that May be Required**, for further detail.

8.9 General Plan (GP) of the City and County of Honolulu

The General Plan (GP), a requirement of the CCH Charter, is a written commitment by CCH to a future for the Island of Oʻahu. The current plan, approved in 2002, is a statement of the long-range social, economic, environmental, and design objectives and a statement of broad policies which facilitate the attainment of the objectives of the plan. The plan is currently being updated.

The sections of the approved GP most relevant to this project include:

Section II, "Economic Activity"

Objective A: To promote employment opportunities that will enable all the people of Oʻahu to attain a decent standard of living.

Policy 3: Encourage the development in appropriate locations on Oʻahu of trade, communications, and other industries of a nonpolluting nature.

Section V, "Transportation and Utilities"

Objective D: To maintain transportation and utility systems which will help Oʻahu continue to be a desirable place to live and visit.

Policy 3: Encourage the study and use of telecommunications as an alternative to conventional transportation facilities.

Policy 5: Require the installation of underground utility lines wherever feasible.

Discussion

The project is consistent with GP Section II, Objective A, to promote employment opportunities that will enable all the people of Oʻahu to attain a decent standard of living and Section V, Objective D, to maintain transportation and utility systems, which will help Oʻahu continue to be a desirable place to live and visit. The proposed project is intended to fulfill the following objectives:

- Provide reliable telecommunications service between Indonesia, the Philippines, Guam, and the U. S. West Coast, and Hawaiʻi;
- Enhance service now provided through cable systems that have limited bandwidth capacity. The proposed SEA-US cable system will have high operating bandwidth enabling the use of high technology services such as telemedicine and real time videotrafficing;
- Provide an alternative to the existing F/O cable systems between the proposed locations in the event of system failure or damage;
- Encourage development and expansion of the telecommunications infrastructure serving Hawaiʻi to accommodate future growth in the information industry; and,
- Provide opportunities for Hawaiʻi's people to obtain job training and education that would allow for upward mobility within the information industry.

The planned project would benefit both the resident and visiting populations on Oʻahu, and will enable Oʻahu to continue to be a desirable place to live and visit.

8.10 Waiʻanae Sustainable Communities Plan (WSCP)

The purpose of the development plans and sustainable community plans prepared by the CCH, DPP, is to implement the GP in specific geographic areas. The WSCP area encompasses the leeward coast of Oʻahu from Nānākuli to Kaena Point and is enclosed by the Leeward slopes of the Waiʻanae mountain range. The area includes the ahupuaʻa of Nānākuli, Lualualei, Waiʻanae, Mākaha, Keaʻau, ʻOhikilolo, Mākua, Kahanahāiki, Keawaʻula (CCH, 2012). The provisions of the WSCP are not regulatory but are meant to provide a coherent vision to guide resource protection and land use in Waiʻanae District. However, the plan does provide guidance for development in the Waiʻanae District, public investment in infrastructure, zoning and other regulatory procedures, and the preparation of the CCH's annual capital improvement program budget.

The most recently-approved WSCP is contained in ROH, Chapter 24, Article 9, effective March 2012. It is the intent of the plan to:

> *"…provide a guide for orderly and coordinated public and private sector development in a manner that is consistent with applicable General Plan provisions, including the designation of Waiʻanae as a rural area and the agricultural land along the Waiʻanae coast for farming, livestock production, and other types of diversified agriculture"* (ROH, Section 24-9.2(b)).

Below are excerpts from the WSCP, March 2012, and a discussion of the proposed project's consistency with the plan.

- Chapter 1: Waianae's Role in Oahu's Development Pattern. *"Consistent with the directed growth policies of the City's <u>General Plan</u>, the Waiʻanae District is targeted for very little growth over the 25-year timeline of this Plan. The focus of the Plan is thus preservation of the rural landscape and of the rural lifestyle of the Waiʻanae District's people."*

  The proposed project involves installation activities as described in **Section 3.0**. During HDD operations, drill pipe will be advanced with the drill bit and placed within the borehole to be used as conduit on the day of the cable pull from nearshore waters. The cable will then be installed by pulling the cable through the drill pipe that runs under Mākaha Beach and Farrington Highway and to a new BMH and CLS. Excavation activities and equipment staging will cause temporary visual impacts in the area, but the project will not cause long term impacts to the rural landscape and the country lifestyle of the Waiʻanae District's people.

- Chapter 2: The Vision for the Future of the Waiʻanae District. *"This chapter presents the overarching concepts and goals… and includes the vision statement for the long-range future of the Waiʻanae District."*

As part of the EA process, community participation will be sought. A public meeting will be held with the Waiʻanae Neighborhood Board and consulted as part of the planning process for the proposed project.

- Chapter 3: Land Use Policies and Guidelines. "*This chapter presents policies and guidelines for the principal types of land use that should be provided for in the Waianae District."*

  The proposed project is consistent with the policies and guidelines presented in Chapter 3, which include, but are not limited to, preservation of open space, preservation of coastal lands, preservation of mountain forest land, preservation of streams and stream floodplains, preservation of historic and cultural resources, and preservation of agricultural lands.

- Chapter 4: Public Facilities and Infrastructure Policies and Guidelines. *"This chapter presents policies and guidelines for the principal infrastructure systems that the Waiʻanae Community would like to see provided for the District."*

  Guidelines for electric power and communications lines aim to reduce the visual impact of power lines and utility poles, especially along Farrington Highway. The SEA-US F/O cable will be principally placed underground in conduit. Above ground utilities, if required for relocation, will be placed on either the existing or relocated utility poles.

Discussion

The project is consistent with policies and specific goals of the WSCP. No mitigation is needed or recommended. Existing overhead utility lines and poles located at the project site will be relocated on-site to accommodate the new construction.

8.11 City and County of Honolulu Zoning

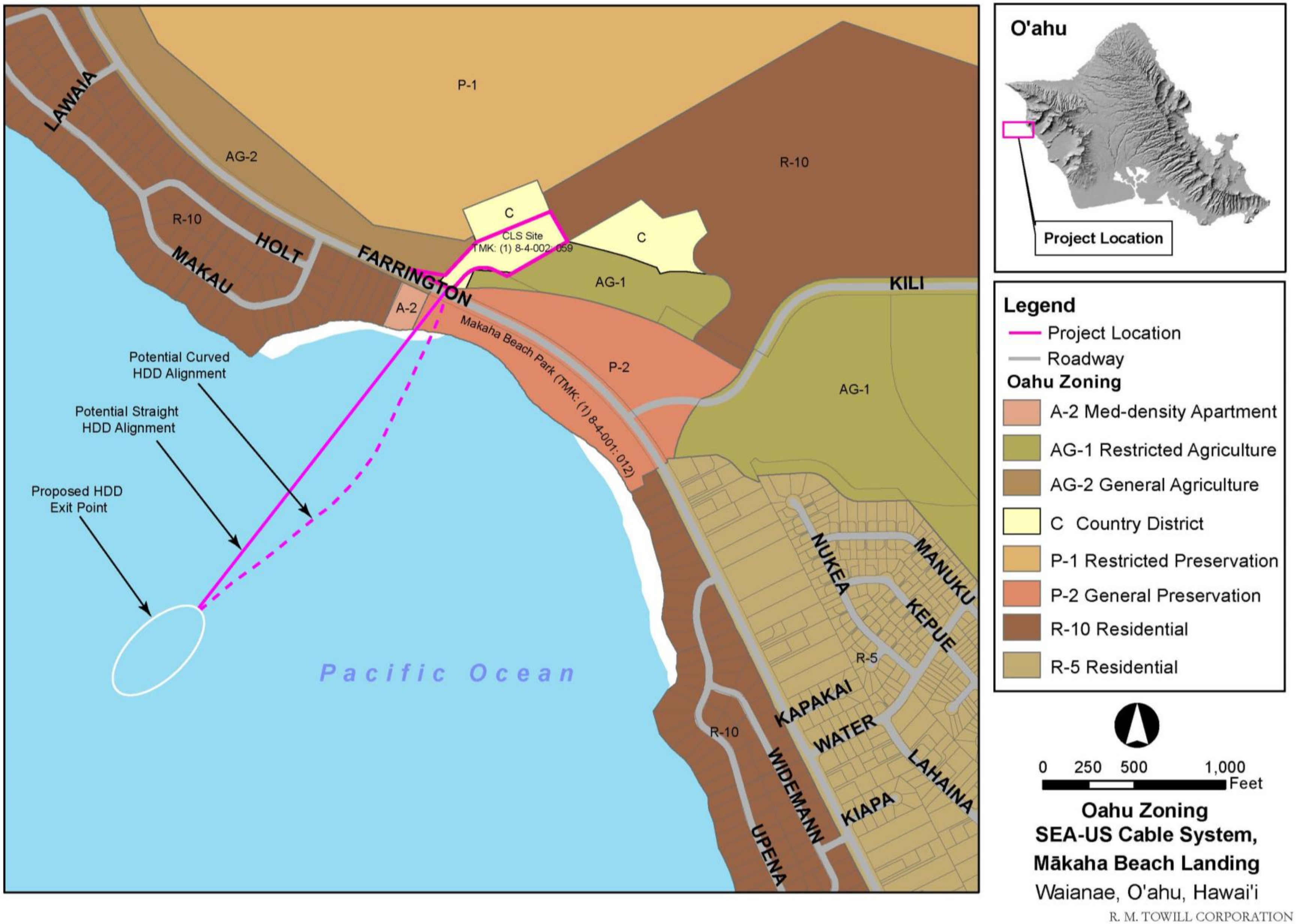
Land uses within the CCH jurisdiction are regulated under ROH, Chapter 21, Land Use Ordinance or LUO. The purpose of the LUO, as stated in section 21.1.20, is to:

> *"… regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, including the Oʻahu general plan and development plans, and to promote and protect the public health, safety and welfare."*

CCH zoning for the project site, TMK (1) 8-4-002: 059, is Country. See **Figure 8-2**, **Oʻahu Zoning**. Utility systems are permitted in every zoning district and are classified as being either Type A or B. Type B utility installations are those with potential major impact, by virtue of their appearance, noise, size, traffic generation or other operational characteristics. Type A projects, on the other hand, would cause minor/no impact on adjacent land uses.

The proposed project would be considered a utility installation, Type A, due to the operational characteristics of the CLS facility, and is considered a permitted use by the CCH, DPP. The maximum height for the proposed CLS building will not exceed the height restrictions for the designated Country zone. No changes to CCH zoning is required.

Figure 8-2, Oʻahu Zoning



Discussion

The proposed project will require the installation and operation of the CLS within the CCH's Country zone, and is considered a permitted use by the CCH, DPP. The project is not anticipated to cause any impacts to neighboring land uses, generate any increase in noise or traffic following construction, influence zoning of any adjoining parcels, or affect the existing CCH zoning in the area. No mitigation is needed or recommended to address zoning.

8.12 Special Management Area (SMA) Rules and Regulations

The SMA is a regulated zone extending inland from the shoreline to a landward boundary delineated by the CCH on O'ahu. The landward boundary of the SMA can vary from a few dozen feet to more than a mile. A portion of the project area, specifically the underground shoreline HDD route and a small piece of the southern corner of the project site, is in the CCH's SMA zone and therefore subject to CCH SMA regulations. See **Figure 8-3**, **Special Management Area**.

Discussion

A SMA Minor Permit, in accordance with ROH, Chapter 25, will be required for construction work in the CCH's SMA involving HDD and cable installation, and will be subject to review and evaluation by the CCH, DPP. Please refer to **Section 8.8** for an analysis of the proposed project with regard to HRS, Chapter 205(A)(2), *Coastal Zone Management*.

8.13 Shoreline Setback Variance (SSV) Permit

The Hawai'i CZMA program designate the areas along the shoreline for:

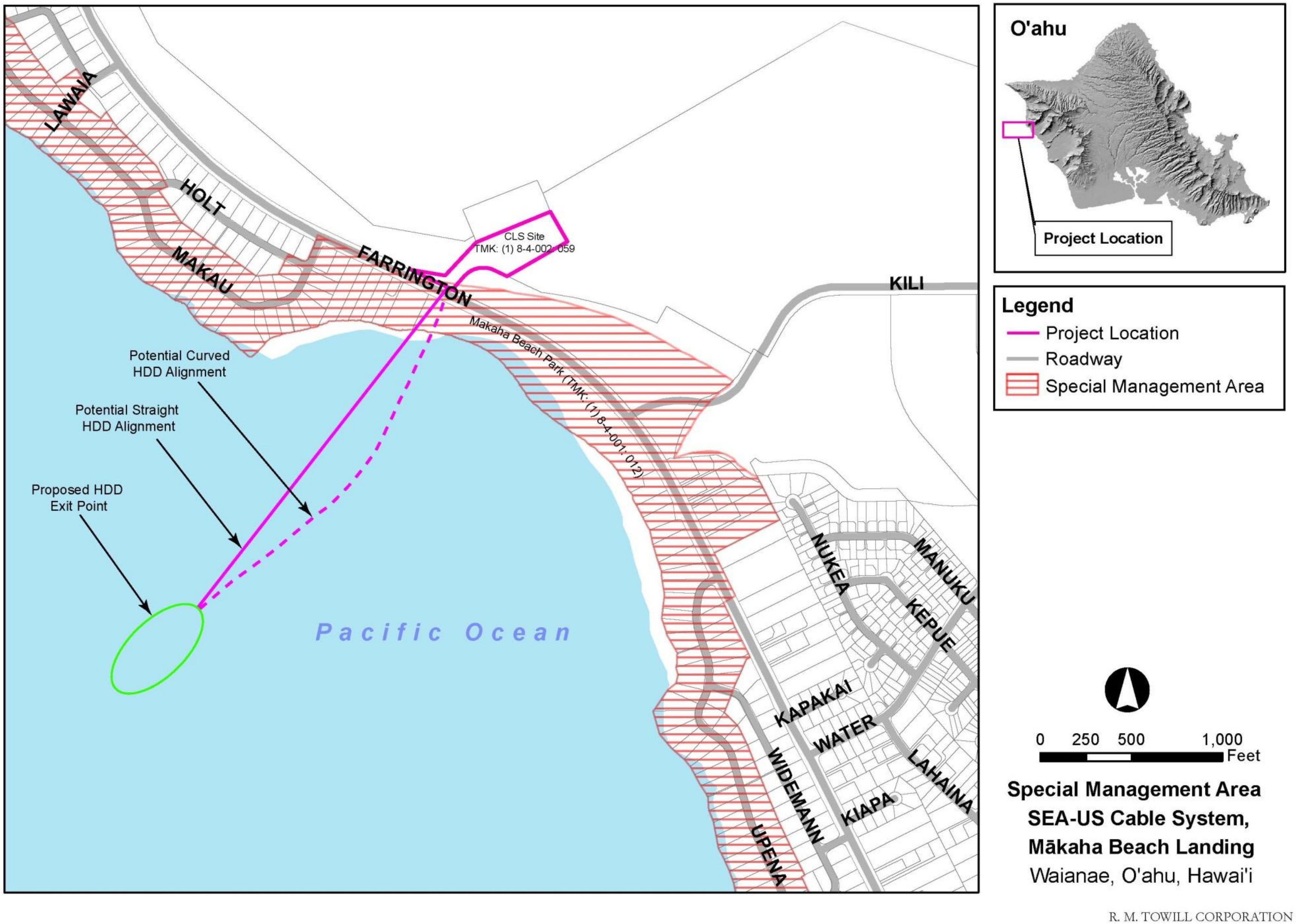
> *"special controls on developments to avoid permanent losses of valuable resources and the foreclosure of management options, and to ensure that adequate access by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided"* (HRS Section 205A-21).

To accomplish these objectives, HRS Chapter 205A established the shoreline setbacks, and authorized counties to develop and administer permitting systems to control development within the shoreline setback.

Discussion

A portion of the area required for HDD and cable installation will fall within the shoreline setback area. Therefore, a SSV will be required to address the use of land for HDD within the 40 ft setback of the certified shoreline as determined by the State Survey Office, DLNR. A SSV application will be submitted to the CCH, DPP upon release of the Final EA and FONSI, in accordance with ROH, Chapter 23, Shoreline Setback. A shoreline survey will be conducted by a registered land surveyor and submitted to the State Land Division for certification. A DPP public hearing will be required.

Figure 8-3, Special Management Area



9.0 Permits and Approvals that May be Required

9.1 Federal

Section 7, ESA, Consultation (USFWS and NOAA)

Magnuson-Stevens Fishery Conservation and Management Act Consultation (NOAA)

Section 106, NHPA, Consultation (DLNR, SHPD)

Section 404, CWA and Section 10, RHA Request for Permit Application (USACE)

9.2 State of Hawaiʻi

Final Environmental Assessment (FEA) and FONSI under HRS, Chapter 343 (DPP)

CZM FEDCON Determination (Department of Business, Economic Development, and Tourism (DBEDT), Office of Planning)

Section 401, CWA, Water Quality Certification (CWB, DOH)

Section 402, CWA, NPDES Permit for Construction Stormwater (CWB, DOH)

Conservation District Use Permit (DLNR, OCCL)

Application for Use and Occupancy of the HDOT ROW (HDOT, Highways Division, ROW Branch)

Right-of-Entry and Grant of Submarine Easement within State Waters (DLNR, BLNR)

Application to discharge construction stormwater into exiting State of Hawaiʻi Highways Division Strom Drain System (HDOT, Highways Division)

9.3 City and County of Honolulu

Special Management Area (SMA) Minor Permit (DPP)

Shoreline Setback Variance (SSV) Permit (DPP)

Easement for Use of Land under Ownership of the CCH (DBFS)

10.0 Agencies, Organizations and Individuals to be Consulted for the Environmental Assessment

10.1 City and County of Honolulu

DPR
DPP
DBFS
Honolulu Fire Department
Honolulu Police Department
Honolulu Board of Water Supply

10.2 State of Hawaiʻi

- DLNR:
  - BLNR
  - OCCL
  - Division of Forestry and Wildlife (DOFAW)
  - Division of State Parks
  - SHPD
  - Land Division
- DOH:
  - CWB
- DBEDT, Office of Planning
- HDOT, Highways Division
- Department of Hawaiian Home Lands
- OHA
- OIBC

10.3 Federal Government

USACE, Honolulu District
NOAA
USFWS
USCG

10.4 Utility Companies

HECO
Hawaiian Telcom
Oceanic Time-Warner Cable differentiate

10.5 Elected Officials and Neighborhood Boards

State Senator Maile S. L. Shimabukuro, District 21
State Representative Jo Jordan, District 44
Honolulu City Councilperson Kymberly Marcos Pine, District 1
Chairperson Kawika Nahoopii, Neighborhood Board No. 24, Waiʻanae

10.6 Landowners and Community Associations

Hawaiian Telcom
CCH, DBFS
HDOT, Highways Division, ROW Branch
DLNR, BLNR
Mākaha Ahupua`a Community Association

10.7 Public Information Meetings Associated with Regulatory Compliance

Public information meetings will be held throughout the EA and environmental permitting process for the proposed project. The public will be notified in advance once meetings are scheduled. See **Section 3.8, Regulatory and Community Consultations** for a list of permits and approvals, and public hearings and meetings that will be held for the proposed project.

11.0 Summary of Impacts and Significance Determination

In accordance with the content requirements of HRS, Chapter 343, and the significance criteria in HAR, Section 11-200-12 of Title 11, Chapter 200, an applicant or agency must determine whether an action may have significant impacts on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects, and its short- and long-term effects. In making the determination, the Rules establish “Significance Criteria” to be applied as a basis for identifying whether significant environmental impacts will occur. According to the Rules, an action shall be determined to have a significant impact on the environment if it meets any one of the criteria. See **Table 11-1** at the end of this section for a summary of impacts and proposed mitigation.

11.1 Short-Term Impacts

The potential for short-term impacts resulting from the proposed action include:

- Temporary closures and disruptions in near shore waters during cable installation;
- Potential disturbances to marine mammals and sea turtles by the presence of vessels and placement of cables during installation of the cable;
- Ground disturbances during construction; and
- Noise during construction.

These potential short-term impacts are not anticipated to result in secondary or cumulative impacts. All anticipated short-term impacts would be addressed through the use of appropriate mitigation measures and practices to minimize adverse effects.

11.2 Long-Term Impacts

There would be positive long-term impacts in the areas of social benefit for residents and visitors from the installation of the SEA-US cable system. Long-term gains resulting from development of the proposed project include provision of more effective State telecommunications capabilities (by means of transmission from the F/O cable). The proposed project will maintain and enhance economic productivity by increasing telecommunications service between the State and international (Southeast Asian nations and Guam) and domestic (Western U. S.) locations. The project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided. The planned project would benefit both the resident and visiting populations on Oʻahu, that will enable Oʻahu to continue to be a desirable place to live and visit.

The anticipated entry of new capacity by the SEA-US cable system will also promote telecommunications services and increase accessibility and use of telecommuting for business, commerce and cultural exchange.

The potential for adverse cumulative environmental impacts is not anticipated:

- The proposed project is consistent with the long-range goals, policies and objectives articulated in policy documents for future planned development in the Waiʻanae area. The proposed project is also compatible with the existing land uses in the area and complies with applicable land use regulations. As a result, project implementation would not contribute to potentially significant land use compatibility or policy conflicts.
- The project itself would not lead to plans for future uncontemplated construction. Therefore, potentially significant cumulative impacts would be avoided. The project may encourage development and expansion of the telecommunications infrastructure serving Hawaiʻi to accommodate future growth in the information industry. This would provide opportunities for Hawaiʻi's people to obtain job training and education that would allow for upward mobility within the information industry.
- The proposed project would result in positive long-term impacts by providing reliable telecommunications service between Indonesia, the Philippines, Guam, and the U. S. West Coast, and Hawaiʻi. The proposed project would enhance service now provided through cable systems that have limited bandwidth capacity. The proposed SEA-US cable system will have high operating bandwidth enabling the use of high technology services such as telemedicine and real time videotrafficing and provide an alternative to the existing F/O cable systems between the proposed locations in the event of system failure or damage. No significant cumulative impacts are anticipated and no additional mitigation measures are required.
- The project is located in an area that is adequately served by public services and facilities, including police and fire protection. The proposed project would not significantly affect the exiting level of service of either police or fire protection. The potential (less than significant) construction related impacts associated with the proposed project would not alter the ability of fire or police protection from providing an adequate level of service in the project environs and would not place an undue burden on the public facilities that would support the project, i.e., police and fire protection.

Table 11-1, SEA-US Cable System Mākaha Beach Landing Impacts Summary

Resource Area	Short-term Impacts	Long-term Impacts	Mitigation and BMPs	DEA Sections
Geology, Topography, & Soil Resources	• Ground disturbing activities (i.e., during site preparation, HDD, and construction).	No Adverse Impact.	• Site restoration to original condition at conclusion of project. No Mitigation required.	5.2 Geology 5.3 Topography 5.4 Soils
Surface Water Resources	• Localized and potential temporary increase in turbidity in the nearshore landing location within Class A Marine Waters.	No Adverse Impact.	• Construction will be regulated through adherence to the Department of the Army and NPDES permit conditions. • During construction, work activities will be in compliance with HAR 11-54 WQS and HAR 11-55 Water Pollution Control • Discharge pollution prevention measures will be employed in all phases of the project. • Following construction all areas of ground disturbance will be stabilized with appropriate materials including the use of vegetative ground cover.	5.6 Surface Water 5.7 Drainage 5.11 Water Quality
Scenic & Aesthetic Resources	• Temporary presence of equipment and vessels, which will be visible to beach users.	No Adverse Impact.	• Equipment will be confined to work areas. • All construction related equipment will be removed following the completion of work. • Existing vegetation and new landscaping will be used to enhance views of the access road and building. • The CLS will be a color consistent with the earth tones of the surrounding site.	5.9 Scenic & Aesthetic Environment

Resource Area	Short-term Impacts	Long-term Impacts	Mitigation and BMPs	DEA Sections
Air Quality	• Temporary and localized emissions from HDD boring rig, construction related equipment, and vehicles.	No Adverse Impact.	• Construction equipment and vehicles shall be maintained in proper working order to reduce air emissions. No mitigation required.	5.10 Air Quality
Noise	• Temporary source of noise above ambient levels from HDD boring rig, construction noise, and vessels.	No Adverse Impact.	• Noise attenuation barriers or enclosures baffled to restrict the escape of noise will be placed around the bore site to mitigate noise effects produced from the operation of the HDD boring rig. • Mufflers will be used on all combustion powered construction vehicles and machinery, and all noise attenuation equipment maintained in good operating condition • Faulty equipment will be repaired or replaced	5.11 Noise
Terrestrial Botanical Resources	• No Adverse Impact.	No Adverse Impact.	No Mitigation required.	5.13 Terrestrial Botanical Resources
Terrestrial Faunal and Avifaunal Resources	• Increased lighting during construction of the proposed project.	No Adverse Impact.	• Light fixtures utilized for this project will be designed and installed to reduce glare and shield light from migrating and/or nocturnally flying seabirds. • Design features for lighting will be based on guidance in the "The Newell's Shearwater Light Attraction Problem, A Guide for Architects, Planners, and Resort Managers."	5.14 Terrestrial Faunal and Avifaunal Resources

Resource Area	Short-term Impacts	Long-term Impacts	Mitigation and BMPs	DEA Sections
Marine & Nearshore Biological Resources	• Potential for short-term disturbance to marine mammals and sea turtles	No Adverse Impact.	• BMPs will be followed by the project contractor to reduce the likelihood of interactions with protected species, and will include watching for and avoiding protected species before commencing work and postponing or halting operations when protected species are within 50 yards of project activities.	5.15 Marine and Nearshore Biological Resources
Recreational Facilities	• Temporary disruption and controlled public access to a limited nearshore area off the coast of Mākaha Beach during cable installation activities	No Adverse Impact.	• Closure of nearshore waters will be accomplished by publishing a notice advising mariners to temporarily avoid the area on days when the ship will lay cable and landing operations will occur.	6.2 Recreational Facilities
Historic & Archaeological Resources	• No Adverse Impact.	No Adverse Impact.	No Mitigation required.	7.2 Historic & Archaeological Resources
Cultural Resources	• No Adverse Impact.	No Adverse Impact.	• See Historic & Archaeological Resources for related BMPs and mitigation.	7.3 Traditional Cultural Practices

11.3 Significance Criteria Evaluation

1. Involves an irrevocable commitment to loss or destruction of natural or cultural resources;

The proposed project is not anticipated to adversely impact, or cause an irrevocable commitment to the loss or destruction of any natural or cultural resources. An investigation of site conditions indicates no known natural or cultural resources which would be adversely impacted by the proposed project. Installation of support infrastructure and use of HDD from the terrestrial project site to the submerged nearshore will result in a relatively unobtrusive project, with no major trenching required along the proposed alignment. The design and planning for the proposed project incorporated protective measures that will avoid resource loss or destruction. Once construction is complete, there will be little to no evidence of work at the shore-end. Ground disturbed in the general area of the CLS will be returned to pre-existing contours as much is practicable and replanted to ensure protection against erosion. Biological observers will provide additional assurance of protection for these resources.

2. Curtails the range of beneficial uses of the environment;

The proposed project would not result in the curtailment of the range of beneficial uses of the environment.

No restriction of the beneficial uses will occur beyond the installation period. Access to the immediate vicinity of the nearshore landing area where the HDD drill bit will emerge from the submerged location will be controlled for a period of approximately one to three days. The project will have no adverse impacts on continued use of the shoreline environment. The materials used will be environmentally benign and have no adverse impact on the environment. F/O cable at the shore-end will be installed below grade by HDD. The terminus of the cable will be the CLS site mauka of Farrington Highway. The location of the F/O cable and supporting infrastructure will preclude use of the site for other purposes.

3. Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;

The proposed project is consistent with the State’s long-term environmental policies, which are to conserve natural resources and enhance the quality of life. The proposed project is consistent with the environmental policies, goals and guidelines expressed in HRS, Chapter 343. Potential sources of adverse impacts have been identified and appropriate measures have been developed to either mitigate or minimize potential impacts to negligible levels.

4. Substantially affects the economic or social welfare of the community or state;

The proposed project will not substantially affect the economic or social welfare of the community or State. The project is intended to improve the long-distance transmission of domestic and international F/O signals and reinforce Hawai‘i’s position as a hub in trans-

Pacific submarine telecommunications networks, which will facilitate the future economic growth of the State. The anticipated entry of new capacity by the SEA-US cable system will promote telecommunications services and increase accessibility and use of telecommuting for business, commerce and cultural exchange.

5. *Substantially affects public health;*

The proposed project, with the implementation of BMPs and committed mitigation measures, will not adversely affect public health or safety. The project will be developed in accordance with Federal, State, and CCH, rules and regulations governing public safety and health.

The F/O cable and accompanying light signals do not constitute a public health or safety hazard. The cable is constructed of steel, glass fibers, and plastics. Light signals transmitted through the cable will be self-contained, of low power, and are not expected to escape. Should a cable break occur, the resulting loss of signal would require a shutdown of the system until repairs can be made. The primary health concerns, therefore, involve air, water, noise, and traffic impacts during construction. It is expected that potential for minor impacts due to construction will be minimized or brought to negligible levels by use of appropriate mitigation measures as described in this EA. No substantial adverse impacts to public health are anticipated.

6. *Involves substantial secondary impacts, such as population changes or effects on public facilities;*

The proposed project is limited to construction of support infrastructure, HDD and installation of drill pipe, and laying and landing of a submarine F/O cable. Although the SEA-US F/O cable system will serve the present and future population of Hawaiʻi, the project itself, will not result in substantial secondary impacts, such as the generation of new population growth or creation of additional demands for public facilities. The project's effects are related to installation and are anticipated to be temporary and not substantial.

7. *Involves substantial degradation of environmental quality;*

The proposed project will be developed in accordance with the environmental polices of HRS, Chapter 343, and the NEPA. The project would not result in significant or substantial degradation of environmental quality. The project would have only temporary and localized effects and the area will be restored upon completion of installation. As demonstrated by similar actions near the project site, specifically the existence of other cables, the environmental quality of the area has not been adversely affected and this project would have similar effects.

8. Is individually limited but cumulatively has considerable effects on the environment, or involves a commitment for larger actions;

The project will not have cumulative effects on the environment, or require a commitment to larger actions. The proposed project does not commit resources for a larger action or subsequent development. There are also no cumulative effects on ecosystem resources or human communities. The proposed project is intended to improve telecommunications capabilities between the Southeast Asian nations of Indonesia and the Philippines, the U. S. territory of Guam, Western U. S., and Hawaiʻi. The project itself, is not expected to adversely impact the environment, generate future population growth, or create major new demands for development.

9. Substantially affects any rare, threatened or endangered species or its habitat;

Rare, threatened, or endangered species will not be substantially affected by the project. No federal jurisdictional waters (streams or wetlands), or federally delineated Critical Habitat for any species is present on or near the terrestrial project parcel. Thus, modifications of habitats on the terrestrial site will not result in impacts to federally designated Critical Habitat. In addition, the proposed project is not anticipated to result in adverse effects to any protected (State of Hawaiʻi and Federal listed threatened or endangered) plant or animal species. No negative effect on plant or animal habitats or specific communities is expected. See **Section 5.13** and **Section 5.14** for discussion on botanical, avifaunal, and faunal species occurring at or near the project site.

Potential for adverse impacts to oceanic fauna including humpback whales, sea turtles, monk seals, coral, spinner dolphins, and shellfishes, are described in detail with appropriate mitigation measures in **Section 5.15**. Protective measures reviewed by the appropriate resource agencies will be implemented during installation to avoid impacts.

10. Detrimentally affects air or water quality or ambient noise levels;

No adverse impacts to air or water quality are anticipated, and no noise or atmospheric discharges are associated with operation of the F/O cable system. During construction, equipment required to install support infrastructure and the cable may result in air emissions and increased noise, that will be intermittent, localized and of very short duration, and are therefore negligible.

To minimize turbidity in submerged waters during daylighting operations, the drill bit will be slowed or stopped completely. Operation of the drill will involve use of a lubricant such as bentonite to facilitate passage of the drill bit through the substratum. The HDD contractor will be directed to prevent and avoid lubricant discharges at the ocean end and will provide management and construction work practices to ensure against adverse effects.

All proposed construction activity is expected to occur in accordance with applicable laws and regulations governing the safe operation and use of construction machinery. As required, any temporary impacts to air quality, water quality, or noise levels during construction would be addressed through the implementation of appropriate mitigation measures described in this document. Water quality may be affected during construction but would be addressed through NPDES, and Section 404/10 and 401 permit requirements, as applicable.

11. *Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters;*

The project area is not subject to damage or considered an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, estuary, or coastal area. The proposed project is located in an area appropriate for installation of a submarine F/O cable. The project site does not contain any especially sensitive environmental characteristics, which would detract from this activity. The project area was selected for its suitability, including the physical setting and potential environmental constraints.

12. *Substantially affects scenic vistas and view planes identified in county or state plans or studies;*

The proposed project involves installation of support infrastructure and submarine F/O cable. Although there will be potential for impacts during construction, it is expected to be of short duration and of limited scope. The project will involve the temporary presence of vessels and equipment, which will be visible to beach users but will not substantially affect the vista or viewplane upon completion of the installation. Upon completion, all construction equipment will be removed from the site. Support infrastructure necessary to the project will include a paved access road, BMH, and CLS. These features are not expected to impact the existing scenic vistas or view planes of the area. After the cable is installed, it will have no effect on vistas or viewplanes.

13. *Requires substantial energy consumption.*

The facilities identified in this project would not consume a substantial amount of energy. Sufficient energy will be used to install the F/O cable system. Construction activities would result in a short-term increase in power demand, but the increase would be of short duration and would cease upon project completion. Energy will also be used during the transport of construction equipment, machinery, and personnel to the project site. None of these activities are expected to result in use of energy significantly greater than similar F/O cable construction projects.

11.4 Preliminary Determination

Based on the above evaluation and the information contained in this Draft Environmental Assessment (DEA), it is preliminarily determined that an Environmental Impact Statement (EIS) is not anticipated to be required and that a Finding of No Significant Impact (FONSI) will be issued and published for this project.

12.0 References

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Appendices

Appendix A	AECOS, Inc., 2015. Reference in Text: (AECOS 2015a), *Marine Biological and Water Quality Surveys off Mākaha Beach, Waiʻanae, Oʻahu*.
Appendix B	AECOS, Inc., 2015. Reference in Text: (AECOS 2015b), *Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002: 059), Waiʻanae District, Island of Oʻahu.*
Appendix C	Cultural Surveys Hawaiʻi, Inc., 2015. Reference in Text: (CSH, 2015a), *Draft Archaeological Assessment for the Southeast Asia – U. S. (SEA-US) Cable Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: [1] 8-4-002: 059*.
Appendix D	Cultural Surveys Hawaiʻi, Inc., 2015. Reference in Text: (CSH, 2015b), *Draft Cultural Impact Assessment for the Southeast Asian – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu TMK: [1] 8-4-002:059.*
Appendix E	Sea Engineering, Inc., 2016. Reference in Text: (Sea Engineering, 2016), *Memorandum: Mākaha Cable Landing – Seafloor Characteristics.* Prepared by Sea Engineering, Inc. Prepared for R. M. Towill Corporation.

Appendix A AECOS, Inc., 2015. Reference in Text: (AECOS 2015a), *Marine Biological and Water Quality Surveys off Mākaha Beach, Waiʻanae, Oʻahu*.

AECOS No. 1451A

Marine biological and water quality surveys off Mākaha Beach, Waiʻanae, Oʻahu

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December 3, 2015

Marine biological and water quality surveys off Mākaha Beach, Wai‘anae, O‘ahu[1]

December 3, 2015 | *DRAFT* | *AECOS* No. 1451A

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Table of Contents

[1] Report prepared for R.M. Towill Corporation for use in project permitting. This document will become part of the public record for the project.

Introduction

A transpacific fiber optic cable is proposed to be laid along the sea floor off the coast of west Oʻahu at Mākaha Beach, in Mākaha, Waianae ("Project", Fig. 1). A directional boring system: Horizontal Directional Drilling (HDD) is proposed for use in the nearshore area off Mākaha Beach. On October 8, 2015, *AECOS,* Inc. biologists conducted biological surveys to inventory marine resources at the proposed location where the HDD would surface from under the seafloor ("daylight") and along the proposed HDD corridor. The purpose of this survey and report is to identify any sensitive biological resources that might be impacted by the Project.

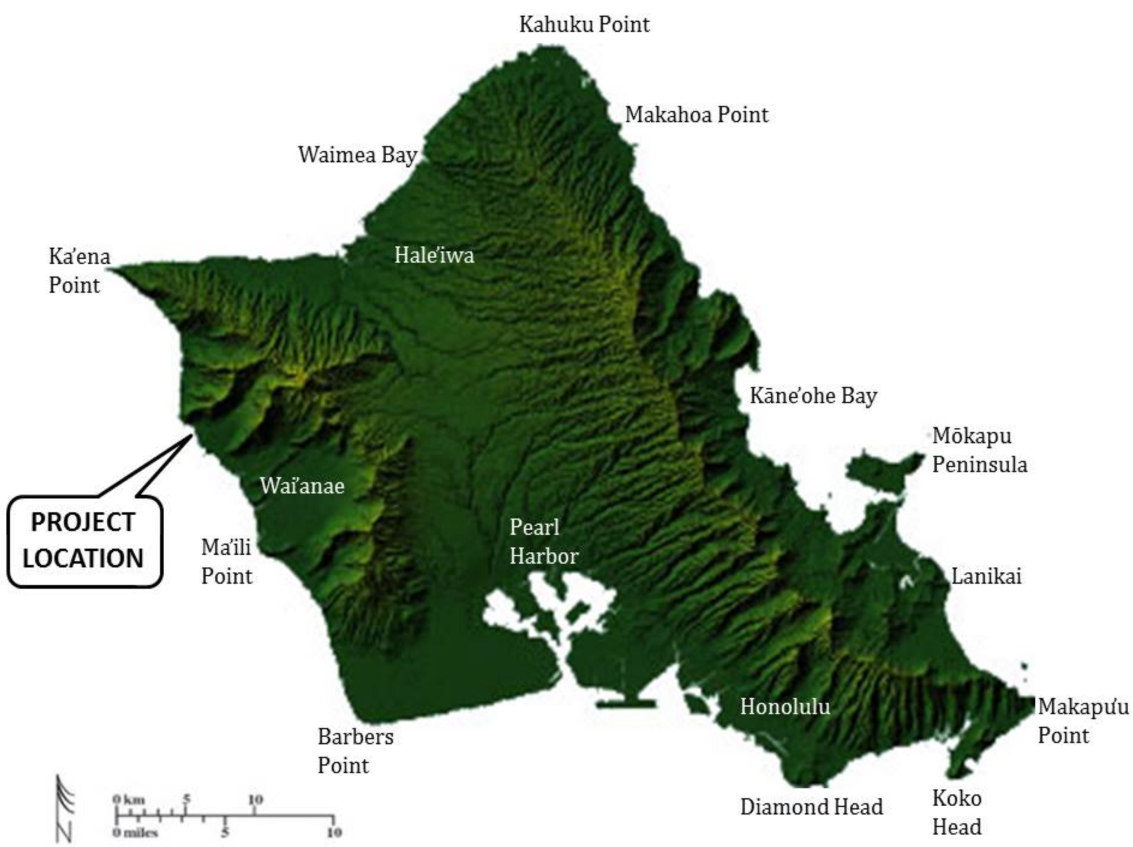

Figure 1. Project location on the Island of Oʻahu.

Site description

Mākaha Beach is located in Mākaha on the west shore of Oʻahu. It is a popular beach for water-related recreation, such as swimming, diving, boogie boarding, body surfing, sunbathing, fishing, boating, canoe racing and surfing. Several surf and canoe club events are held annually at Mākaha Beach Park. It is also a popular tourist destination. A small picnic area is located at the north end of the park (Pacific Architects, Inc., 1997). The shoreline is composed of carbonate sand and limestone and basalt rock. The area is exposed to southerly swells in summer months, northerly swells in winter months, and southerly to westerly waves from Kona storms throughout the year, but most often in the winter. Large waves may break on or near the shoreline causing temporary erosion as the deep nearshore reef provides little protection in most areas. The shoreline at Mākaha Beach has remained somewhat stable since 1910, but with high seasonal variability (SOEST, 2010; Hwang, 1988). Aerial photos taken in summer months show little or no beach on the south end and a relatively wide beach on the north part. Aerial photographs taken in fall and winter months typically show wide beach in the south and narrow beach in the north. Beach profile surveys taken in the summer and winter at Mākaha Beach since 1994 show that the middle of the beach is, on average, 12 m (40 ft) narrower in winter months (SOEST, 2010).

The land divisions of Keaʻau and Mākaha are separated by a high ridge of the Waiʻanae Range extending to the coast at Mākaha Point. The headland at Mākaha Point is a terrace of reef limestone formed during an ancient stand of the sea. The sea around Mākaha Point is sometimes referred to as Takata.

Limestone bottom off Mākaha and Kepuhi Points deepens rapidly offshore. A sharp drop-off between 8 to 18 m (25 to 60 ft) occurs within 180 m (600 ft) of shore off Mākaha Point. Several caves are found in the face of the submarine cliff. At the base of the escarpment is a rubble deposit merging with a sand bottom that extends into deeper water. Steep-walled channels from 1 to 5 m (2 to 15 ft) deep and up to 12 m (40 ft) wide cross the bottom south of Kepuhi Point. Large channels are sand-bottomed. Off Mākaha Beach Park, a large sand channel runs seaward from the mouth of Waiʻele Stream. To the sides of the sand channel, the bottom is mostly limestone with small sand channels and patches (*AECOS*, 1981).

NOAA-NOS benthic habitat maps (Batista et al., 2007) can be used to identify physical zones (i.e., reef flat, channel, reef crest, fore reef, and bank/shelf) and biological cover (i.e., percent coral, percent macroalgae, percent turf, percent coralline algae, and uncolonized). A NOAA-NOS benthic habitat map shows the survey area to include bank/shelf of coral reef and hard bottom with areas of

10-50% macroalgae cover, 50-90% turf algae cover, and sand bottom (Figure 2).

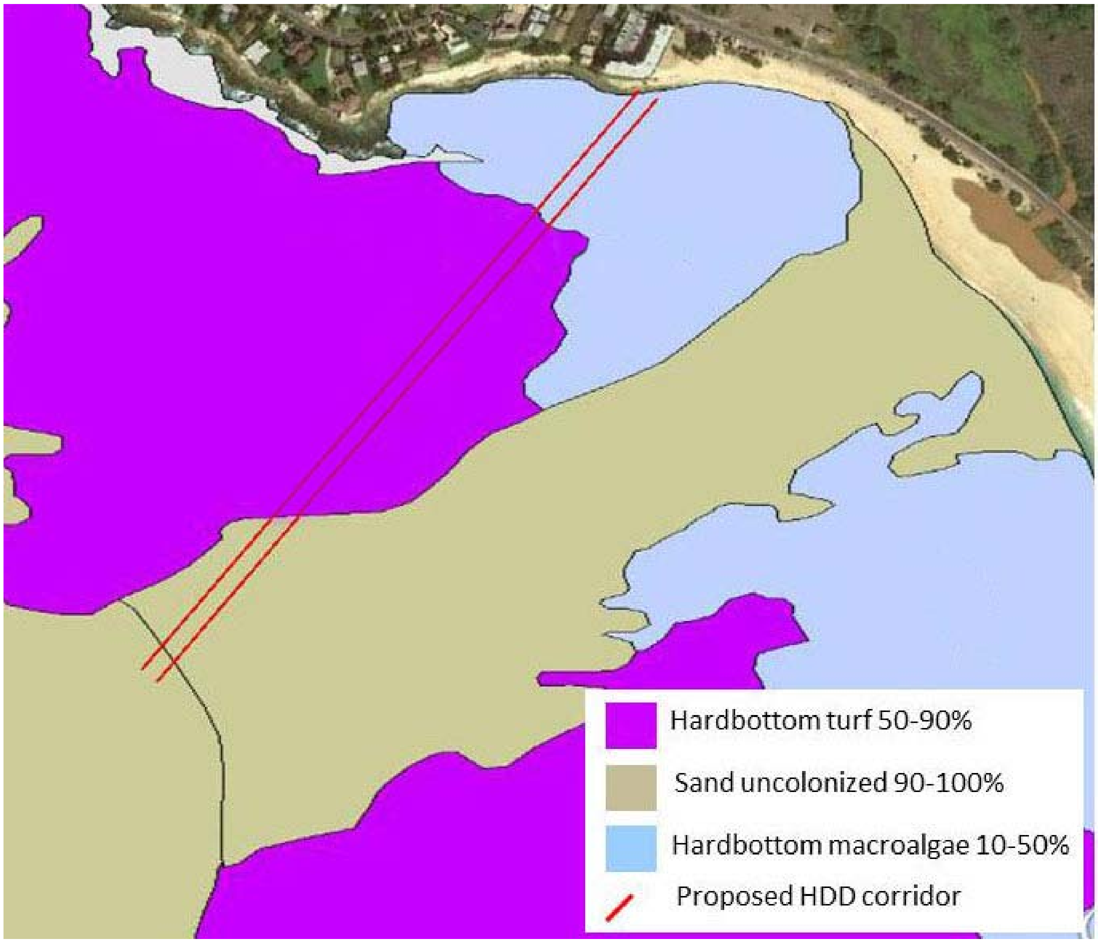

Figure 2. Benthic habitat characterization off Mākaha Beach (from Battista et al, 2007).

Project description

The proposed Project involves the installation of a submarine fiber optic telecommunications cable in offshore waters approximately ¼ to ½ mile seaward of Mākaha Beach. Installation of the fiber optic cable will involve use of HDD equipment positioned on land owned by Hawaiian Telcom. HDD is a steerable method of installing underground cables in a prescribed bore path using a surface drilling rig. HDD has no or minimal impact on the surface above the path. A borehole is established at a point on the land and is then extended laterally beneath the ground and seafloor until it surfaces (or "daylights") at a prescribed point on the seafloor. The estimated depth of water at which the HDD borehole will daylight is 15 to 20 m (49 to 33 ft) at a location in off-shore coastal waters selected to minimize disturbance to the environment, disruption to users of Mākaha Beach, interference with existing cables, and to secure long term protection of the SEA-US Cable System. The drilling is expected to last several months and conduit will be placed in the borehole as the drill progresses. Fiber optic cable will be pulled through the conduit to a manhole located on Hawaiian Telcom property inland of the beach.

Methods

Water Quality

To characterize water quality along the proposed cable corridor and as a contribution to establishing baseline water quality for the Project, three water quality sampling stations were established. These are described as follows: "Sta. 1" is located at approximately the HDD daylight location in water approximately 20 m (60 ft) deep; "Sta. 2" is located at where the northern edge of the sand channel meets the limestone platform, in water approximately 10 m (30 ft) deep; and "Sta 3" is located just seaward of breaking waves on Mālaha Beach (Figure 3). At Stas. 1 and 2, samples were collected at three depths: 1 ft below the sea surface, mid depth, and 1 ft above the sea floor. Only a surface sample was collected at Sta. 3.

Water quality samples were collected on October 8, 2015. Temperature, salinity, pH, and dissolved oxygen (DO) were measured *in situ*. Water samples were collected, chilled, and returned to the *AECOS* laboratory for analysis (*AECOS* Log No. 31423). The following parameters were measured in the laboratory: salinity, turbidity, total suspended solids (TSS), ammonia nitrogen, nitrate+nitrite, total nitrogen (total N), total phosphorus (total P), and chlorophyll α. Table 1 lists the instruments and analytical methods used for field and laboratory analyses.

Marine Biota

On October 8, 2015 *AECOS* biologists conducted a survey to inventory marine assemblages at the proposed HDD daylight location and along the cable corridor. Figure 4 shows the proposed HDD corridor area and coordinates of the HDD daylight location. The precise HDD corridor and daylight location cannot be determined, so the survey included a swath (approximately 16 m [52 ft] wide) within the area as indicated. The survey at the proposed daylight location included the seafloor within an approximate 20-m (64-ft) radius from the indicated location. Qualitative surveys were conducted along the proposed HDD corridor from shoreline to the HDD daylight location.

Figure 3. Location of water quality stations sampled on October 8, 2015.

Our biological survey began at 10:00 AM, 93 minutes after a predicted +0.45 low tide relative to mean lower low water (MLLW; Waianae, ID: 1612482; NOAA, 2014). Water visibility during the survey was about 15 m (50 ft). Marine algae, fishes, and macroinvertebrates were identified in the field and verified with various texts (Hoover, 1999; Huisman, et al. 2007). A listing, including relative abundances of marine organisms in two "areas" (sand channel and reef) is presented as Appendix A.

Table 1. Analytical methods and instruments used for water quality analyses of samples collected off Mākaha Beach.

Analysis	**Method**	**Reference**	**Instrument**
Temperature	SM 2550B	SM (1998)	YSI Model 550 DO meter thermistor
Salinity	SM 120.1	SM (1998)	YSI 85 Meter
pH	SM 4500H+	SM (1998)	pH pHep HANNA meter
Dissolved Oxygen	SM 4500-O G	SM (1998)	YSI Model 550 DO meter
Turbidity	EPA 180.1, Rev. 2.0	USEPA (1993)	Hach 2100Q Turbidimeter
Total Suspended Solids	SM 2540D	SM (1998)	Gravimetric (analytical balance)
Ammonia	Kérouel and Aminot (1997)	Kérouel and Aminot (1997)	Seal AA3 Autoanalyzer, colorimetric
Nitrate + Nitrite	Grasshoff	Grasshoff et al. (1999)	Seal AA3 Autoanalyzer, colorimetric
Total Nitrogen	Grasshoff 9.6.3	Grasshoff et al. (1999)	Seal AA3 Autoanalyzer, UV
Total Phosphorus	Grasshoff 9.1.5	Grasshoff et al. (1999)	Seal AA3 Autoanalyzer, UV
Chlorophyll α	SM10200H(M)	SM (1998)	Fluorometric

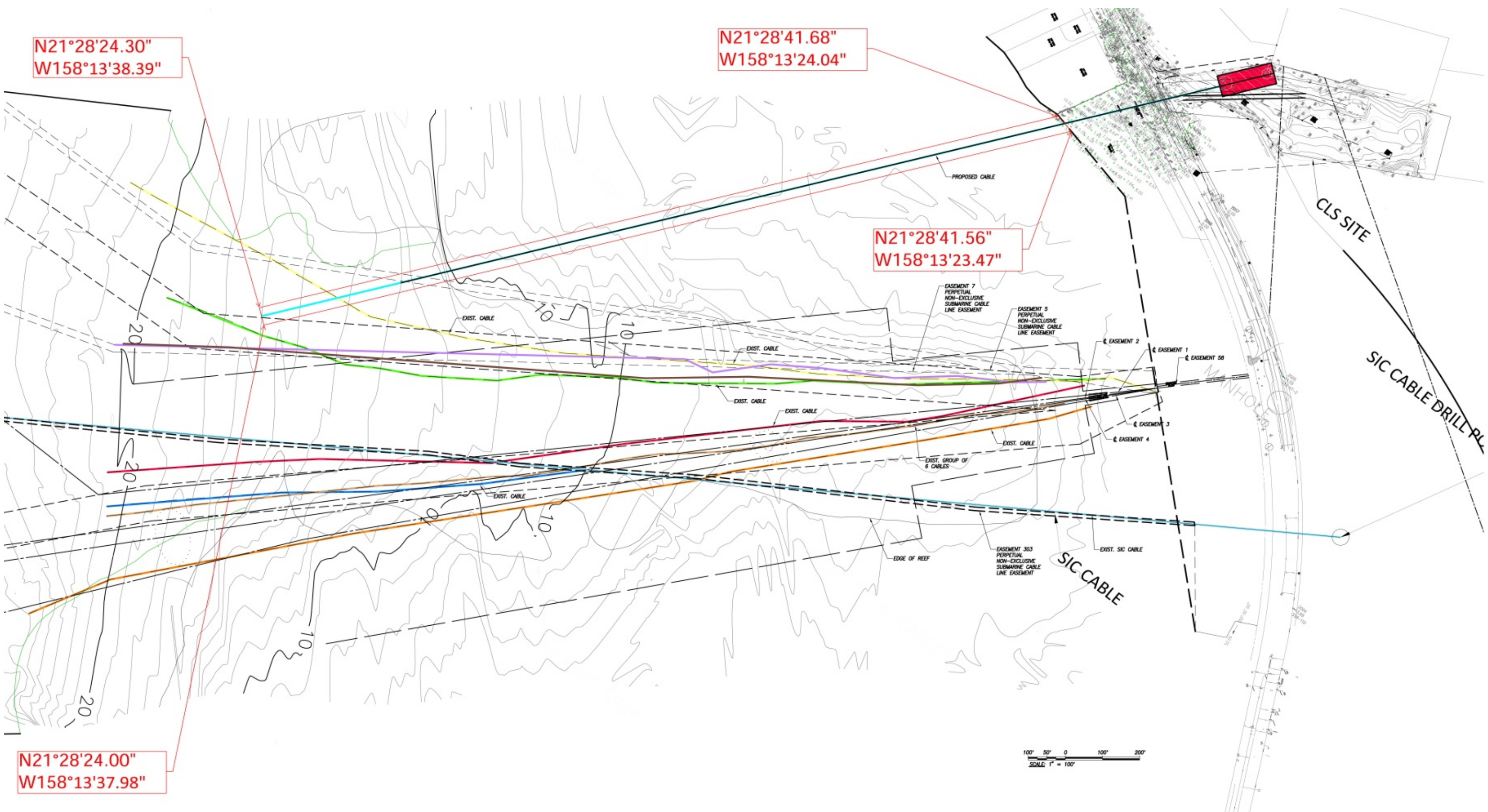

Figure 4. Locations of survey areas (corridor outlined in red lines and coordinates located offshore). Existing cables and easements included as colored lines. Depth contours in meters.

Results

Water Quality

The results of the water quality sampling October 8, 2015 are shown in Table 2. Temperature shows little variation; the highest temperature was recorded in the shallow waters at Sta. 3. No trend in salinity or pH values is evident. DO saturation and turbidity levels tended to increase with depth. TSS was slightly elevated at Sta. 3 (close to waves breaking waves on the shore) and the bottom sample at Sta.1, likely due to disturbance of bottom sediments. There was little variation in ammonia and nitrate+nitrite, while total N values were variable. Total P and chlorophyll α tended to increase with depth, although the highest chlorophyll α was at the surface at Sta. 3.

Table 2. Water quality results from October 8, 2015 at Mākaha Beach Project.

Station	**Time**	**Depth** (ft)	**Temp** (°C)	**Salinity** (PSU)	**DO sat.** (%)	**pH**	**Turbidity** (NTU)
Station 1	1047	1	27.6	35.05	97	8.16	0.22
	1021	27	27.8	35.11	107	8.13	0.22
	1020	54	27.7	35.26	112	8.14	0.26
Station 2	1214	1	27.7	35.26	100	8.03	0.13
	1210	16	27.9	35.12	106	8.05	0.24
	1210	34	27.8	35.13	113	8.02	0.23
Station 3	1430	1	28.1	35.10	95	8.13	0.63

Station	**Depth** (ft)	**TSS** (mg/L)	**NH_3** (μgN/L)	**NO_3+NO_2** (μgN/L)	**Total N** (μgN/L)	**Total P** μgP/L)	**Chl. α** (μg/L)
Station 1	1	2.4	5	<1	79	11	0.08
	27	2.4	6	1	78	16	0.09
	54	5.4	5	1	84	38	0.13
Station 2	1	3.7	5	<1	72	8	0.03
	16	3.3	5	<1	93	8	0.05
	34	3.1	5	<1	85	15	0.10
Station 3	1	5.9	8	1	49	6	0.22

HDD daylight area

The proposed HDD daylight area occurs in waters approximately 17 m (56 ft) deep. Representative photos of the seafloor and biota in the proposed HDD daylight area are shown in Figure 5.

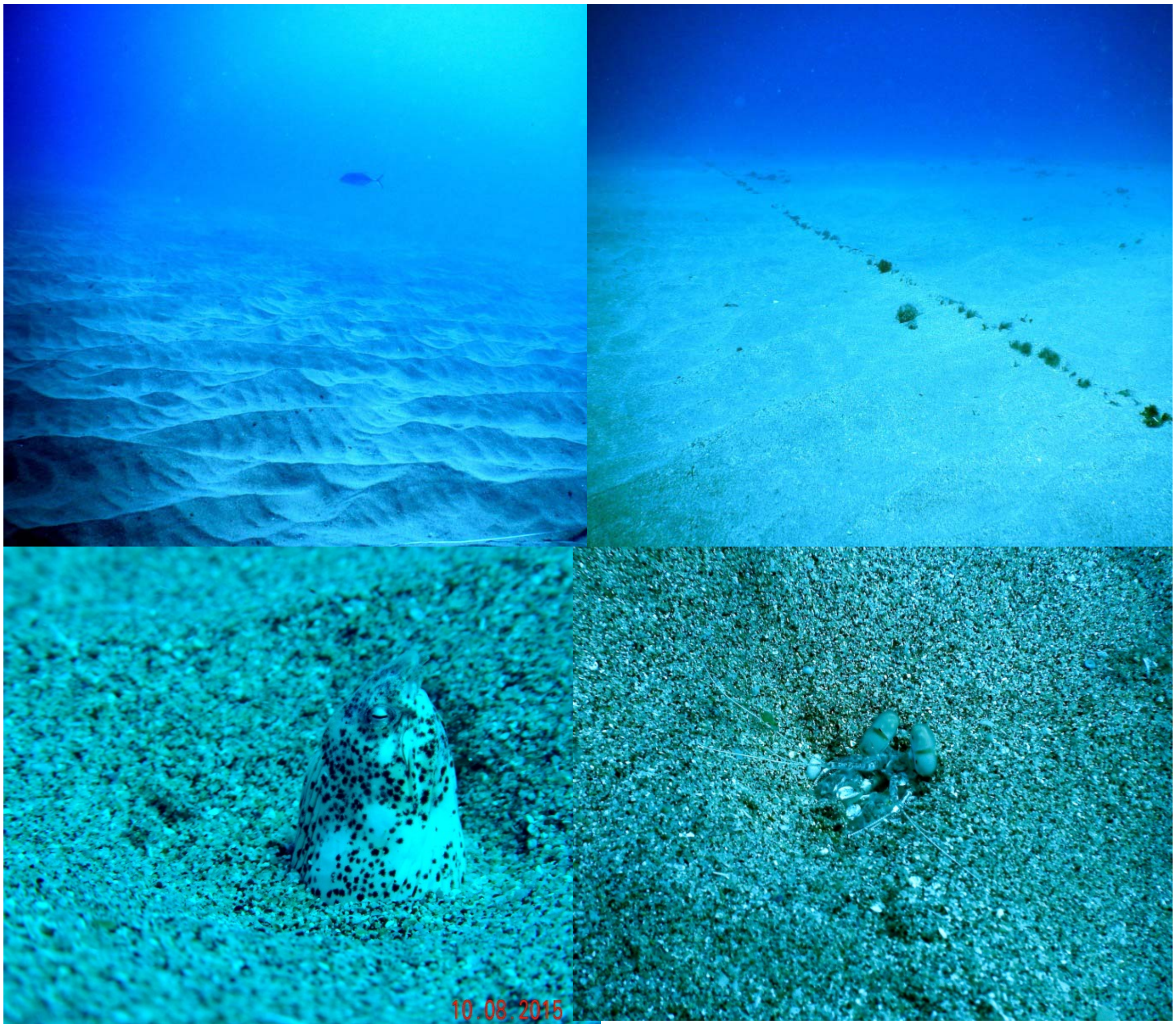

Figure 5. HDD daylight location occurs in a sand channel. A bluefin trevally was observed in this area (top left). An existing cable hosting algae occurs on the northern boundary of the HDD daylight location (top right). The sand bottom contains small burrows, hosting and snake eel (*Callechelys lutea*; bottom left) and spearing mantis shrimp (*Oratosquilla fabricii*; bottom right).

The seafloor in the proposed HDD daylight location is sand, with scattered small rocks that host algal growth. Empty tests of miniature sea urchin (*Echinocyamus* sp.) are common on the sand. One marlinspike auger (*Terebra maculata*) was observed. The sand is pocketed by small burrows, which host spearing mantis shrimp (*Oratosquilla fabricii*) and snake eel (*Callechelys lutea*). An existing cable was observed on the north edge of the HDD daylight area. A green alga (*Caulerpa taxifolia*) and cyanobacteria grow on the exposed parts of the cable. Fishes are rare here. Only two were observed: bluefin trevally (*Caranx melampygus*) and blackside razor wrasse (*Iniistius umbrilatus*). Pods of spinner dolphin (*Stenella longirostris*) were seen in this offshore location.

HDD corridor

The bottom is sand in offshore portion of the HDD corridor at depths up to 60 ft (18.2 m). Consolidated limestone bottom begins some 160 m (525 ft) landward from the HDD daylight location where, at a depth of approximately 45 ft (14 m), the reef slopes upward from the sand bottom. Bottom relief is high, with numerous ledges, caves, and overhangs (see Figure 6). Sand in channels that groove the solid bottom are numerous. A moderate amount of coralline algae and algal turfs grows on the limestone. Urchins (*Tripneustes gratilla*, *Echinometra mathaei* and *E. oblonga*) are abundant on the reef, their scouring visible in the limestone surface. Blue soft coral (*Sarcothelia edmondsoni*) is also abundant here. Other, less conspicuous macroinvertebrates include: worms (*Sabellastarte spectabilis*, *Spironbrancus giganteus*, and *Lomia medusa*), blue-dragon nudibranch (*Pteraeolidia ianthina*), crabs (*Trapezia* sp., *Alpheus deuteropus*), urchins (*Heterocentrotus mammillatus*, *Diadema paucispinum,* and *Echinothrix calamaris*), and black sea cucumber (*Holothuria atra*). Several green sea turtles (*Chelonia mydas*) were observed around the limestone bottom. Dive operators and snorkel tours frequent this area of the reef. Several popular dive sites occur along the proposed HDD corridor.

Coral cover at depths of 25 to 45 ft (8 to 14 m) is estimated at 50%. At least seven taxa of coral occur. *Pocillopora meandrina*, *Poc. damicornis* and *Porites lobata* are the dominant species. Other less common corals include *Leptastrea bewickensis*, *Montipora capitata*, *M. patula*, and *Pavona varians*. Closer to the shore, the bottom limestone complexity and topographical relief decreases. Expanses of flat limestone dominate here, with low-growing or turf-like algae dominant. The inshore half of the reef is home to conspicuously large numbers of urchins, including red pencil urchin (*H. mammilatus*), banded urchin (*E. calamaris*), and collector urchin. Coral cover in water 15 to 25 ft (4 to 8 m) deep is estimated at approximately 20%. Fig. 6 presents representative photos of reef structure and biota along the HDD corridor.

Figure 6. At approximately 50 ft depth, the reef occurs. Green sea turtle (*C. mydas*) is common here (top left). Caves and overhangs are numerous (top right). Coral cover is estimated at 50%, with *P. lobata, Poc. meandrina* and *Poc. damicornis* common (bottom left and right).

A total of 60 fish taxa was observed in our survey. Of these 60 taxa, 13 are species endemic to Hawaiʻi (found only in the Hawaiian Islands). The most well-represented genera across the survey area are surgeonfishes (Acanthuridae; 10 species), followed by damselfishes (Pomacentridae) and wrasses (Labridae), with 8 species each, and butterflyfishes (Chaetodontidae) and triggerfishes (Balistidae), with 6 species each. Appendix A contains a check list of marine organisms observed in the survey area in 2015.

Common fishes are surgeonfishes, including orangeband surgeonfish (*A. olivaceus*), yellow tang (*A. flavescens*), and brown tang (*A. nigrofuscus*); goatfishes, including square-spot goatfish (*Mulloidichthys flavolineatus*), yellowfin goatfish (*M. vanicolensis*), and manybar goatfish (*Parupeneus multifasciatus*); bluestripe snapper (*Lujanus kasmira*) and parrotfishes, including stareye parrotfish (*Calotomus carolinus*) and palenose parrotfish (*Scarus psittacus*). Wrasses are also common, with numerous saddle wrasse (*Thalassoma duperrey*), and bird wrasse (*Gomphosus varius*) recorded.

Figure 7. The overhangs and caves on the limestone bottom provide shelter areas for schools of square spot goatfish (*M. flavolineatus*) and bluestripe snapper (*L. kasmira*).

Observed high in the water column feeding on plankton are various damselfish, including bright-eye damselfish (*Plectroglyphidodon imparipennis*), Hawaiian gregory (*Stegastes marginatus*), oval chromis (*Chromis ovalis*) and blackfin chromis (*C. vanderbiliti*), milletseed butterflyfish (*Chaetodon miliaris*) and black triggerfish (*Melichthys niger*). Hawkfish (*Paracirrhites arcatus*, *P. forsteri* and *Cirrhitus pinnulatus*) occur sheltered in coral heads. Filefish (*Cantherhines dumerilii* and *C. sandwichensis*), boxfish (*Ostracion meleagris*), Moorish idol (*Zanclus cornutus*), bigeye emperor (*Monotaxis grandoculis*), spiny porcupinefish (*Diodon holocantus*), and Pacific trumpetfish (*Aulostomus chinensis*) are present but tend to be rare in the survey area.

Discussion

Water Quality

Waters off Mākaha Beach are designated Class A, open coastal marine waters in the State of Hawaiʻi water quality standards (HDOH, 2014a). HDOH intends Class A waters be protected for recreational purposes and aesthetic enjoyment. Other uses are permitted as long as they are compatible with recreational uses and protection and propagation of fish, shellfish, and wildlife. Class A marine waters are not to receive discharges that have not received the highest degree of treatment or control compatible with the criteria established for this class. No new industrial discharges are permitted within open coastal marine waters, with the exception of storm water discharges associated with industrial activities and discharges covered by a National Pollutant Discharge Elimination System (NPDES) general permit, approved by the US Environmental Protection Agency (EPA) and issued by HDOH.

Mākaha Beach is currently listed on the state 2014 Final List of Impaired Waters in Hawaiʻi as impaired for nitrate+nitrite, ammonia, turbidity and chlorophyll α (HDOH, 2014b). It is also listed as a "Category 5" water body due to impairments, meaning that a total Maximum Daily Load (TMDL) assessment is needed. Mākaha Beach has been assigned a TMDL priority code of "low". This list was prepared under the Clean Water Act as a §303(d) Listed Watershed, which identifies "waters which will not attain applicable water quality standards with technology-based controls alone (e.g., water quality limited)."

State water quality criteria for open coastal waters incorporate "wet" and "dry" criteria values based on average percent of freshwater inflow: "Dry" criteria apply when the open coastal waters receive less than three million gallons per day of fresh water discharge per shoreline mile. Off Mākaha Beach, dry criteria apply based on an absence of perennial stream discharges to the area. Our slinity results showed no significant dilution (<1%) from oceanic salinity (35.2 PSU; SOEST, 1996).

State criteria for "dry" open coastal water are shown in Table 3. The criteria for temperature, salinity and pH are based on "deviations from ambient conditions"; i.e., pertain essentially to discharges that might cause deviations. Our results would be regarded as measurements of ambient conditions. For certain (mostly physical) parameters (temperature, salinity, DO saturation and pH), results can be assessed with regard to the state criteria. However, criteria for turbidity, nutrients, and chlorophyll α are based on data geometric means not to exceed specific criterion values. Since geometric means require a minimum of three separate sampling events per station, our single-sample results cannot be meaningfully compared with state criteria.

Table 3. Selected state water quality criteria (dry season) applicable to open coastal marine waters after HAR §11-54-6.3(b) (HDOH, 2014a).

Parameter	Geometric Mean value not to exceed this value	Value not to be exceeded more than 10% of the time	Value not to be exceeded more than 2% of the time
Total Nitrogen (µg N/l)	110.0	180.0	250.0
Ammonia (µg N/l	2.00	5.00	9.00
Nitrate+Nitrite (µg N/l)	3,50	10.0	20.0
Total Phosphorus (µg P/l)	16.0	30.0	45.0
Chlorophyll (µg/L)	0.15	0.50	1.00
Turbidity (NTU)	0.20	0.50	1.00

Other "standards":

- pH units shall not deviate more than 0.5 units from a value of 8.1, except at coastal locations where and freshwater from stream, storm drain or groundwater discharge may depress the pH to a minimum level of 7.0
- Dissolved oxygen shall not decrease below 75% of saturation.
- Temperature shall not vary more than 1C° from ambient conditions.
- Salinity shall not vary more than 10% from natural or seasonal changes.

Temperature, salinity, DO saturation and pH were in conformance with state standards. The values recorded for turbidity, chlorophyll α, all nutrient moieties (with the exception of ammonia) were characteristic of open coastal waters. No criterion exists for TSS in open coastal waters, but this parameter is usually measured when Project activities may result in sediment disturbances.

Protected and Listed Species

The Project includes work in marine waters where ESA-listed species may be exposed to project-related activity. One listed (endangered or threatened; DLNR, 2015; NOAA-NMFS, 2010a and 2011; USFWS, 2015) species was encountered in the October 2015 survey: green sea turtle (*Chelonia mydas*). Spinner dolphins, protected under the Marine Mammal Protection Act (MMPA) were also sighted. Other listed and protected marine species (sea turtles, Hawaiian monk seal, and humpback whale) are known to occur in the general vicinity.

Sea turtles and marine mammals typically avoid human activity, so exposure to such activity and equipment operation would be infrequent and non-injurious, resulting in insignificant effects on the ESA-listed marine species. Additionally, protected species BMPs require that the project manager and contractor reduce the likelihood of interactions by watching for and avoiding protected species before commencing work and by postponing or halting operations when protected species are within 50 yards of project activities (USACE, 2012).

<u>Sea turtles</u> — Of the sea turtles found in the Hawaiian Islands, only green sea turtle is likely in the Project vicinity. Hawksbill sea turtle (*Eretmochelys imbricata*) is rare in the Hawaiian Islands and only known to nest in the southern reaches of the state (NOAA-PIFSC, 2010). The green sea turtle was listed as a threatened species under the Endangered Species Act in 1978 (ESA; USFWS, 1978, 2001). Since protection, the green sea turtle has become the most common sea turtle in the Hawaiian Islands with a steadily growing population (Chaloupka et al., 2008). On February 16, 2012, NMFS and the USFWS received a petition from the Association of Hawaiian Civic Clubs to identify the Hawaiian green turtle population as a distinct population segment (DPS) and delist the Hawaiʻi DPS under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.). In March 2015, NOAA-NMFS published a proposed rule to reclassify the green sea turtle into 11 DPS, but continue protection of the Hawaiʻi DPS as a threatened species under the ESA (NOAA & USFWS, 2015a). The public comment period for this proposal ended September 25, 2015 (NOAA & USFWS, 2015b).

Threats to the green sea turtle in Hawaiʻi include: disease and parasites, accidental fishing take, boat collisions, entanglement in marine debris, loss of foraging habitat to development, and ingestion of marine debris (NMFS-USFWS, 1998).

Green sea turtle nesting occurs mostly on beaches of the Northwestern Hawaiian Islands, with 90% occurring at French Frigate Shoals (Balazs et al., 1992). None of the Hawaiian sea turtles is known to nest in the Project vicinity. Aki's Beach, approximately 107 m (528 ft) south of Mākaha Beach Park, is a known basking area for green sea turtles (NOAA-PIFSC, 2010).

The green sea turtle diet consists primarily of benthic macroalgae (Arthur and Balazs, 2008), which the shallow reefs of the main Hawaiian Islands provide in abundance. Red macroalgae generally make up 78% of their diet, whereas green macroalgae make up 12% (Arthur and Balazs, 2008). The single most consumed algal species is *Acanthophora spicifera*, which is an introduced species first recorded in Hawaiʻi in 1950 (Huisman et al., 2007). Little algal cover was observed in the Project vicinity, and no *A. spicifera*. Despite the lack of preferred foraging resources, several green sea turtles were observed in our October 2015 surveys.

Turbidity (murky water) does not appear to deter green sea turtles from foraging and resting areas and construction projects in Hawaiʻi have found sea turtles adaptable and tolerant of construction-related disturbances (Brock, 1998a,b).

<u>Shellfishes</u> — Shellfishes, including pearl oyster (*Pinctada margaritifera*), are regulated throughout the State of Hawaiʻi, where it is prohibited to "catch, take, kill, possess, remove, sell or offer for sale", without a permit, pearl oysters and 6 other shellfishes (DLNR, 2009). No pearl oysters were observed in our survey.

<u>Monk Seal</u> — The endangered Hawaiian monk seal (*Monachus schauinslandi*) is known to occur in the waters off Mākaha Beach. The majority of monk seal sighting information collected in the main Hawaiian Islands is reported by the general public and is highly biased by location and reporting effort. Systematic monk seal count data come from aerial surveys conducted by the Pacific Islands Fisheries Science Center (PIFSC). Aerial surveys of all the main Hawaiian Islands were conducted in 2000-2001 and in 2008 (Baker and Johanos, 2004; PIFSC, unpublished data). One complete survey of Oʻahu was conducted for each of these years. . No Hawaiian monk seals were sighted at Mākaha Beach Park during these three aerial surveys.

Reports by the general public, which are non-systematic and not representative of overall seal use of main Hawaiian Island shorelines, have been collected in the main Hawaiian Islands since the early 1980s. For the purposes of this report, a sighting is defined as a calendar day during which an individual seal is documented as present at a specific location. There have been 151 reported sightings of monk seals at Mākaha Beach Park from 2005 to 2014 (Table 4). Nineteen uniquely identifiable seals have been sighted in this area (Table 5). No monk seal births have been documented at Mākaha Beach Park.

Table 4. Number of reported Hawaiian monk seal sightings at Mākaha Beach Park on the Island of Oʻahu (2005 to 2014).

Location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	**Total**
Mākaha Beach Park	5	3	8	6	5	19	20	31	25	29	**151**

Critical habitat for Hawaiian monk seals has been designated (NOAA-NMFS, 2015) and includes the seafloor and marine habitat to 10 m above the seafloor from the 200 m depth contour through the shoreline and extending into terrestrial habitat 5 m inland from the shoreline between identified boundary points. These terrestrial boundary points define preferred pupping areas and significant haul-out areas. (NOAA-NMFS, 2015). Mākaha Beach does not fall within assigned boundary points, therefore is excluded from monk seal critical habitat designation. However, critical habitat starts at the waterline and extends from there out to the 200-m depth contour, including the seafloor and marine habitat 10 m in height (NOAA-NMFS, 2015). The Project occurs in a designated marine critical habitat area.

Spinner dolphin — The spinner dolphin (*S. longirostris*) gained protection under the Marine Mammal Protection Act (MMPA) in 1972, yet they are not considered depleted in waters of the Pacific Islands Region. Spinner dolphins are frequently encountered around the main Hawaiian Islands. Currently, the Protected Resources Division of the NOAA-NMFS Pacific Islands Regional Office (PIRO) is working on an Environmental Impact Statement (EIS) on the potential rulemaking under the MMPA to provide more protection to Hawaiian spinner dolphins (NOAA-NMFS, 2006).

The MMPA states that the essential habitats used by marine mammals should be protected, and marine mammals should be protected from the harmful actions of man. NOAA-NMFS PIRO recommended guidelines for interactions with spinner dolphins include: 1) remain at least 50 yards from dolphin; 2) limit observation time to ½ hour; 3) if approached by a spinner dolphin while on a boat, put the engine in neutral and allow the animal to pass. Boat movement should be from the rear of the animal (NOAA-NMFS, 2011).

Table 5. Number of sightings of uniquely identified Hawaiian monk seals reported at Mākaha Beach Park, on the island of Oʻahu (2005 to 2014).

Seal ID	Size	Sex	Sightings
R010	Adult	Female	6
R012	Adult	Male	6
R018	Adult	Male	10
R020	Adult	Female	1
R302	Adult	Male	2
R4DF	Adult	Female	5
R6FI	Sub-adult	Male	1
R912	Adult	Female	3
RB24	Adult	Female	3
RE74	Adult	Male	52
RI37	Adult	Female	3
RK36	Adult	Male	1
RL42	Sub-adult	Female	1
RO28	Adult	Female	7
RR70	Adult	Male	2
RV08	Adult	Male	1
T15M	Adult	Male	1
T21M	Adult	Male	1
T34M	Adult	Male	16
Total			**122**

Humpback whale — The humpback whale or *koholā* (*Megaptera novaeangliae*) was listed as endangered in 1970 under the ESA. In 1993 it was estimated that there were 6,000 humpback whales in the North Pacific Ocean, and that 4,000 of those regularly came to the Hawaiian Islands. The population is estimated to be growing at between 4 and 7% per year. Today, as many as 10,000 humpback whales may visit Hawaiʻi each year (HIHWNMS, 2014). Humpback whales typically arrive in the Hawaiian Islands as early as October and may stay as late as May or early June. The waters off Mākaha Beach are not included in the Humpback Whale National Marine Sanctuary.

Coral — Coral species are protected under Hawaiʻi state law, which prohibits "breaking or damaging, with any implement, any stony coral from our waters, including any reef or mushroom coral" (HAR §13-95-70; DLNR, 2014). It is also unlawful to take, break or damage with any implement, any rock or coral to which marine life of any type is visibly attached (HAR §13-95-71, DLNR, 2014). On August 27, 2014, NOAA issued a final rule for listing 20 coral species as threatened under ESA (NOAA-NMFS, 2014). None of these newly listed corals occurs in Hawaiʻi.

Essential Fish Habitat

The 1996 Sustainable Fishery Act amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and subsequent Essential Fish Habitat (EFH) Regulatory Guidelines (NOAA, 2002) describe provisions to identify and protect habitats of federally-managed marine and anadromous fish species. Under the various provisions, federal agencies that fund, permit, or undertake activities that may adversely affect EFH are required to consult with the National Marine Fisheries Service (NMFS).

Congress defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." (MSFCMA, 1996; NOAA, 2002). EFH provisions in MSFCMA designate that species harvested in sufficient quantities to require fisheries management are to be subdivided into similar Management Unit Species (MUS). Five MUS groups are currently managed in Hawaiian waters: bottomfish, pelagics, precious corals, crustaceans, and coral reef ecosystem. In the waters surrounding the Hawaiian Islands, EFH for coral reef ecosystem MUS as defined by the Final Coral Reef Ecosystem Fishery Management Plan (WPRFMC, 2001) and subsequent Fishery Ecosystem Plan for the Hawaiian Archipelago (WPRFMC, 2005), "includes all waters and habitat at depths from the sea surface to 50 fathoms extending from the shoreline (including state and territorial land and waters) to the outer boundary of the Exclusive Economic Zone (EEZ)."

The proposed Project is located within waters designated as EFH (including water column and all bottom areas) for coral reef ecosystem, bottomfish, pelagic and crustacean MUS. Of the thousands of species which are federally managed under the coral reef FMP, at least 61 (juvenile and adult life stages; MRC, 2005) are known to occur in waters off Mākaha Beach Park.

Assessment

Due to the Project design location of the HDD daylighting in a large sand channel; direct impacts to sensitive marine biota have been avoided. Little, if any, adverse indirect impacts may occur as a result of the HDD corridor. Best management practices (BMPs), including environmental protection specifications and endangered species protection, as described below, may be applicable.

Endangered Species Protection - The following endangered species BMPs may be applicable during the anchor installation:

- Each day, conduct a survey for marine protected species before any work starts, and postpone work if a species is observed. If a marine protected species is in the area, observe a 150-ft (46-m) buffer with no human encroachment. If a monk seal/pup pair is seen, a 300-ft (92-m) buffer must be observed.
- Monitor for marine protected species 30 min prior to, during, and 30 min after any in-water Project activity. Record information on the species, numbers, behavior, sex or age class (if possible), location, time of observation, start and end times of project activity and any other disturbances (visual or acoustic).
- In the event a marine protected species enters the Project area and activity cannot be halted, conduct observations and immediately contact NOAA/NMFS. For monk seals contact Marine Mammal Response Coordinator at (808) 944-2269 and the monk seal hotline at (888) 256-9840. For turtles, contact the turtle hotline at (808) 983-5730.

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Appendix A

Inventory of marine biota observed Off Mākaha Beach, Waiʻanae, Oʻahu, October 8, 2015

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name & *Hawaiian name*	Status	Abundance by location Sand Channel	 Reef
	ALGAE			
CHLOROPHYTA	GREEN ALGAE			
Caulerpa taxifolia			R	
Neomeris sp.			R	O
RHODOPHYTA	RED ALGAE			
Hydrolithon gardineri		Ind.		O
Hydrolithon onkodes		Ind.		O
Pneophyllum conicum		Ind.		O
CYANOBACTERIA	BLUE GREEN ALGAE			
Lyngbya majuscule				U
Symploca hydnoides		Ind.		U
	INVERTEBRATES			
OCTOCORALLIA	SOFT CORALS			
Sarcothelia edmondsoni	blue soft coral	End.		A
CNIDARIA, ANTHOZOA, SCELRACTINIA	HARD CORALS			
POCILLOPORIDAE				
Pocillopora damicornis	lace coral	Ind.		C
Pocillopora meandrina	cauliflower coral	Ind.		A
PORITIDAE				
Porites lobata	lobe coral, *pohaku puna*	Ind.		A
ACROPORIDAE				
Montipora capitata	rice coral	Ind.		C
Montipora patula	sandpaper rice coral	Ind.		O
AGARICIIDAE				
Pavona varians	corrugated coral	Ind.		U
FAVIIDAE				
Leptastrea bewickensis	bewick coral	Ind.		R
ANNELIDA, POLYCHAETA, SABELLIDAE	WORMS			
Sabellastarte spectabilis	feather duster worm	Ind.		U
SERPULIDAE				
Spirobranchus giganteus	Christmas-tree worm, *kio*	Ind.		O
TEREBELLIDAE				
Lomia medusa	Medusa spaghetti worm	Ind.		U
MOLLUSCA, GASTROPODA, TEREBRIDAE				
Terebra maculata	marlinspike auger	Ind.	R	

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name & *Hawaiian name*	Status	Abundance by location Sand Channel	 Reef
MOLLUSCA,NUDIBRANCHIA, EOLIDS, AEOLIDACEA, PTERAEOLIDIIDAE				
Pteraeolidia ianthina	blue dragon nudibranch	Ind.		U
ARTHOPODA, CRUSTACEA, STOMATOPODA SQUILLIDAE	MANTIS SHRIMP			
Oratosquilla fabricii	spearing mantis shrimp	Ind.	R	
ARTHOPODA, CRUSTACEA, DECOPODA TRAPEZIIDAE	CRABS			
Trapezia sp.	coral guard crab	Ind.		O
ALPHEIDAE				
Alpheus deuteropus	petroglyph shrimp	Ind.		O
ECHINODERMATA, OPHIOCOMIDAE	SEA URCHINS			
Ophiocoma pica	pied brittle star	Ind.		R
ECHINODERMATA, ECHNOIDEA, ECHINOMETRIDAE	SEA URCHINS			
Echinometra mathaei	rock boring urchin *ʻina kea*	Ind.		A
Echinometra oblonga	oblong boring urchin; *ʻina*	Ind.		A
Heterocentrotus mammillatus	red pencil urchin; *hāʻukeʻukeʻulaʻula*	Ind.		O
DIADEMATIDAE				
Diadema paucispinum	long-spined urchin; *wana hālula*	Ind.		R
Echinothrix calamaris	banded urchin	Ind.		R
TOXOPNEUSTIDAE				
Tripneustes gratilla	collector urchin; *hāwaʻe maoli*	Ind.		A
ECHINODERMATA, HOLOTHUROIDEA HOLOTHURIDAE	SEA CUCUMBERS	Ind.		
Holothuria atra	black sea cucumber; *loli okuhi kuhi*	Ind.		U
FIBULARIIDAE				
Echinocyamus spp.	miniature heart urchin		C	

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name & *Hawaiian name*	Status	Abundance by location Sand Channel	Reef
VERTEGRATA, ACTINOPTERYGII	**BONY FISHES**			
ACANTHURIDAE	SURGEONFISHES and UNICORNFISH			
Acanthurus triostegus	convict tang *manini*	Ind.		R
Zebrasoma flavescens	Yellow tang	Ind.		A
Acanthurus guttatus	whitespotted surgeonfish; *ʻapi*	Ind.		U
Acanthurus leucopareius	whitebar surgeonfish; *māikoiko*	Ind.		U
Acanthurus nigrofuscus	brown tang, *māʻiʻiʻi*	Ind.		C
Acanthurus olivaceus	Orangeband surgeonfish, *naʻenaʻe*	Ind.		C
Zebrasomea viliferum	Sailfin tang; *māneoneo*	Ind.		U
Acanthurus achilles	Achilles tang; *pākuʻikuʻi*	Ind.		O
Naso lituratus	Orangespine unicornfish; *umaumalei*	Ind.		R
Naso unicornis	bluespine unicornfish; *kala*	Ind.		O
POMACENTRIDAE	DAMSELFISH			
Abudefduf abdominalis	Hawaiian sergeant *mamo*	End.		U
Abudefduf sordidus	blackspot sergeant *kūpīpī*	End.		
Dascyllus albisella	Hawaiian dascyllus, *āloʻiloʻi*	Ind.		U
Chromis ovalis	oval chromis	End.		A
Chromis vanderbilti	blackfin chromis	Ind.		C
Chromis verater	threespot chromis	End.		R
Plectroglyphidodon imparipennis	bright-eye damselfish	Ind.		C
Stegastes marginatus	Hawaiian gregory	End.		C
LABRIDAE				
Thalassoma duperrey	saddle wrasse; *hinalea lauwili*	End.		A
Stethojulius balteata	belted wrasse; *ʻomaka*	End.		U
Coris gaimard	yellowtail coris, *hīnālea ʻakilolo*	Ind.		U
Labroides phthirophagus	Hawaiian cleaner wrasse	End.		U
Iniistius umbrilatus	blackside razor wrasse	End.	R	
Bodianus albotaeniatus	Hawaiian hogfish; *'a'awa*	End.		R

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name & *Hawaiian name*	Status	Abundance by location Sand Channel	Reef
LABRIDAE (continued)				
Oxycheilinus unifasciatus	Ringtail wrasse; *pō'ou*	Ind.		R
Gomphosus varius	bird wrasse; *hīnālea ʻiʻiwi*	Ind.		C
SCARIDAE	PARROTFISH			
Calotomus carolinus	stareye parrotfish, pōnuhunuhu	Ind.		C
Scarus psittacus	Palenose parrotfish, *uhu*	Ind.		C
CHAETODONTIDAE	BUTTERFLYFISH			
Chaetodon kleinii	sunburst butterflyfish	Ind.		R
Chaetodon miliaris	Milletseed butterflyfish; *lauwiliwili*	End.		A
Chaetodon lunula	raccoon butterflyfish; *kīkākapu*	Ind.		U
Chaetodon ornatissimus	ornate butterflyfish, *kīkākapu*	Ind.		O
Chaetodon quadrimaculatus	fourspot butterflyfish, *lauhau*	Ind.		O
Forcipiger flavissimus	Common longnose butterflyfish; *lauwiliwili nukunuku ʻoiʻoi*	Ind.		R
TETRAODONTIDAE				
Canthigaster amboinensis	ambon toby	Ind.		O
Canthigaster coronata	crowned puffer; *puʻu olai*	Ind		O
Canthigaster jactator	Hawaiian whitespotted toby	End.		O
Arothron hispidus	stripebelly puffer; *ʻoʻopu hue*	Ind.		R
DIODONTIDAE				
Diodon holocanthus	spiny porcupinefish, *kōkala*	Ind.		R
AULOSTOMIDAE	TRUMPETFISH			
Aulostomus chinensis	Pacific trumpetfish; *nūnū*	Ind.		R
BALISTIDAE	TRIGGERFISH			
Melichthys vidua	pinktail triggerfish; *humuhumu hiʻu kole*	Ind.		O
Melichthys niger	black triggerfish, black durgon; *humuhumu ʻeleʻele*	Ind.		C

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name & *Hawaiian name*	Status	Abundance by location Sand Channel	Reef
BALISTIDAE (continued)				
Xanthichthys auromarginatus	Gilded triggerfish	Ind.		O
Rhinecanthus rectangulus	reef triggerfish *humuhumu nukunuku apuaʻa*	Ind.		O
Sufflamen bursa	lei triggerfish *humuhumu lei*	Ind.		R
CIRRHITIDAE				
Paracirrhites arcatus	arc-eye hawkfish; *pilikoʻa*	Ind.		O
Cirrhitus pinnulatus	stocky hawkfish; *po'opa'a*	Ind.		R
Paracirrhites forsteri	blackside hawkfish; *hilu pilikoʻa*	Ind.		O
MONACANTHIDAE	FILEFISH			
Cantherhines dumerilii	barred filefish; *ʻōʻili*	Ind.		R
Cantherhines sandwichensis	squaretail filefish; *ʻōʻili lepa*	Ind.		R
OSTRACIIDAE				
Ostracion meleagris	Spotted boxfish *moa*	Ind.		R
ZANCLIDAE				
Zanclus cornutus	moorish idol; *kihikihi*	Ind.		R
LETHRINIDAE	EMPERERS			
Monotaxis grandoculis	bigeye emperer; *mu*	Ind.		R
OPHICHTYIDAE	SNAKE EELS			
Callechelys lutea	yellow-spotted snake eel	End.	R	
LUTJANIDAE	SNAPPERS			
Lujanus kasmira	bluestripe snapper; *taʻape*	Nat.		A
MULLIDAE	GOATFISH			
Mulloidichthys flavolineatus	square-spot goatfish, *wekeʻā*	Ind.		A
Mulloidichthys vanicolensis	yellow fin goatfish, *weke ʻula*	Ind.		A
Parupeneus multifasciatus	manybar goatfish, *moano*	Ind.		C
CARANGIDAE				
Caranx melampygus	bluefin trevally; *ʻōmilu*	Ind.	R	R

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name & *Hawaiian name*	Status	Abundance by location	
			Sand Channel	Reef
	REPTILES			
CHORDATA, REPTILIA CHELONIIDAE				
Chelonia mydas	green sea turtle, *honu*	Ind.		C
	MAMMALS			
MAMMALIA, CETACEA, DELPHINIDAE				
Stenella longirostris	spinner dolphin; *naia*	Ind.	O	C

KEY TO SYMBOLS USED:
Abundance categories:
R – Rare – only one or two individuals observed.
U – Uncommon – several to a dozen individuals observed.
O – Occasional – seen irregularly in small numbers
C – Common -observed everywhere, although generally not in large numbers.
A – Abundant – observed in large numbers and widely distributed.
Status categories:
End. – Endemic – species found only in Hawaii
Ind. – Indigenous – species found in Hawaii and elsewhere
Nat. – Naturalized – species were introduced to Hawaii intentionally or accidentally.

Appendix B AECOS, Inc., 2015. Reference in Text: (AECOS 2015b), *Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002: 059), Wai'anae District, Island of O'ahu.*

Natural Resources Assessment for Hawaiian Telcom site (parcel TMK: 8-4-002:059), Waiʻanae District, Island of Oʻahu

December 3, 2015 *AECOS* No. 1451B

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Executive Summary

A December 2, 2015 survey of a mostly undeveloped parcel (TMK: 8-4-002:059) in Waiʻanae on leeward Oʻahu by *AECOS* biologists revealed that no Endangered Species Act or comparable State of Hawaiʻi listed plants or animals are present. Further, the parcel is not within federally designated Critical Habitat nor are waters of any kind present that could potentially be jurisdictional under federal law. Our recommendation for any development on this parcel is limited to shielding of construction and/or facility lights to minimize adverse impacts on overflying seabirds.

Introduction

At the request of R. M. Towill Corporation, *AECOS* Inc. conducted a biological survey of natural resources (essentially biological resources) on a 3-ac (1.2-ha) parcel (TMKs: 8-4-002:059) at 84-284 Farrington Highway in Waiʻanae (Mākaha) on the Island of Oʻahu (Figure 1). The property is located across the highway from Mākaha Beach and adjacent to Mākaha Beach Park facilities (comfort station, pavilion, canoe *hale*) located *mauka* of the highway. Presently, parcel TMK: 8-4-002:059 has a small Hawaiian Telcom vault structure surrounded by a security fence and an unimproved "road" (Figure 3) connecting the compound with the highway. With the exception of the maintained

[1] Rana Biological Consulting, Kailua-Kona, Hawaiʻi.

compound area, the site is fully covered by vegetation, which varies from grassland savannah to areas of moderately dense, shrub growth. The site is littered with piles of debris, widely scattered boulders, and some linear, low rock features.

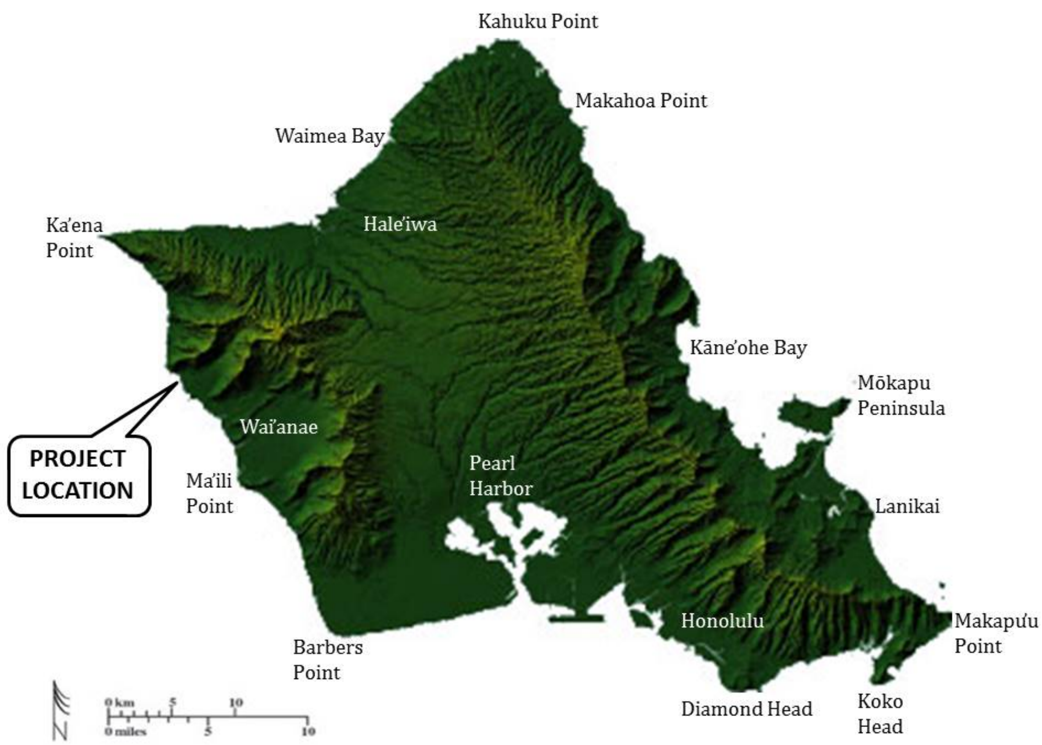

Figure 1. Island of O'ahu showing location of the surveyed property on the Wai'anae coast.

Methods

Plant Survey

For use during the botanical survey conducted by Eric Guinther on December 2, 2015, a property boundary map was loaded into a Trimble 6000 Series GNSS unit (GeoXH) and served as a guide to the survey area (property line) limits. The GNSS unit recorded the progress tracks of the botanist, providing real time feedback on location and adequacy of coverage during the wandering (pedestrian) survey. Plant species were identified as they were encountered

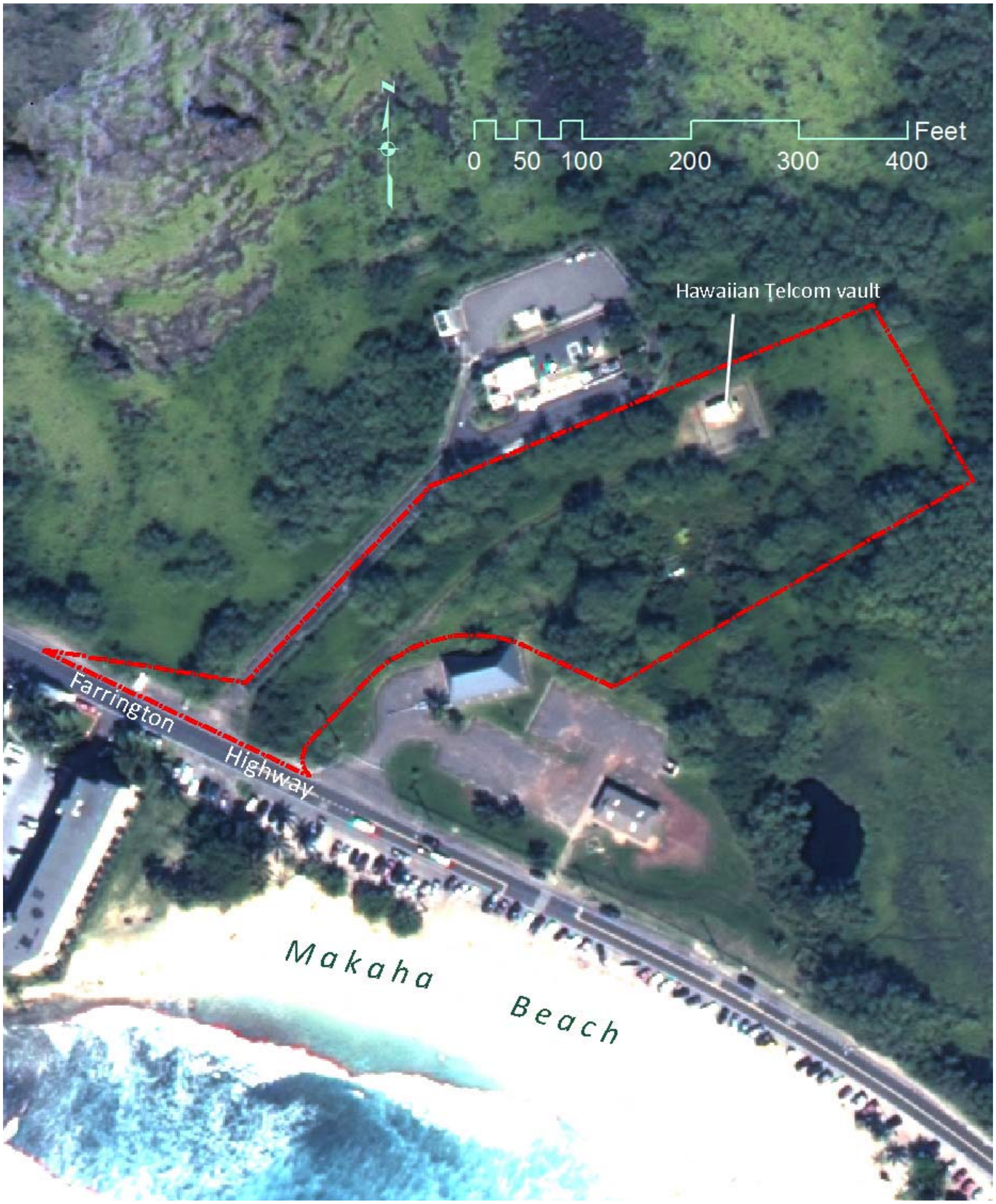

Figure 2. Survey area outlined in red across from Mākaha Beach.

and notes taken to develop a relative abundance for each species recorded. Any plant not immediately recognized during the survey was photographed and/or a representative feature (flower, fruit, etc.) collected for later identification at the laboratory as needed.

Plant species names in this report follow *Manual of the Flowering Plants of Hawaiʻi* (Wagner, Herbst, & Sohmer, 1990; Wagner & Herbst, 1999) for native and naturalized flowering plants and *A Tropical Garden Flora* (Staples & Herbst, 2005) for ornamental plants. More recent name changes for naturalized plant species follow Imada (2012).

Figure 3. An unimproved road extends through savanna from Farrington Highway to a Hawaiian Telcom vault structure on parcel TMK: 8-4-002:059. View looking *makai* (south).

Bird and Mammal Survey

Reginald David conducted the birds and mammals survey during the morning hours of December 2, 2015. Four avian count stations were sited within the survey area. A single, eight-minute avian point-count was made at each of the count stations. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations.

Additionally, the zoologist walked the entire site and time not spent counting at point-count stations was used to search for species and habitats not detected during station counts. Weather conditions were ideal, with unlimited visibility and winds of between 2 and 6 kilometers-per-hour.

The avian phylogenetic order and nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 56th supplements to the Check-List (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser et al., 2009, 2010, 2011, 2012, 2013, 2014, 2015).

The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the survey area. Mammal scientific names follow *Mammal species of the world: a taxonomic and geographic reference* (Wilson and Reeder, 2005).

Results

Vegetation

Vegetation across the site is dense, consisting of grasses with scattered trees (mostly *kiawe* [*Prosopis pallida*]) and moderate coverage with shrubs, mostly *koa haole* (*Leucaena leucocephala*) and *klu* (*Acacia farnesiana*) Several months of unseasonable rainfall have contributed to an unusual lushness of the vegetation throughout this leeward Oʻahu coast (see Figure 4).

Flora

Table 1 is a listing of all the species of flowering plants observed during the survey. No ferns or gymnosperms were observed. Total number of taxa listed is 25, although 5 of these are species planted on adjacent properties very close to or along the property line. Three native plant species (12%) are represented in this flora; all 3 are indigenous herbs (native to Hawaiʻi and elsewhere in the Pacific). None is particular conspicuous on the property, dominated as it is by two grasses: buffelgrass (*Cenchrus ciliaris*) and Guinea grass (*Urochloa maxima*).

Figure 4. Survey area seen from the far east end of the parcel showing an area of buffelgrass grassland bordered by *koa haole* shrub.

Table 1. Flora listing for TMK: 8-4-002:059, Wai'anae, O'ahu

Species listed by family	Common name	Status	Abundance	Notes
FLOWERING PLANTS				
DICOTYLEDONES				
AIZOACEAE				
Trianthema tetragonioides (Pall.) Kuntze	---	Nat	O	
AMARANTHACEAE				
Alternanthera pungens Kunth	khaki weed	Nat	R	
ANACARDIACEAE				
Mangifera indica L.	mango	Nat	R	<2>

Table 1 (continued).

Species listed by family	Common name	Status	Abundance	Notes
ASTERACEAE (COMPOSITAE)				
Calyptocarpus vialis Less.	---	Nat	R	
CONVOLVULACEAE				
Ipomoea obscura (L.) Ker-Gawl	---	Nat	Uu	<2>
Merremia aegyptica (L.) Urb.	hairy merremia, juv.	Nat	Ua	<2>
EUPHORBIACEAE				
Aleurites moluccana (L.) Willd.	*kukui*	**Pol**	R	<1>
Jatropha curcas L.	physic nut	Nat	Uc	
FABACEAE				
Acacia farnesiana (L.) Willd.	*klu*	Nat	C	
Desmanthus pernambucanus (L.) Thellung	virgate mimosa	Nat	A	
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	AA	
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	Nat	A	
MALVACEAE				
Abutilon incanum (Link) Sweet	*koʻoloa keokeo*	**Ind**	O	
Sida ciliaris L.	---	Nat	A	
Sida fallax Walp.	*ʻilima*	**Ind**	U	
Waltheria indica L.	*ʻuhaloa*	**Ind**	Uu	
NYCTAGINACEAE				
Boerhavia coccinea Mill.	false *alena*	Nat	O	
Bougainvillea spectabilis Wild.	bougainvillea	Orn	Ua	<1>
PORTULACEAE				
Portulaca oleracea L.	pigweed	Nat	R	
FLOWERING PLANTS MONOCOTYLEDONES				
ARECACEAE				
Cocos nucifera L.	coconut palm	**Pol**	R	<1>
Veitchia merrillii (Beccari) H. E.. Moore	Manila palm	Orn	R	<1><2>
POACEAE				
Cenchrus ciliaris L.	buffelgrass	Nat	AA	
Cynodon dactylon (L.) Pers.	Bermuda grass	Nat	O	
Urochloa maxima (Jacq.) R. Webster	Guinea grass	Nat	AA	
indet. bamboo	new planting	Orn	R	<1><2>

Table 1 (continued).

Key to Table 1.

STATUS = distributional status for the Hawaiian Islands:

Ind = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.

Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.

Orn = a cultivated plant; a species not thought to be naturalized (spreading on its own) in Hawaiʻi.

Pol = an early Polynesian introduction. Introduced before 1778.

ABUNDANCE = occurrence ratings for plant species:

R – Rare seen in only one or perhaps two locations.

U - Uncommon seen at most in several locations

O - Occasional seen with some regularity

C - Common observed numerous times during the survey

A - Abundant found in large numbers; may be locally dominant.

AA - Very abundant a dominant, vegetation-defining species.

Lower case letters (u, c, a) following qualitative rating of abundance indicate localized abundance is greater than occurrence rating. For example, Ra would be a plant encountered only once or twice, but very numerous where encountered.

NOTES: <1> – Planted specimen; planted on adjacent property or on the property line.

<2> – Plant lacking key diagnostic characteristics (flower, fruit); identification, therefore, uncertain.

Avian Survey

<u>Avian Point Count Survey</u> - A total of 155 individual birds of 18 species, representing 13 separate families, was recorded during station counts (Table 2). All 18 avian species recorded during the course of this survey are alien to the Hawaiian Islands (Table 2).

Avian diversity and densities are in keeping with the highly disturbed secondary vegetation present on the survey site. Three species—Red-vented Bulbul (*Pycnonotus cafer*), Spotted Dove (*Streptopelia chinensis*), and Japanese White-eye (*Zosterops japonicus*)—accounted for slightly more than 54% of all birds recorded during station counts. The most frequently recorded species was Red-vented Bulbul, which accounted for 19% of the total number of individual birds recorded during station point counts. No additional avian species were recorded during the time spent wandering the site.

Table 2 – Avian species detected for Hawaiian Telcom site (TMK: 8-4-002:059).

Common Name	***Scientific Name***	***ST***	***RA***
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Domestic Chicken	*Gallus gallus*	D	0.50
	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Rock Pigeon	*Columba livia*	A	1.50
Spotted Dove	*Streptopelia chinensis*	A	7.00
Zebra Dove	*Geopelia striata*	A	5.00
	PASSERIFORMES		
	PYCNONOTIDAE - Bulbuls		
Red-vented Bulbul	*Pycnonotus cafer*	A	7.25
	CETTIIDAE - Cettia Warblers & Allies		
Japanese Bush-Warbler	*Cettia diphone*	A	0.50
	ZOSTEROPIDAE - White-eyes		
Japanese White-eye	*Zosterops japonicus*	A	6.75
	TIMALIIDAE - Babblers		
Red-billed Leiothrix	*Leiothrix lutea*	A	1.00
	TURDIDAE - Thrushes		
White-rumped Shama	*Copsychus malabaricus*	A	0.25
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	0.75
	THRAUPIDAE - Tanagers		
Red-crested Cardinal	*Paroaria coronata*	A	0.50
	CARDINALIDAE - Cardinals Saltators & Allies		
Northern Cardinal	*Cardinalis cardinalis*	A	2.50
	FRINGILLIDAE - Fringilline and Carduline Finches & Allies		
	Carduelinae - Carduline Finches & Hawaiian Honeycreepers		
House Finch	*Haemorhous mexicanus*	A	1.00
	PASSERIDAE - Old World Sparrows		
House Sparrow	*Passer domesticus*	A	0.75
	ESTRILDIDAE - Estrildid Finches		
Common Waxbill	*Estrilda astrild*	A	1.50
African Silverbill	*Euodice cantans*	A	0.50
Java Sparrow	*Lonchura oryzivora*	A	1.00
Chestnut Munia	*Lonchura atricapilla*	A	0.50

Key to Table 2

ST Status

D Domesticated – Feral species not considered to be established in the wild on the Island of Oʻahu

A Alien – Introduced to the Hawaiian Islands by humans

RA Relative Abundance – Number of birds detected divided by the number of count stations (4)

Mammals Survey

One terrestrial mammalian species was detected on site during the course of this survey. Scat, tracks and sign of dogs (*Canis familiaris*) were recorded in several locations within the study site. A dog was seen walking near the entrance to the site, and several were heard barking from locations outside of the survey area. Dogs are alien to the Hawaiian Islands and are deleterious to native species.

Discussion

Botanical Resources

The botanical survey revealed no plants of particular interest or conservation value growing on the parcel. The flora is a typical of lowland, leeward Oʻahu assemblage. Native herbaceous species present are common species and no plants listed under either state or federal endangered species programs (HDLNR, 1998; USFWS, 2015) are present on or immediately adjacent to the site.

Avian Resources

The findings of the avian survey are consistent with the location of the property, and the habitats present there. All of the avian species recorded during the course of this survey are alien to the Hawaiian Islands. No avian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected (HDLNR, 1998; USFWS, 2015).

<u>Seabirds</u> **-** Although no seabirds were detected during this survey, it is possible that the threatened endemic sub-species of the Newell's Shearwater (*Puffinus newelli*) and the Wedge-tailed Shearwater (*Puffinus pacificus*), which is protected under the federal Migratory Bird Treaty Act, over-fly the project area between April and the middle of December each year in very small numbers. Newell's Shearwaters are not known to breed on the Island of Oʻahu, though seabirds likely to be this species have been recorded on ornithological radar in low numbers flying over parts of the Island. Wedge-tailed Shearwaters have been picked up as downed birds in the fall months on the Waiʻanae Coast (David, 2015).

The primary cause of mortality in Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges 1998; Ainley et al., 2001). Collision with manmade structures is considered to be the second most significant cause of mortality of this seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds may collide with manmade structures, and if not killed outright, become easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003).

Potential for impact on protected seabirds is a threat to transiting birds disoriented by lights associated with the project. If it is deemed expedient to conduct night-time construction activities, or if lights are installed as part of the project, these must be shielded (Reed et al., 1985, Telfer et al., 1987).

Mammalian Resources

Although no rodents were recorded, it is likely that one or more of the four established alien Muridae found on Oʻahu—roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), black rat (*Rattus exulans hawaiiensis*), and European house mouse (*Mus musculus domesticus*)—utilize resources found within the general project area on a seasonal basis. All of these introduced rodents are deleterious to native ecosystems and native faunal species. No mammalian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected during the course of this survey (HDLNR, 2015; USFWS, 2015).

<u>Hawaiian hoary bat</u> - With the exception of the *ʻōpeʻapeʻa* or Hawaiian hoary bat (*Lasiurus cinereus semotus*), all terrestrial mammals found on the Island of Oʻahu are alien species, and most of these are ubiquitous. No Hawaiian hoary bats were detected during the course of this survey. Given the habitat present on the site, and the lack of suitable roosting trees, any potential usage of the area by this species would be of an incidental foraging nature. It is not expected that this project will result in deleterious impacts to this listed species.

Federal Jurisdictional Waters / Critical Habitat

Our survey revealed no federal jurisdictional waters (streams or wetlands) on the subject property. Further, no federally delineated Critical Habitat for any species includes, or is close to the parcels. Thus, modifications of habitats on the site will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under state law.

Recommendations

- If night-time construction activity or equipment maintenance is proposed during construction activities on this property, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

- If exterior facility lighting is installed in conjunction with the project, it is recommended that the lights be shielded to reduce the potential for interactions of nocturnally flying seabirds.

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Appendix C Cultural Surveys Hawaiʻi, Inc., 2015. Reference in Text: (CSH, 2015a), *Draft Archaeological Assessment for the Southeast Asia – U. S. (SEA-US) Cable Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: [1] 8-4-002: 059*.

Draft

Archaeological Assessment for the Southeast Asia-U.S. (SEA-US) Cable Project Mākaha Ahupua‘a, Wai‘anae District, O‘ahu TMK: [1] 8-4-002:059

Prepared for
R.M. Towill Corporation

Prepared by
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Management Summary

Reference	Archaeological Assessment for the Southeast Asia-U.S. (SEA-US) Cable Project Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: [1] 8-4-002:059 (Manirath and Hammatt 2015)
Date	November 2015
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) MAKAHA 15
Investigation Permit Number	CSH completed this archaeological assessment (AA), initially termed an archaeological inventory survey (AIS), under archaeological permit number 15-03, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-13-282.
Agencies	SHPD
Land Jurisdiction	Hawaiian Telcom
Project Proponent	R.M. Towill Corporation
Project Funding	NEC Corporation of America and Hawaiian Telcom
Project Location	The southwest portion of the project area is located along Farrington Highway just northeast of the northern terminus of Mākaha Beach Park and extending northeast approximately 200 meters (m). The project area is located on a portion of a 1998 Waianae U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.
Project Description	The proposed SEA-US Cable project involves the installation of a submarine fiber optic (F/O) telecommunications cable in offshore waters approximately 0.4 to 0.8 kilometers (km) seaward (west) of Mākaha Beach. The cable will be placed in a specially prepared conduit located at the bottom of the seafloor, at a depth of approximately 15 to 20 m. Once the cable is placed in the conduit it will be pulled to shore from inside the conduit to a specially prepared manhole located within the project area. The precise location of the manhole within the project area has not been finalized. The conduit at the seafloor will be installed using horizontal directional drilling (HDD). This will involve placing drilling equipment within the project area. Drilling to create the borehole will continue beneath the ground until it is ready to daylight on the seafloor. There is no specific timeframe for the period of drilling but it is expected to last several months. Conduit will be placed into the borehole as the drilling progresses. The location for the daylighting of the borehole and conduit in offshore coastal waters was selected to minimize disturbance to the environment, the users of the Mākaha Beach, and to minimize interference with existing cables. The extensive sand deposits offshore from Mākaha Beach will reduce the exposure of the cable to ocean forces, eventually allowing it to be buried in the sand. This process is expected to allow for

	the protection of corals and other marine species that depend on the area for food, foraging, and habitat. Once completed, the location of the cable in 15-20 m of water depth is not expected to affect beach users including surfers and fishermen. Ultimately, the final build-out of the project will result in telecommunications connectivity among Southeast Asia, Hawaiʻi, Guam, and the U.S. West Coast. The project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided.
Project Acreage	The SEA-US Cable project area includes 1.14 hectares (2.82 acres).
AIS Scope[i]	This AA, initially termed an AIS, focused on the identification of archaeological historic properties and burial sites per the guidelines of HAR §13-276. The identification, documentation, and evaluation of in-use potential architectural historic properties such as historic buildings and structures was outside the scope of this investigation. Throughout this report the term "historic properties" is used and should be generally understood to refer to archaeological historic properties, unless otherwise stated.
Area of Potential Effect (APE)[ii]	The area of potential effect is considered to be the entire 1.14-hectare (2.82-acre) project area.
Historic Preservation Regulatory Context[iii]	This report was prepared in accordance with the AIS requirements outlined in HAR §13-276 and was conducted to identify, document, and assess significance of any historic properties. This document is intended to support the proposed project's historic preservation review under Hawaiʻi 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. An AIS research design for the SEA-US Cable project was submitted for review (25 September 2015) to the SHPD, and the SHPD accepted the proposed research design by email on 30 October 2015. A cultural impact assessment (CIA) is also being prepared to comply with the State of Hawaiʻi's environmental review process under HRS §343. No historic properties were identified within the project area during the initial AIS investigation; therefore, this report is termed an archaeological assessment, per HAR §13-284-5(b)(5)(A): "Results of the survey shall be reported through an archaeological assessment, if no sites were found, or an archaeological survey report which meets the minimum standards set forth in chapter 13-276-5."

Fieldwork Effort	Fieldwork was accomplished on 28 October 2015 and 9 November 2015 by CSH archaeologists Scott Belluomini, B.A., Lisa Manirath, M.A., Megan Hawkins, M.A., and Project Manager Trevor Yucha, B.S., under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. This work required approximately 5 person-days to complete.
Historic Properties Identified	No historic properties were identified during the current AA.
Effect Recommendation[iv]	In accordance with Hawaiʻi State historic preservation review legislation, HAR §13-284-7, the project's effect recommendation is "no historic properties affected."
Mitigation Recommendations	No significant historic properties were identified; therefore, no further archaeological historic preservation work is recommended.

[i] An "archaeological inventory survey" is defined as "the process of identifying and documenting the archaeological historic properties and burial sites in a delineated area, gathering sufficient information to evaluate significance of the historic properties and burials, and compiling the information into a written report for review and acceptance by the department [SHPD]" (HAR §13-276-2). An archaeological inventory survey report ust contain documentation, arguments and reasoning, and mitigation commitments to support the completion of historic preservation review steps one through four for archaeological historic properties.

[ii] "Project Area" is defined (HAR §13-284-2) as "the area the proposed project may potentially affect, either directly or indirectly. It includes not only the area where the proposed project will take place, but also the proposed project's area of potential effect." "Effects include, but are not limited to, partial or total destruction or alteration of the historic property, detrimental alteration of the properties' surrounding environment, detrimental visual, spatial, noise or atmospheric impingement, increasing access with the chances of resulting damage, and neglect resulting in deterioration" (HAR §13-284-7(b). Based on these definitions of "project area" and "effects" there is potential for project effects to historic properties to extend outside the footprint of project construction. Accordingly a definition and justification of the "project area" and "area of potential effect" employed in the AIS study is required.

[iii] The State of Hawaiʻi historic preservation review process is designed to identify and mitigate a project's impacts to significant historic properties. Historic properties are defined as "any building, structure, object, district, area, or site, including *heiau* [temple] and underwater site, which is over fifty years old" (HAR §13-284-2). The six potential historic preservation review steps include the following: 1) identification and inventory, to determine if historic properties are present in the project's area and, if so, to identify and document (inventory) them; 2) evaluation of historic property significance; 3) determination of project effect (impact) on significant historic properties; 4) mitigation commitments that commit to acceptable forms of mitigation in order to properly handle or minimize impacts to significant historic properties; 5) detailed mitigation plan, scope of work to properly carry out the general mitigation commitments; and 6) verification of completion of detailed mitigation plan (HAR §13-284-3). A project's effect and potential mitigation measures are evaluated based on the project's potential impact to "significant" historic properties (those historic properties determined significant following their evaluation of significance [HAR §13-284-6]).

[iv] One of two effect determinations must be established: 1) "No historic properties affected," the project will have no effect on significant historic properties; or 2) "Effect, with agreed upon mitigation commitments," the project will affect one or more significant historic properties, and the effects will potentially be harmful. However, the agreed upon mitigation commitments involving one or more forms of mitigation will reasonably and acceptably mitigate the harmful effects (HAR § 13-284-7).

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Section 1 Introduction

1.1 Project Background

At the request of the project proponent R.M. Towill Corporation, Cultural Surveys Hawai'i, Inc. (CSH) has prepared an archaeological assessment (AA) for the Southeast Asia-U.S. (SEA-US) Cable project, Mākaha Ahupua'a, Wai'anae District, O'ahu, TMK: [1] 8-4-002:059. The project area is located along Farrington Highway just northeast of the northern terminus of Mākaha Beach Park and extending northeast approximately 200 meters (m). The project area is depicted on a portion of the 1998 Waianae 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).

The proposed SEA-US Cable project involves the installation of a submarine fiber optic (F/O) telecommunications cable in offshore waters approximately 0.4 to 0.8 kilometers (km) seaward (west) of Mākaha Beach, O'ahu, Hawai'i. The cable will be placed in a specially prepared conduit located at the bottom of the seafloor, at a depth of approximately 15 to 20 m. Once the cable is placed in the conduit it will be pulled to shore from inside the conduit to a specially prepared manhole located within the project area. The precise location of the manhole within the project area has not been finalized.

The conduit at the seafloor will be installed using horizontal directional drilling (HDD). This will involve placing drilling equipment within the project area. Drilling to create the borehole will continue beneath the ground until it is ready to daylight on the seafloor. There is no specific timeframe for the period of drilling but it is expected to last several months. Conduit will be placed into the borehole as the drilling progresses.

The location for the daylighting of the borehole and conduit in offshore coastal waters was selected to minimize disturbance to the environment, the users of the Mākaha Beach, and to minimize interference with existing cables. The extensive sand deposits offshore from Mākaha Beach will reduce the exposure of the cable to ocean forces, eventually allowing it to be buried in the sand. This process is expected to allow for protection of corals and other marine species that depend on the area for food, foraging, and habitat. Once completed, the location of the cable in 15-20 m of water depth is not expected to affect beach users including surfers and fishermen.

Ultimately, the final build-out of the project will result in telecommunications connectivity among Southeast Asia, Hawai'i, Guam, and the U.S. West Coast. The project will further benefit Hawai'i with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided.

1.2 Historic Preservation Regulatory Context and Document Purpose

This report was prepared in accordance with the AIS requirements outlined in §13-276 and was conducted to identify, document, and assess significance of any historic properties.

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.

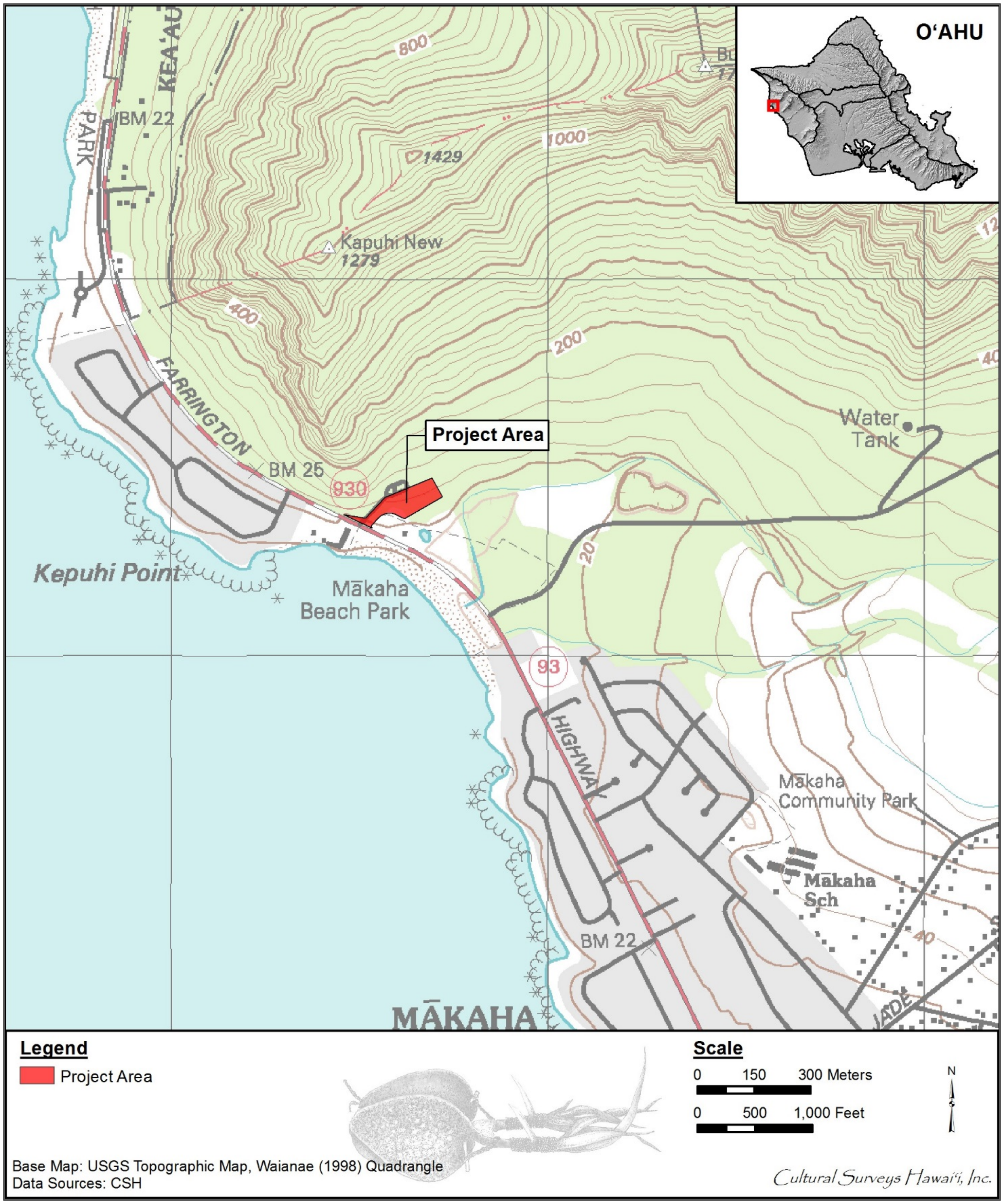

Figure 1. Portion of the 1998 Waianae USGS 7.5-minute topographic quadrangle showing the location of the project area

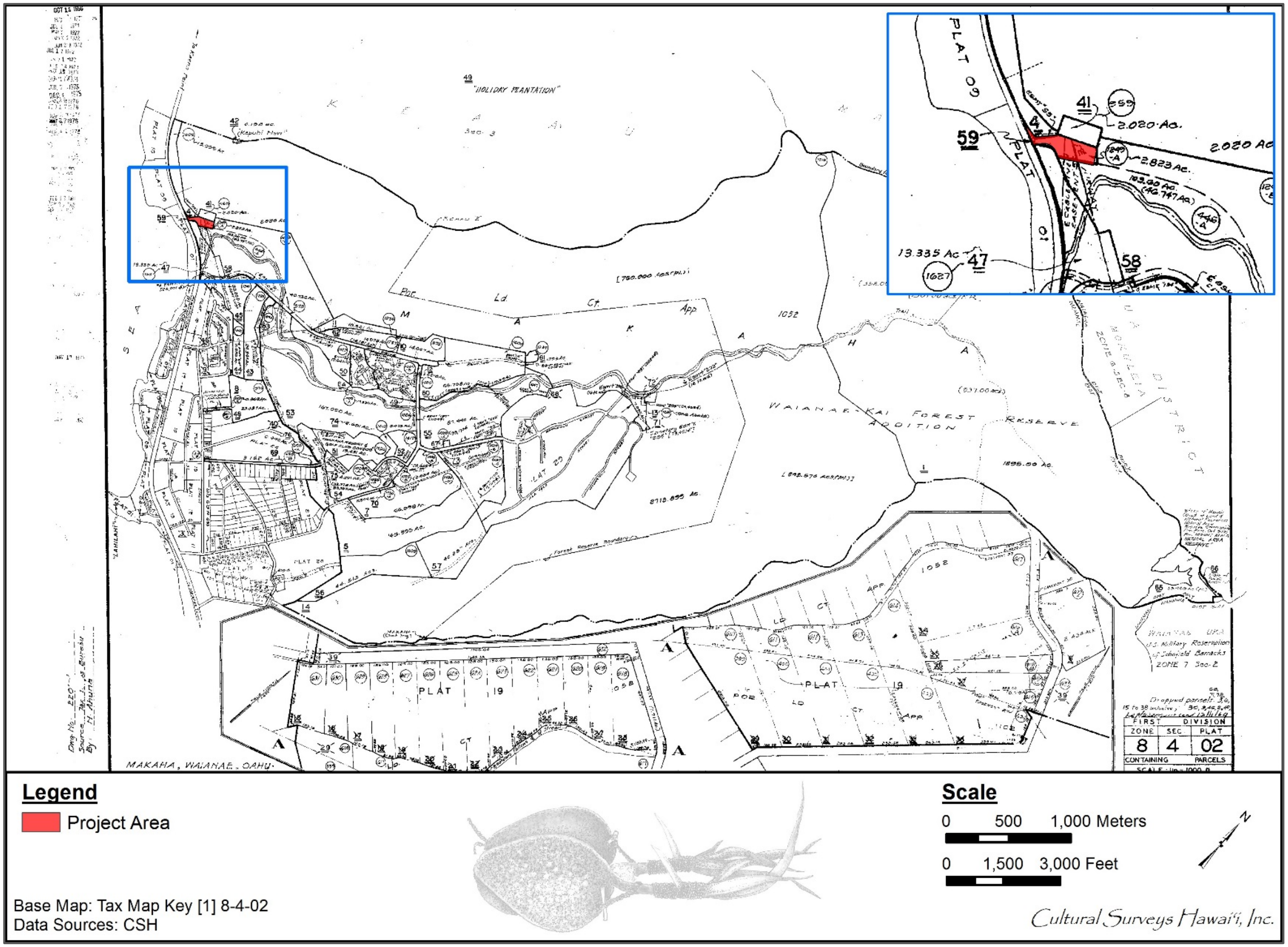

Figure 2. Tax Map Key (TMK) [1] 8-4-002 showing the project area (Hawai'i TMK Service 2014)

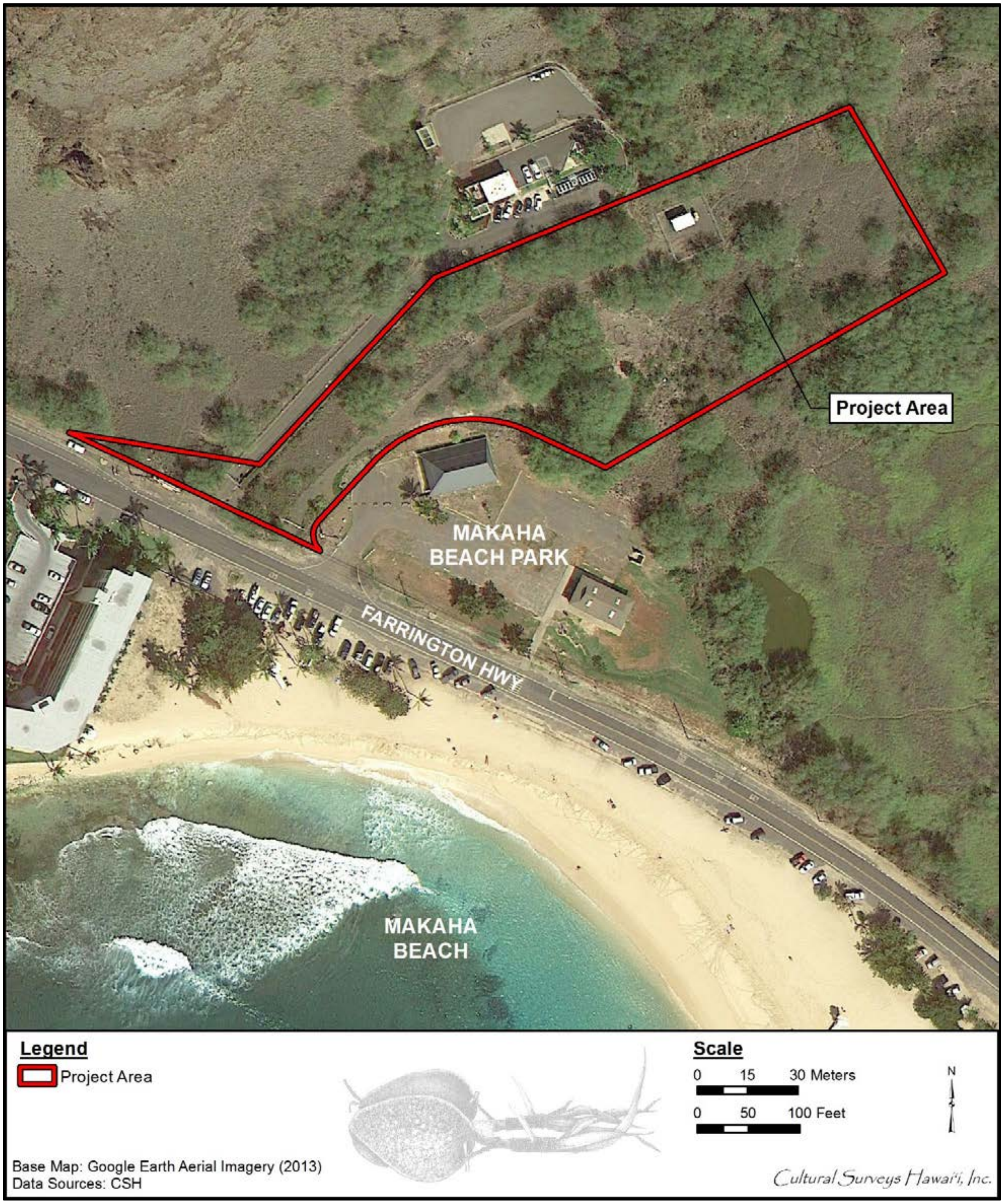

Figure 3. Aerial photograph of the project area (Google Earth 2013)

An AIS research design for the SEA-US Cable project was submitted for review (25 September 2015) to the SHPD, and the SHPD accepted the proposed research design by email on 30 October 2015.

A cultural impact assessment (CIA) is also being prepared to comply with the State of Hawaiʻi's environmental review process under HRS §343.

No historic properties were identified within the project area during the initial AIS investigation; therefore, this report is termed an archaeological assessment, per HAR §13-284-5(b)(5)(A): "Results of the survey shall be reported through an archaeological assessment, if no sites were found, or an archaeological survey report which meets the minimum standards set forth in chapter 13-276-5."

1.3 Environmental Setting

1.3.1 Natural Environment

Based on U.S. Department of Agriculture soils survey data, soils within the project area consist of stony land, 5 to 40% slopes (rST), and coral outcrop, 0 to 20% slopes (CR) (Figure 4). Stony land is described by Foote (et al. 1972) as occurring in valleys and on side slope of drainage ways:

> It consists of mass boulders and stones deposited by water and gravity . . . Stones and boulders cover 15 to 90 percent of the surface. The soil among stones consists of reddish silty clay loam that is similar to Ewa soils and very dark grayish brown clay that is similar to Lualualei soils. [Foote et al. 1972:120]

Coral outcrops consist of coral or cemented calcareous sand. Small areas of coral outcrops are exposed on the ocean shore, on the coastal plains, and at the foot of the uplands. Coral outcrop is geographically associated with Jaucas, Keeau, and Mokuleia soils:

> Coral outcrop makes up about 80 to 90 percent of the acreage. The remaining 10 to 20 percent consists of a thin layer of friable, red soil material in cracks, crevices, and depressions within the coral outcrop. This soil material is similar to that of the Mamala series. [Foote et al. 1972:29]

Rainfall is less than 500 mm (20 inches) annually along the Waiʻanae Coast and winter storms are the major source of precipitation. December through February are relatively wet months for the region (Armstrong 1973). Vegetation along the Waiʻanae Coast is sparse. With 500 mm (20 inches) or less of rain annually, only the hardiest plants adapted to coastal environments can thrive.

The vegetation is typical of dry seashore environments in Hawaiʻi and is dominated by alien species. Indigenous species include *hau* (*Hibiscus tiliaceus*), *kou* (*Cordia subcordata*), *kamani* (*Calophyllum inophyllum*), *naupaka* or *naupaka kahakai* (*Scaevola sericea*), *paʻu o Hiʻiaka* (*Jacquemontia ovalifolia sandwicensis*), the native beach morning glory or *pohuehue* (*Ipomea pes-caprae*), and the coconut or *niu* (*Cocos nucifera*). Introduced species found bordering Farrington Highway include sea grape (*Coccoloba uvifera*), *kiawe* trees (*Prosopis pallida*), Madagascar Olive trees (*Noronhia emarginata*), and *koa haole* (*Leucaena leucocephala). Kiawe*, *koa haole*, and various grasses were dominant within the project area.

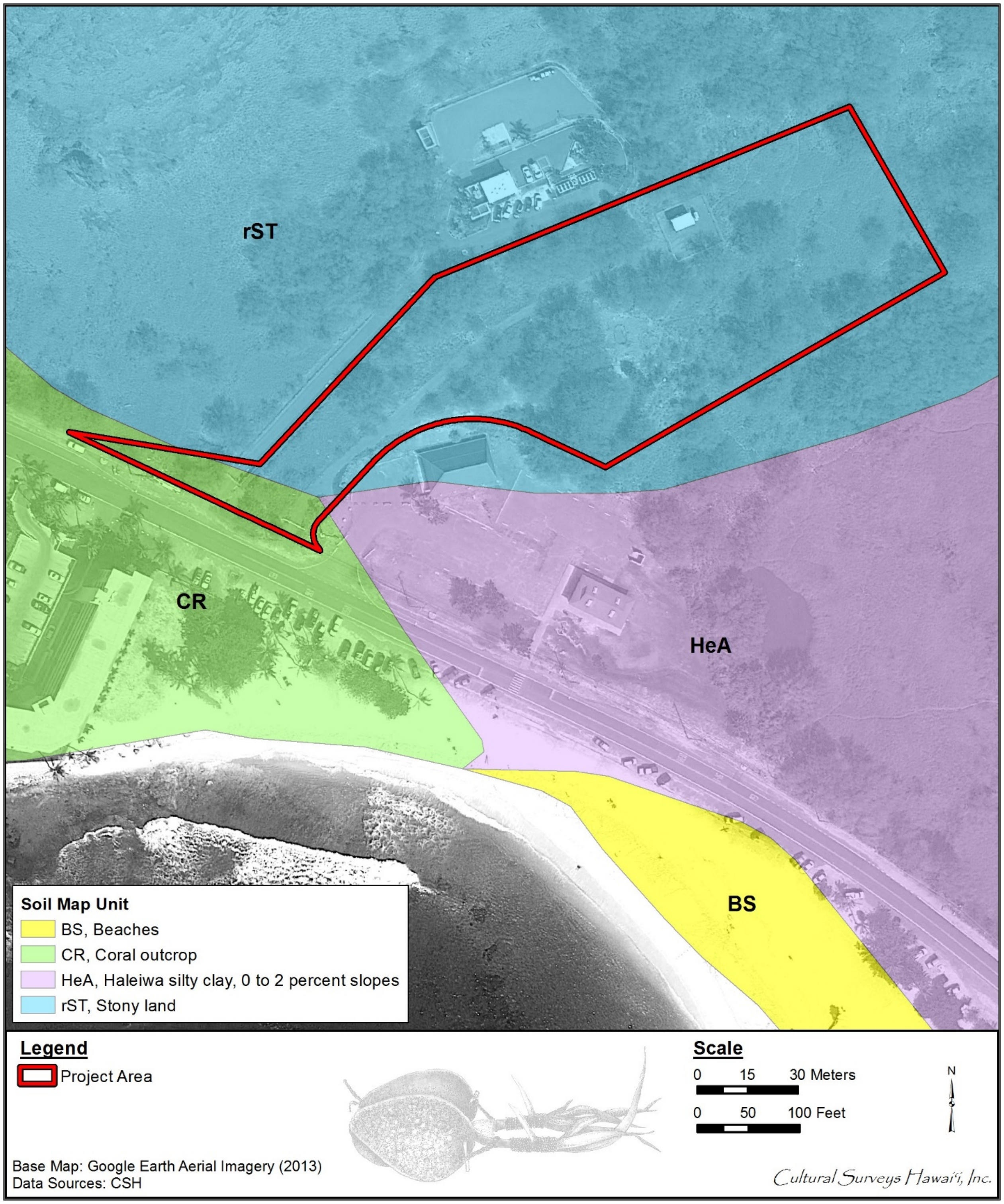

Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (U.S. Department of Agriculture Soils Survey Geographic Database [SSURGO] 2001; Google Earth 2013)

1.3.2 Built Environment

The built environment within and in the immediate vicinity of the project area consists of paved roads and graded, unpaved road-shoulder pull-off/parking areas, and commercial development.

Paved roads are located both within and in the immediate vicinity of the project area. Farrington Highway is adjacent to the project area on the west side, running roughly north-south, and continues in both directions. Another paved road leading to the GTE Hawaiian Telephone Company Inc. and AT&T Transoceanic Communication LLC substation property bisects the project area in the westernmost region. The entirety of the road does not cross the full project area, but instead serves as a northern boundary for the project area.

An unpaved, unimproved road is located directly through the center of the project area leading to a commercial property owned by Hawaiian Telcom (Figure 5). On the southern boundary of the project area, and adjacent to Farrington Highway, a paved parking lot is within the vicinity of the project area utilized by patrons of Mākaha Beach Park, especially those with boat tow accessories as there is ample space to maneuver. On the northern boundary of the parking lot sits a covered structure that serves as a storage area for outrigger canoes and associated equipment (Figure 6).

Figure 5. Overview of unimproved road within the project area leading to Hawaiian Telcom property access, view to northeast

Figure 6. Overview of the project area depicting an adjacent storage area for outrigger canoes and associated equipment, view to northeast

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this AA under archaeological permit number 15-03, issued by the SHPD pursuant to HAR §13-282. Fieldwork was conducted on 28 October 2015 and 9 November 2015 by CSH archaeologists Scott Belluomini, B.A., Lisa Manirath, M.A., Megan Hawkins, M.A., and Project Manager Trevor Yucha, B.S., under the general supervision of Hallett H. Hammatt, Ph.D. This work required approximately 5 person-days to complete. In general, fieldwork included 100% pedestrian inspection of the project area, subsurface testing, and GPS data collection.

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 through systematic sweeps spaced 10 m apart. No surface historic properties were identified.

2.1.2 Subsurface Testing

The subsurface testing program was backhoe assisted and involved five test excavations. In general, linear trenches measuring approximately 6 m (20 feet [ft]) long and 0.6 m (2 ft) wide were excavated within the project area.

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 included 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. Where stratigraphic anomalies or potential cultural deposits were exposed, these were carefully represented on test excavation profile maps.

2.1.3 GPS Data Collection

The locations 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 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 9.1. CSH utilizes the NAD 83 HARN datum and UTM Zone 4N coordinate system.

2.2 Laboratory Methods

No significant cultural materials were observed and collected during the course of the AA. No laboratory analyses were conducted.

2.2.1 Disposition of Materials

No cultural materials were observed and collected during the current AA. All data generated during the course of the AA are stored at the CSH offices.

2.2.2 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 Hawaiʻi, the Hawaiʻi State Archives, the Mission Houses Museum Library, the Hawaiʻi Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawaiʻi State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ʻAina database (Waihona ʻAina 2000).

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 and Historical Background

3.1.1 Mythological and Traditional Accounts

The project area is located within the *ahupuaʻa* (land division) of Mākaha, which extends from the leeward Waiʻanae Range to the coast between Waiʻanae Ahupuaʻa to the southeast and Keaʻau Ahupuaʻa to the northwest (Figure 7).

Although there are many traditional accounts detailing the pre-Contact period of other portions of the Waiʻanae District, few exist for Mākaha. Mary Kawena Pukui (Pukui et al. 1974) gives the meaning of Mākaha as "fierce" and Roger C. Green (1980) suggests this translation refers to "fierce or savage people" once inhabiting the valley. Green (1980:5) refers to "the ʻŌlohe people, skilled wrestlers and bone-breakers, by various accounts [who] lived in Mākaha, Mākua, and Keaʻau, where they often engaged in robbery of passing travelers."

3.1.1.1 Legend: How Mākaha Got Its Name

The shores fronting the beautiful Mākaha Valley were known for their abundant marine resources. Edward Iopa Kealanahele's legend ("How Makaha got its name," Kealanahele 1975) gives light to the great ocean resources:

> Long ago, there lived in this valley a handsome young chief named Makaha. His skill as a fisherman gained island-wide attention, which eventually reached the ears of Ke Anuenue [the rainbow], the goddess of rain, who lived in upper Manoa Valley.
>
> She was so intrigued that she sent her trusted winged friend, Elepaio, to investigate Makaha. Elepaio returned with exciting stories of Mākaha's daring and skills.
>
> The next morning, Ke Anuenue created an awe-inspiring double rainbow which arched from Manoa Valley to this valley, from where she and her retinue could watch Makaha perform his daring feats at the ocean.
>
> The people of the Waiʻanae Valley were petrified by that magnificent rainbow that ended in this unnamed valley where Makaha lived.
>
> Knowing that Ke Anuenue was watching, they prayed that she would bring them the much needed gentle rains and not the harsh storms she could create when displeased.
>
> Makaha, aware of her presence, scaled Mauna Lahilahi and called loudly to his aumakua [his ancestral spirit] Mano ai Kanaka, the most vicious of man-eating sharks. As Mano ai Kanaka glided in from the ocean, Makaha dived from the rocky pinnacle, emerged on Mano ai Kanaka's back and rode with regal grandeur.
>
> As the two disappeared into the depths, the sea became calm. Suddenly Makaha seemed to be everywhere along the rocky coast gracefully tempting death. Then, just as suddenly, Makaha seemed to skim the ocean as Mano ai Kanaka carried him to shore. Makaha then carried his entire catch to the rainbows end deep in the valley

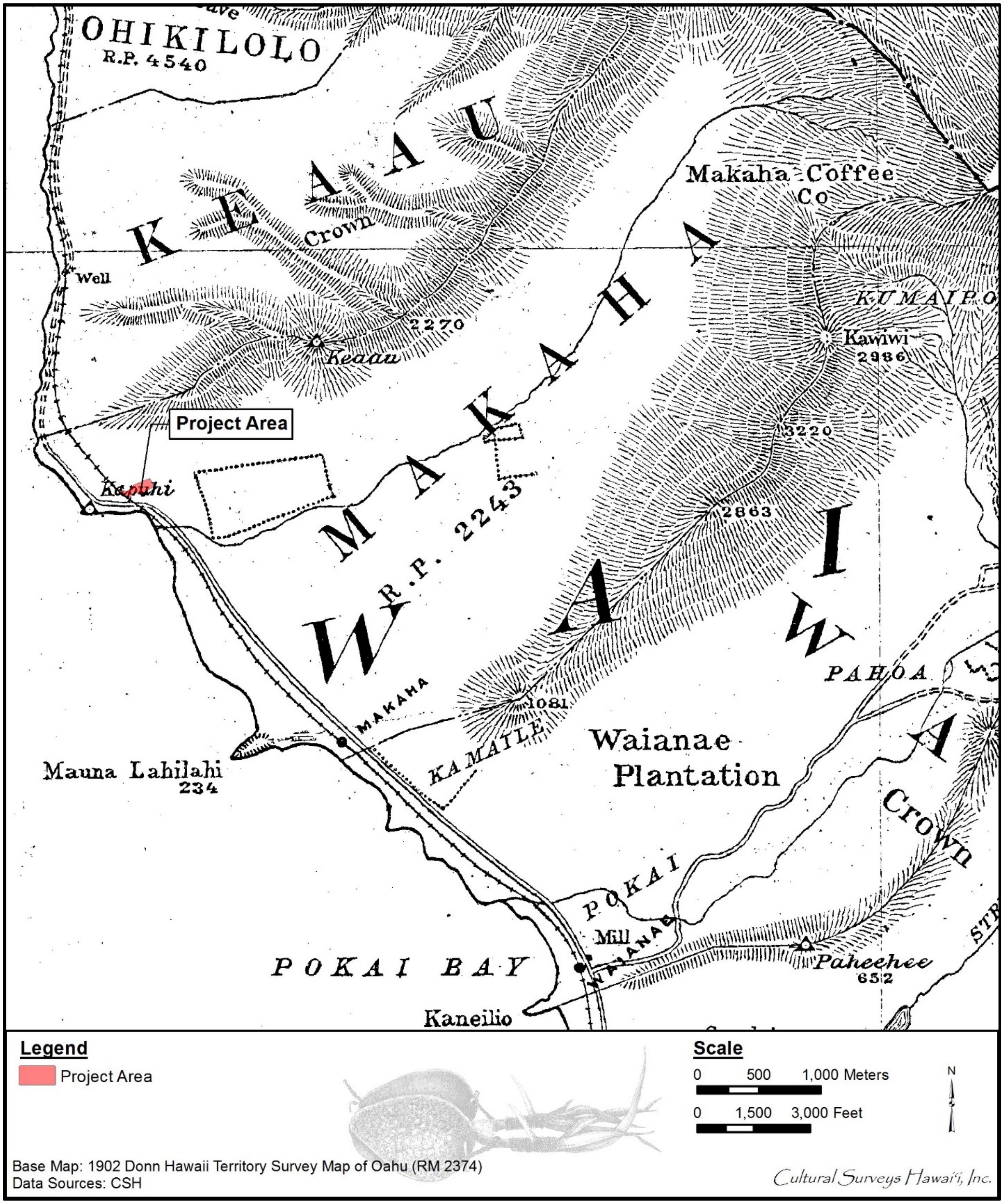

Figure 7. 1902 Donn Hawaii Territory Survey Map of Oahu

> and offered it to Ke Anuenue. Deeply touched, she sent gentle rains to the parched earth of the great Waiʻanae Valley. She was impressed by the selection of seafood that was offered her but was disappointed by the quality of the poi, maiʻa [banana] and uala [sweet potato] which were dry and stringy. She demanded to know why since she was so accustomed to good quality fruits. She was told that it was because of the lack of rainfall in the valley.
>
> Ke Anuenue became enamored with Makaha and from then on her double rainbow would appear in Mākaha's kuleana [land area] and gentle rains would fall on Waiʻanae so the people could enjoy lush bananas and an abundance of taro.
>
> The people built a heiau in honor of Ke Anuenue and Makaha but Ke Anuenue refused the honor and named the entire valley, Makaha, by which it is now known. [Kealanahele 1975]

One of the many legends concerning the fierceness of Mākaha involves robbers and cannibals, as the following attests (McAllister 1933):

> Long ago there lived here a group of people who are said to have been very fond of human flesh. At high altitude on each side of the ridge [separating Mākaha from Keau], guards were stationed to watch for people crossing this narrow stretch of land between the mountains and the sea. On the Mākaha side, they watched from a prominent stone known as Pohaku o Kane, on the Keau side, from a stone known as Pohaku o Kaneloa. The individual who passed here was in constant danger of death, for on each side of the trail men lay in wait for the signal of the watcher. If a group of persons approached, too many to be overcome by these cannibalistic peoples, the guards called out to the men hidden below, 'Moanakai' (high tide); but if, as frequently happened, only two or three people were approaching the watchers called 'Mololokai' (low tide). The individuals were then attacked and the bodies taken to two small caves on the seaside of the road. Here the flesh is said to have been removed and the bones, skin, and blood left in the holes, which at high tide, were washed clean by the sea. [McAllister 1933:121–122]

3.1.1.2 Stories of Malolokai

In the *ahupuaʻa* of Mākaha there are accounts of a talking stone on the hill of Malolokai, and two small pits on the *makai* (seaward) side of the road at Kepuhi Point:

> We rode to the plain of Kumanomano . . . and it is said of the place, the teeth of the sun is sharp at Kumanomano. Mākaha rose above like a rain cloud. We passed in front of a famous hill Malolokai. We saw the talking stone standing there. [*Kuokoa*, 11 August 1899 in Sterling and Summers 1978:79]

A brief account of the location of Malolokai cave is given by Kuokoa in Sterling and Summers (1978:79): "Malolokai lies below [beyond] the hill of Maunalahilahi close to a cliff. Below, in the level land of Waihokaea are the bones of the travelers who were killed by skilled *lua* fighters."

Lua literally means hand-to-hand fighting that includes bone-breaking (Pukui and Elbert 1986). It is often referred to as the art of *lua*, or the Hawaiian martial art. Starting in the 1750s, the art of *lua* was only taught to the *aliʻi* (royalty) and their guards. This knowledge was a long time familial secret and could only be passed down through family. Later, in the early 1800s, the *kapu* (taboo) was broken and the Hawaiian martial art of *lua* was taught to other people outside the bloodline (Paglinawan et al. 2006).

Lua warriors used an array of weapons in combat made of different types of hardwood found throughout the Hawaiian Islands such as *kauwila* (*Alphitonia ponderosa* and *Colubrina oppositifolia)* and *koa* (*Acacia koa*). Marine resources were also used to make weapons such as shark teeth used to make the *leiomano*, a shark tooth weapon used as a knife, and the marlin (swordfish) bill (Paglinawan et al. 2006).

Some legends say they were cannibals and not *lua* fighters:

> The late Harry George Poe, born in Makua Valley in 1882, wrote in his diary that the robbers threw their victims into a pit that went underground to the ocean. Poe explained, 'the reason is, they wants a man's legs without no hair on to make [an] aku [tuna] fishhook. They believe in those days that the human leg is best, lucky hook for aku.' One legend says a group of hairless men from Kauai finally wiped out the entire colony of robbers. Since that time, Malolokai has been safe for travelers. [McGrath et al. 1973:11]

In Hiʻiaka's "Address to Cape Kaena," she mentioned Mākaha as she traveled along the sunny coast. As she stood at the top of the Pōhākea Pass looking back, she sang the following song (Emerson 1915):

Kaena's profile fleets through the calm,	Kunihi Kaena, Holo i ka Malie;
With flanks ablaze in the sunlight-	Wela i ka La ke alo o ka pali;
A furnace-heat like Kilauea;	Auamo mai i ka La o Kilauea;
Ke-awa-ula swelters in heat;	Ikiiki i ka La na Ke-awa-ula
Kohola'-lele revives in the breeze	Ola i ka makani Kai-a-ula Koholaʻ -lele
That breath from the sea, Kai-a-ulu.	He makani ia no lalo.
Fierce glows the sun of Makua;	Haoa ka Loa i na Makua;
How it quivers at Ohiki-lele-	Lili ka La i Ohiki-lolo
'Tis the Sun-god's dance oʻer the plain,	Haʻa-hula leʻa ke La i ke kula,
A roit of dance at Makaha.	Ka Haʻa ana o ka La i Makaha;
The sun-tooth is sharp at Kumano;	Oi ka niho o ka La i Ku-manomano;
Life comes again to Maile ridge,	Ola Ka-maile i ka huna na niho
When the Sun-god ensheaths his fang.	Moʻa wela ke kula o Walio;
The Plain Walio is sunburned and scorched;	Ola Kua-iwa i ka malama po
Kua-iwa revives with the nightfall;	Ola Waianae i ka makani Kai-a-ulu
Waianae is consoled by the breeze	Ke hoa aku la i ka lau o ka niu
Kai-a-ulu and waves its coco fronds;	Uwe' o Kane-pu-niu i ka wela o ka La;

Kane-pu-niu's fearful of sunstroke'(e)
A truce, now, to toil and fatigue:
We plunge in the Lua-lei water
And feel the kind breeze of Kona,
The cooling breath of the goddess,
As it stirs the leaves of ilima.
The radiant heat scorches the breast
While I sidle and slip and climb
Up one steep hill then another;
Thus gain I at last Moa-ula,
The summit of Poha-kea.
There stand I and gaze oversea
To Hilo, where lie my dewy-cold
Forest preserves of lehua
That reach to the sea in Puna-
My lehuas that enroof Kukiʻi.
[Emerson 1915:157–158]

Alaila kuʻu ka luhi, ka maloʻeloʻe,
Auau aku i ka wai i Lua-lua-lei
Aheahe Kona, Aheahe Koolau wahine,
Ahe no i ka lau o ka ilima.
Wela, wela i ka La ka pili i ka umauma,
I Puʻu-liʻiliʻi, i Kalawalawa, i Pahe-lona,
A ka piʻiʻna i Wai-ko-ne-ne'-ne;
Hoomaha aku i Ka-moa-ula;
A ka luna i Poha-kea
Ku au, nana i kai o Hilo:
Ke ho'omoe a'e i ke kehau
O a'u hale lehua i kai o Puna,
O a'u hale lehua i kai o Ku-ki'i

Menehune (legendary race of small people who worked at night) in Mākaha are mentioned in *Hawaiian Folk Tales* by Thos. G. Thrum (1998) in the story of Kekupua's Canoe. The *menehune* constructed a canoe for chief Kakae who lived in Wahiawa for his wife to travel to Tahiti. Kekupua was the chief's main man who went to Mākaha to pull the canoe down to the ocean.

3.1.2 Early Historic Period

3.1.2.1 Waiʻanae District

The origin of the name Waiʻanae is thought to be connected to the richness of the waters off Waiʻanae's coast: *wai* (water) and *ʻanae* (large mullet) (Sterling and Summers 1978). Several accounts attest to the abundance of fish from Waiʻanae waters (Pukui et al. 1974; Wilkes 1845). In 1840, Wilkes makes the following comment: "The natives are much occupied in catching and drying fish, which is made a profitable business, by taking them to Oahu, where they command a ready sale" (Wilkes 1845:81–82).

Traditional accounts of Waiʻanae portray a land of dual personality: a refuge for the dispossessed and an area inhabited by the rebellious and outlaws. Certain landmarks in Waiʻanae attest to this dichotomy. Kawiwi, a mountain between Waiʻanae and Mākaha Ahupuaʻa, was dedicated as a refuge by priests during times of war (Kamakau 1961; McAllister 1933) (Figure 8). Pōkaʻī Bay was used as a school administered by the exiled high-class priests and *kahuna* (priest) who took refuge in Waiʻanae after Kamehameha Nui gained control of Oʻahu (Sterling and Summers 1978:68). It was also near Pōkaʻī Bay, at a place named Puʻu Kāhea, that the eighteenth-

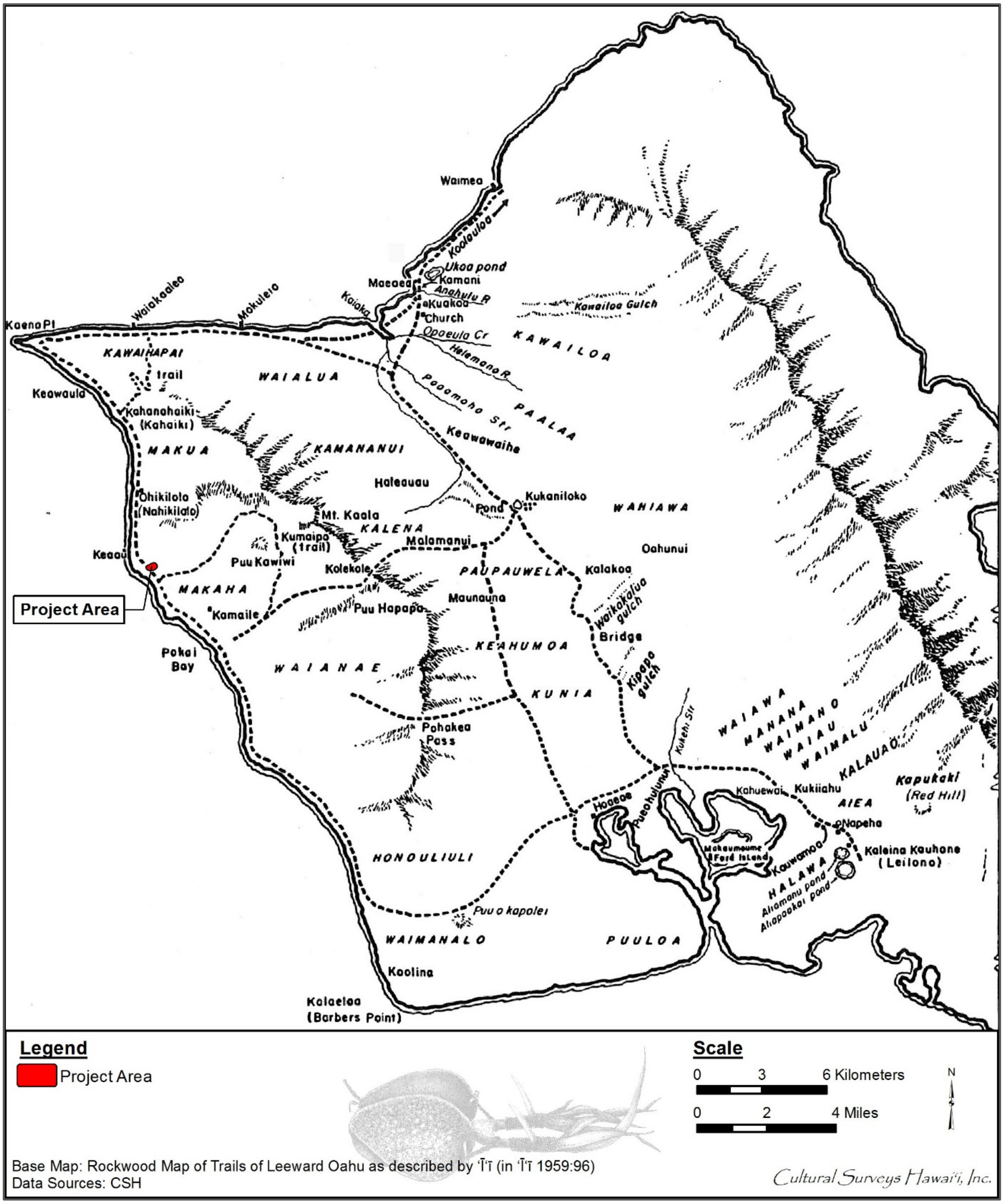

Figure 8. Rockwood map of trails of Leeward O'ahu as described by Ī'ī (Ī'ī 1959:96)

century prophet and *kahuna nui* (high priest) of Oʻahu, Kaʻopulupulu, made his last famous prophecy before he was killed in Poʻolua (Sterling and Summers 1978:71). In contrast, other places in Waiʻanae were famed for their inhospitality.

Certainly, the environmental conditions along the Waiʻanae Coast played a part in shaping Waiʻanae people. Vancouver, the first explorer to describe this coast in 1793, describes the Waiʻanae Coast as "composed of one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants . . ." (Vancouver 1798:217).

The ʻŌkuʻu Epidemic of 1804 (thought to be cholera) undoubtedly had a major effect on the native population, not only in Waiʻanae, but throughout the rest of the Islands as well. John Papa ʻĪʻī relates that the ʻŌkuʻu "broke out, decimating the armies of Kamehameha I" [on Oʻahu] (ʻĪʻī 1959:16). Other diseases also took their toll. The combined census for the Waiʻanae and ʻEwa Districts in 1831-1832 was 5,883 (Schmitt 1977:12). Twenty years later, the combined census for the two districts was 2,451.

Another early historic period foreign influence that greatly impacted Hawaiian culture and the traditional lifestyle was the sandalwood trade. In an effort to acquire western goods, ships, guns, and ammunition, the chiefs acquired massive debts to the American merchants (ʻĪʻī 1959:155). These debts were paid off in shiploads of sandalwood. When Kamehameha found out how valuable the sandalwood trees were, he ordered the people not to let the felled trees fall on the young saplings to ensure their protection for future trade (Kamakau 1992:209–210).

3.1.2.2 Mākaha Ahupuaʻa

Earliest accounts specific to Mākaha describe a good-sized inland settlement and a smaller coastal settlement (Green 1980). These accounts correlate well with a ca. 1855-1884 map (Green 1980:22) that depicts only six houses along the Mākaha coastline (Figure 9). Green (1980:20–21) describes Mākaha's coastal settlement as "restricted to a hamlet in a small grove of coconut trees on the Keaʻau side of the valley, some other scattered houses, a few coconut trees along the beach, and a brackish water pool that served as a fish pond, at the mouth of the Mākaha Stream." This stream supported traditional wetland agriculture—taro in pre-Contact and early historic periods and sugarcane in the more recent past. Mākaha Stream, although it has probably changed course in its lower reaches, favors the northwest side of the valley leaving most of the flat or gently sloping alluvial plain on the southeast side of the valley. Rainfall is less than 20 inches annually along the coast and increases to approximately 60 inches along the 4,000-ft high cliffs at the back and sides of the valley (Hammatt et al. 1985). Seasonal dryland cultivation in early times would have been possible, and dryland fields (*kula*) have been found in the valley in previous surveys (Green 1980).

The ancient, small (130-sq m) stepped stone *heiau* (temple) called Laukīnui, is so old that tradition claims it was built by the *menehune*. In areas watered by the stream there were *loʻi* (irrigated terrace) lands, but along this arid coast there was plenty of land where there was not enough water for taro, and typically here sweet potatoes and other dryland crops would have flourished. The Bishop Museum study undertaken by Green (1980) found several field shelters with fire pits from this dryland field system. Their settlement model indicates that during this early period the field shelters were used as rest and overnight habitations by people living permanently on the coast, who moved inland to plant, tend, and harvest their crops during the wet season (Green 1980:74).

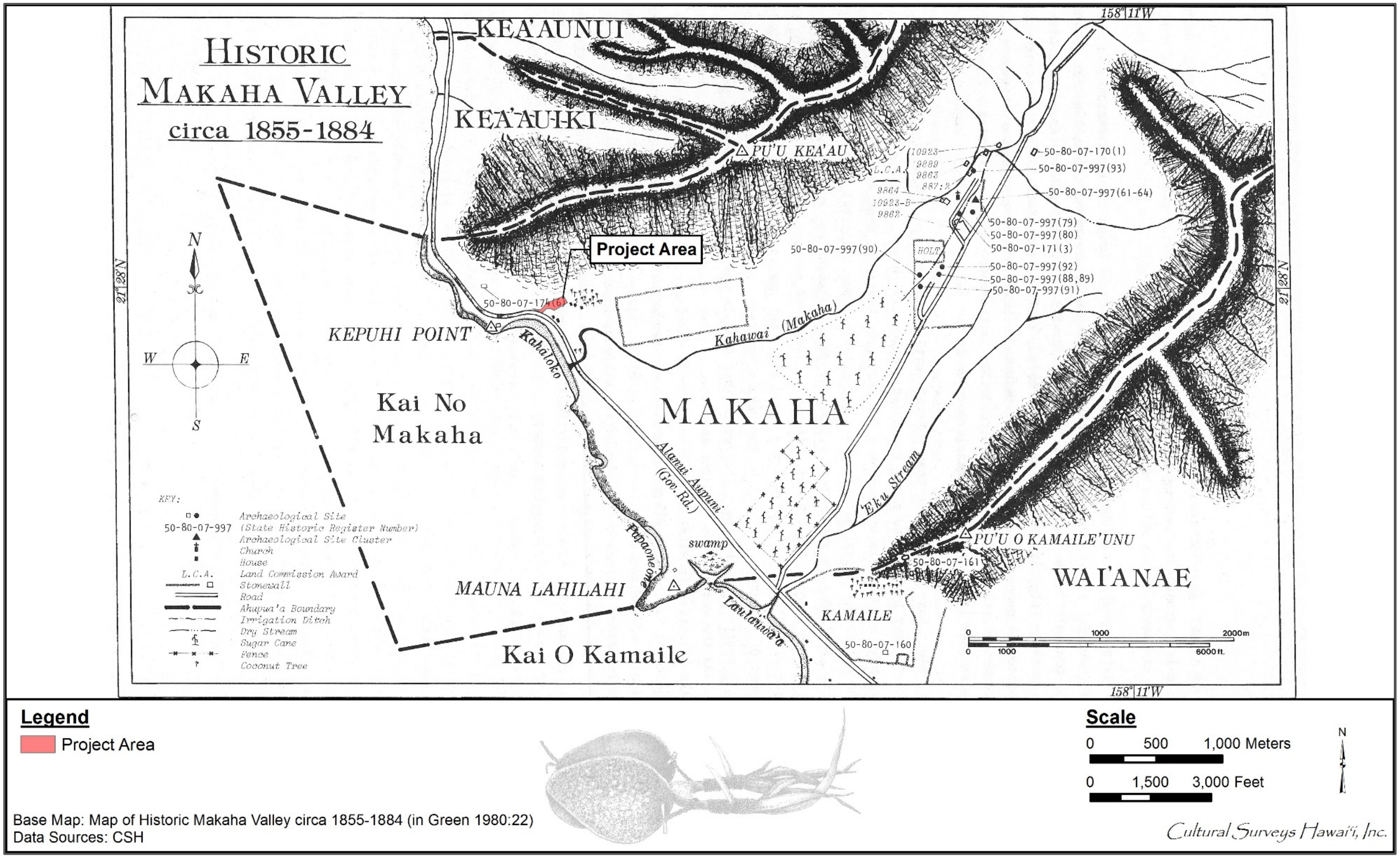

Figure 9. 1855-1884 map (Green 1980:22) of Mākaha Valley showing location of project area and surrounding Land Commission Awards (LCA)

At the boundary between Mākaha and Waiʻanae Ahupuaʻa lies Mauna Lahilahi, a striking pinnacle jutting out of the water. Vancouver describes Mauna Lahilahi as “a high rock, remarkable for its projecting from a sandy beach.” He also describes a village located south of Mauna Lahilahi situated in a grove of coconuts (Vancouver 1798:219). This village is Kamaile, which Green (1980:8) likens to a miniature *ahupuaʻa* “with the beach and fishery in front and the well-watered taro lands just behind.” A fresh water spring, Kekoʻo, gave life to this land and allowed for the existence of one of the largest populations on the Waiʻanae Coast. The present project area would have been north of the coastal settlement in the relatively low site density shoreline environment.

3.1.3 The Māhele and the Kuleana Act

The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—which introduced private property into Hawaiian society. In 1848, the crown and the *aliʻi* received their land titles. Kuleana awards for individual parcels within the *ahupuaʻa* were subsequently granted in 1850. Mākaha Ahupuaʻa had 13 claims of which seven were awarded (Figure 10 and Table 1). Note that not all the Land Commission Awards (LCA) listed on the table are shown on Figure 10. Six of the seven Mākaha LCA parcels were located inland attesting to the importance of the inland settlement (see Figure 10). The seventh Mākaha LCA claims a *muliwai* as its western boundary. According to Pukui and Elbert (1986:236) a *muliwai* refers to a “river, river mouth; pool near mouth of a stream, as behind a sand bar, enlarged by ocean water left there by high tide; estuary.” The reference to it as a boundary suggests this LCA was probably situated near the coast. Two unawarded claims also mention the *muliwai* as their boundary. Based on this information, it is possible these claims were for Mākaha lands in the vicinity of the current project area.

Land use information for the Mākaha LCAs is sparse. *Loʻi* (terraced field) lands and *kula* lands were an important part of sustenance. Aside from these general land specifications, however, there is mention of *noni* (*Morinda citrifolia*), ponds, and land for raising *maʻo*. The *noni* and ponds are recorded in association with the *ʻili* (land division smaller than an *ahupuaʻa*) of Kamaile suggesting the claimant was claiming land in neighboring Waiʻanae Ahupuaʻa in addition to the Mākaha claim. *Maʻo* refers to an introduced species of “cotton” (*Gossypium barbadense* or *Gossypium hirsutum*), which was commercially grown in Hawaiʻi beginning in the early part of the nineteenth century, although it never became an important industry (Wagner et al. 1990:876). *Maʻo* generally does well in hot, arid environments and Mākaha would have been a suitable climate for such an industry.

Kuhoʻoheihei (Abner) Pākī, father of Bernice Pauahi, was given the entire *ahupuaʻa* of Mākaha by Liliha after her husband, Boki, disappeared in 1829 (Green 1980). Although several individuals are recorded as having charge over Mākaha including Aua, Kanepaiki “chief of the Pearl River,” and the present “King,” A. Pākī felt entitled to the entire *ahupuaʻa* of Mākaha. It is uncertain how much of his claim was granted. Whatever the case, it is suggested Paki was able to wield a certain amount of control over the residents of Mākaha during the Māhele resulting in the limited number of LCA applications. The number of taxpaying adult males in 1855 numbered 39, suggesting there were more families living and working the Mākaha lands (Barrere 1970:7) than was reflected in Māhele awards. Based on the Māhele documents, Mākaha’s primary settlement was inland where waters from Mākaha Stream could support *loʻi* and *kula* cultivars. Although there is evidence for settlement along the shore, for the most part, this was limited to scattered, isolated residents. The

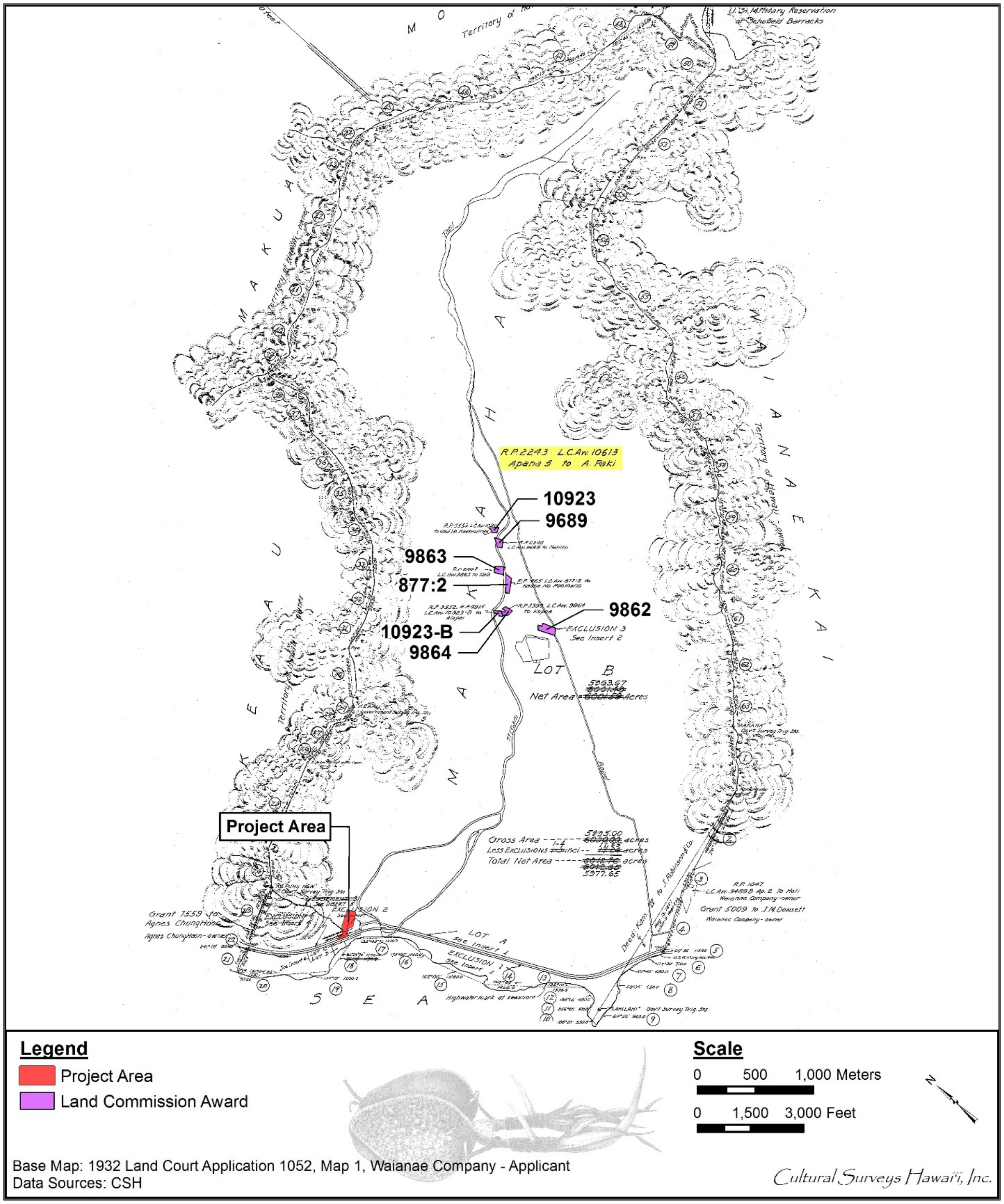

Figure 10. 1932 Land Court Application 1052, Map 1, Waianae Company, showing project area

Table 1. LCAs in Mākaha Ahupuaʻa

Land Claim #	Claimant	*ʻIli*	Land Use	Landscape Feature	Awarded
877	Kaana/Kuaana for Poomano, wife	Kapuaa		Surrounded by lands of Alapai	1 *ʻāpana* (lot); 1.587 acres (also Hotel St and Waianae awards)
8228	Inaole (no name)	Laukini	House	Stream on two sides	No
8763	Kanakaa	Hoaole	*ʻIli*		No
9689	Nahina	Kekio	16 *loʻi*, house lot	*Kahawai* (stream valley), *muliwai* on west	1 *ʻāpana*, 957 acres
9859	Napoe	Aheakai/ Laukini Mooiki	17 *loʻi* (*moʻo*) and *kula* house	*Pali* on N, Kalua *mā* on N, *kula* and stream on E, stream on S, *muliwai* on west	No
9860	Kalua	Luulauwaa (Laulauwaa)	House	In *kahawai* of Mākaha, *hau*, *muliwai* on west	No
9861	Nahina, see above	Kekio			No
9862	Kanehaku	Kekio Mooiki			
9863	Kala	Waikani Kahueiki Kapuaa		Stream on S. *pali*(s) and stream land of Alapai	1 *ʻāpana*; (Kalihi) 1.346 acres
9864	Kapea	Laukini	19 *loʻi kula*	*Pali*	1 *ʻāpana*; 1.217 acres
10613	Pākī, Abner	Ahupuaʻa			*ʻāpana* 5; 4,933 acres
10923	Uniu	Mākaha		Stream on E. land of Kalua on S, *pali* on W	1 *ʻāpana*; .522 acres 1 *ʻāpana*; .576 acres
10923B	Alapai	Kapuaa	2 *loʻi* and *kula*	*Pali* on E, *kahawai* on W	1 *ʻāpana*; .52 acres

only "cluster" of habitation structures was concentrated near Mākaha Beach, near the Keaʻau side of Mākaha where there is also reference to a fishpond. There is inconclusive evidence for land claims within the immediate vicinity of the current project area.

3.1.4 1850 to 1900

By ancient custom, the sea for a mile off the shores belonged to the *ahupuaʻa* as part of its resources. The ruling chief could prohibit the taking of a certain fish or he could prohibit all fishing at specific times. Pākī filed two such prohibitions, one in 1852 for the taking of *heʻe* or octopus (*Polypus* sp.) and the other in 1854 for the taking of *ʻōpelu* (*Decaqpterus pinnulatus*) (Barrere in Green 1980:7).

In 1855, Chief Pākī died and the administrators of his estate sold his Mākaha lands to James Robinson and Company. Later, in 1862, one of the partners, Owen Jones Holt, bought out the shares of the others (Ladd and Yen 1972). The Holt family dominated the economic, land use, and social scene in Mākaha from this time until the end of the nineteenth century. During the height of the Holt family dynasty, from about 1887 to 1899, the Holt Ranch raised horses, cattle, pigs, goats and peacocks (Ladd and Yen, 1972:4). Mākaha Coffee Company also made its way into the valley, buying up land for coffee cultivation, although they never became a prosperous industry. Upon Holt's death in 1862, the lands went into trust for his children.

3.1.5 Alterations to the Waiʻanae Coastline (1880 to 1930)

Prior to the 1880s, the Waiʻanae coastline may not have undergone much alteration. The old coastal trail probably followed the natural contours of the local topography. With the introduction of horses, cattle, and wagons in the nineteenth century, many of the coastal trails were widened and graded to accommodate these new introductions. However, the changes probably consisted of superficial alterations to the existing trails and did not entail major realignments. Kuykendall (1953) describes mid-nineteenth century road work:

> Road making as practiced in Hawaiʻi in the middle of the nineteenth century was a very superficial operation, in most places consisting of little more than clearing a right of way, doing a little rough grading, and supplying bridges of a sort where they could not be dispensed with. [Kuykendall 1953:26]

The first real alteration to the Waiʻanae coastline probably came with the growth of the Waianae Sugar Company. The company cultivated cane in three valleys—Mākaha, Waiʻanae, and Lualualei—and to more easily transport their cane to the dock and to the mill at Waiʻanae Kai, a railroad was constructed in 1880. The construction of the railroad would have had an impact on the natural features in the area such as the sand dunes as well as the human-made features, particularly the fishponds and salt ponds maintained in the coastal zone. Additional alteration to the Waiʻanae coastline occurred in the late nineteenth century with the extension of Dillingham's Oahu Railway and Land Company (OR&L) rail line into the Leeward Coast. One reporter writes a glowing story of the railroad trip to Waiʻanae at its opening on 4 July 1895:

> For nine miles the road runs within a stone's throw of the ocean and under the shadow of the Waiʻanae Range. With the surf breaking now on the sand beach and now dashing high on the rocks on one side, and with the sharp craigs and the mountains interspersed with valleys on the other, patrons of the road are treated to some of the most magnificent scenery the country affords. [McGrath et al. 1973:56]

This report suggests the railroad hugged the ocean during a good portion of the trip. The railway's grade requirements demanded considerable alterations to natural landscapes in order to make them feasible for transport, including curve and slope reduction. An 1884 map illustrates the alignment of the old Government Road (Figure 11), which was likely a modified version of the original coastal trail. After the Belt Road was completed, further roadwork was carried out in the 1930s on what was called the "Waiʻanae Road," later named Farrington Highway. Kili Drive was built ca. 1970s to provide additional access into Mākaha Valley. The additional access was necessary due to the increased population related to residential, golf resort, and condominium development in the valley.

3.1.6 1900 to Present

The Holt Ranch began selling off its land in the early 1900s (Ladd and Yen 1972). In 1907, the Waianae Sugar Company moved into Mākaha and by 1923, virtually all of lower Mākaha Valley was under sugarcane cultivation (Figure 12). The plantation utilized large tracks of Lualualei, Waiʻanae, and Mākaha Valley. The manager's report for 1900 described the plantation as having some 400 acres of new land cleared, fenced, and planted, 2 miles of railroad, and nearly 3 miles of flumes laid to said lands (Condé and Best 1973:357). For a half century, Mākaha was predominantly sugarcane fields but by 1946, the manager's report announced plans to liquidate the property because of the additional increase in wage rates, making the operations no longer profitable (Condé and Best 1973:358).

The lack of water resources played a role in Waianae Sugar Company's low profitability. In the 1930s, Waianae Plantation sold out to American Factors Ltd. (Amfac, Inc.). American Factors initiated a geologic study of the ground water in the mountain ridges in the back of Mākaha and Waiʻanae valleys. The study indicated that tunneling for water would be successful, but before tunneling could commence, World War II came about and plans were put on hold (Green 1980). In 1945, American Factors contracted the firm of James W. Glover, Ltd. to tunnel into a ridge in the back of Mākaha Valley. The completed tunnel (i.e., Glover Tunnel) was 4,200 ft long and upon completion had a daily water capacity of 700,000 gallons. The water made available was mainly used for the irrigation of sugar. In 1946, Waianae Plantation announced in the *Honolulu Advertiser* (Friday, 18 October 1946) that it planned to liquidate its nearly 10,000 acres of land. The day before, news of the impending sale was circulated among the investors at the Honolulu Stock Exchange. One of the investors was Chinn Ho:

> The unorthodox Ho had started his Capital Investment Company only the year before with a bankroll of less than $200,000, much of it the life savings of plantation workers. He was known as a friend of the little man, an eager disciple of economic growth, and an upstart. [McGrath et al. 1973:145]

Chinn Ho managed to broker the deal the following day by 2 p.m, when the Waianae Plantation sold the Mākaha lands to the Capital Investment Corporation, which stills maintains ownership of much of Mākaha Valley. There was an attempt to convert the sugar lands back to ranching but the perennial problem of water continued.

Parts of the property were sold off as beach lots, shopping centers, and house lots. Many of the former plantation workers bought house lots. Chinn Ho also put his personal investment into Mākaha and initiated resort development including a luxury hotel and in 1969, the Mākaha Valley Golf Club, an 18-hole course with tennis courts, restaurant and other golf facilities was opened for

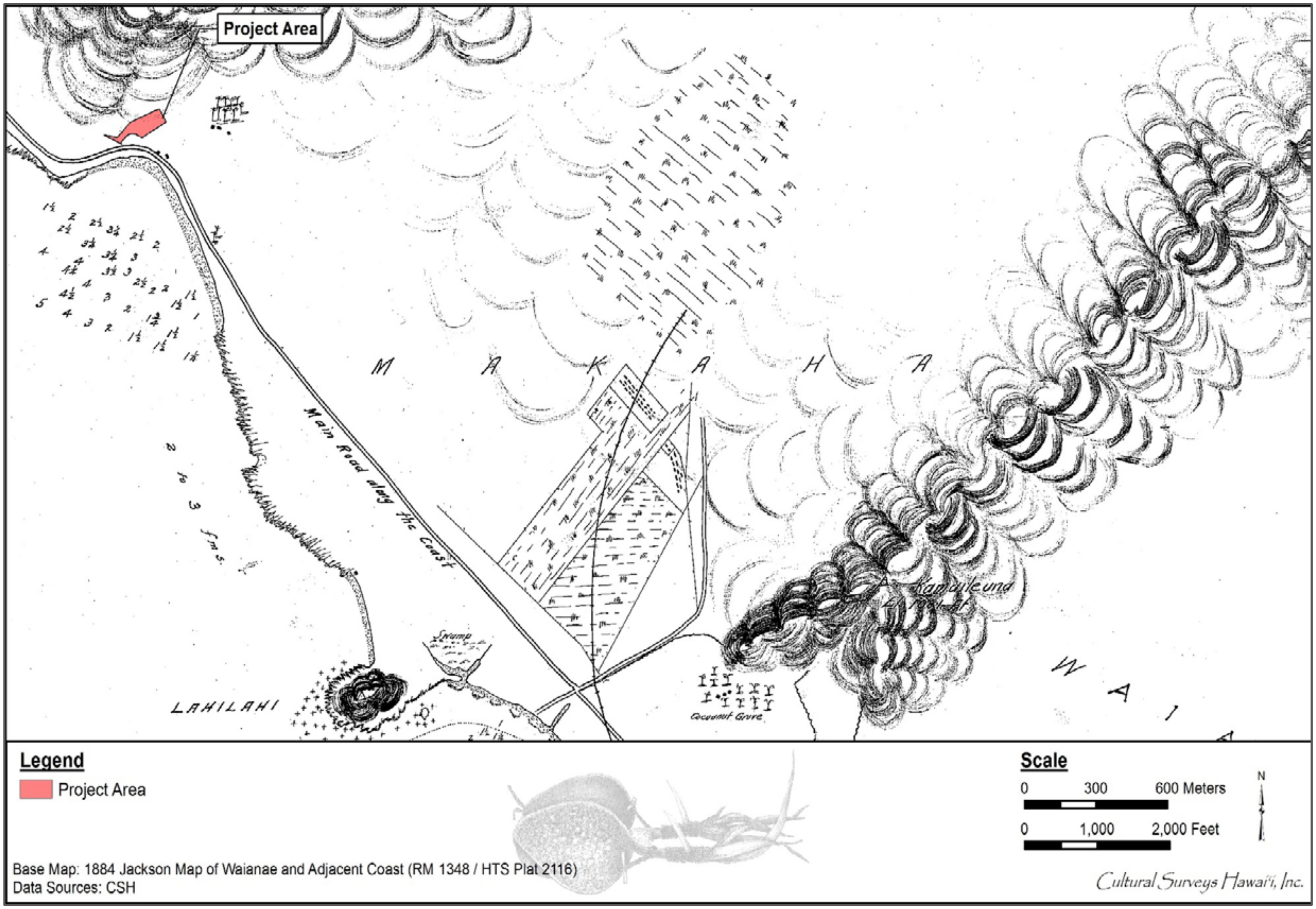

Figure 11. An 1884 Government Survey map showing the alignment of the Old Government Road along the Wai‘anae Coast and through the current project area (Jackson 1884)

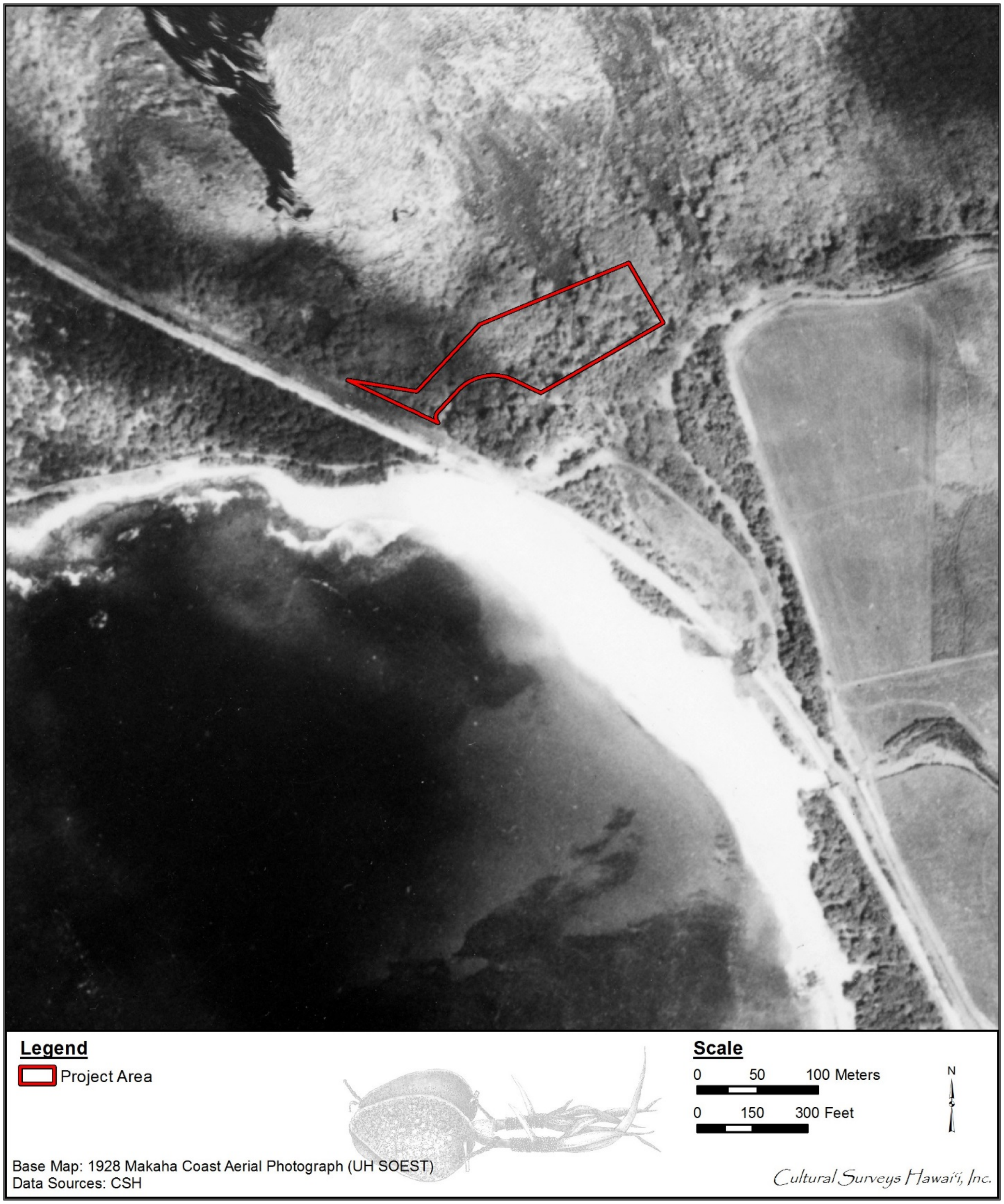

Figure 12. 1928 Makaha Coast aerial photograph (UH SOEST) showing the SEA-US Cable project area

local and tourist use (McGrath et al. 1973:146–163). Numerous other small-scale agricultural interests were pursued during this time period including coffee, rice, and watermelons (Ladd and Yen 1972). Water from Glover Tunnel was now used to water Mākaha Valley farms, the lush grounds of the Mākaha Inn and Country Club, and its associated golf course.

Starting from the 1960s, the project area shows gradual development, for example as depicted in the 1967 aerial photograph (Figure 13). The area was completely graded and cleared by the 1970s (Figure 14). The only building adjacent to the project area at that time was a telecommunications substation, which was built in 1963. The substation still exists today and is owned by GTE Hawaiian Telcom Company, Inc. A 1988 aerial photograph shows the area has vegetation and trees again as well as the construction of a small road passing through the project area (Figure 15). The 2005 Siarot map (Figure 16) illustrates that the vicinity of the current project area also has had developments related to the installation of telecommunication cables.

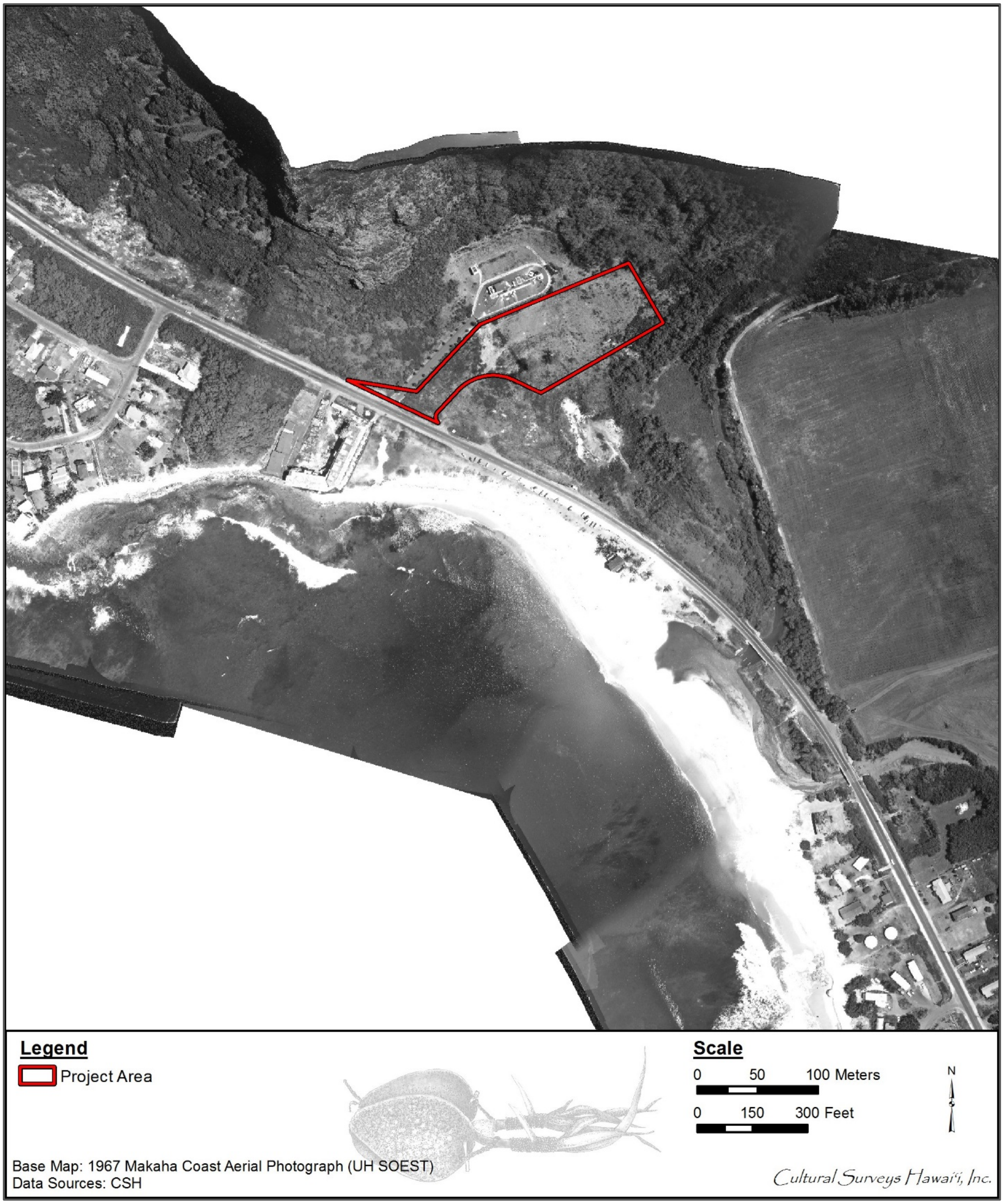

Figure 13. 1967 Makaha Coast aerial photograph (UH SOEST) showing the SEA-US Cable project area

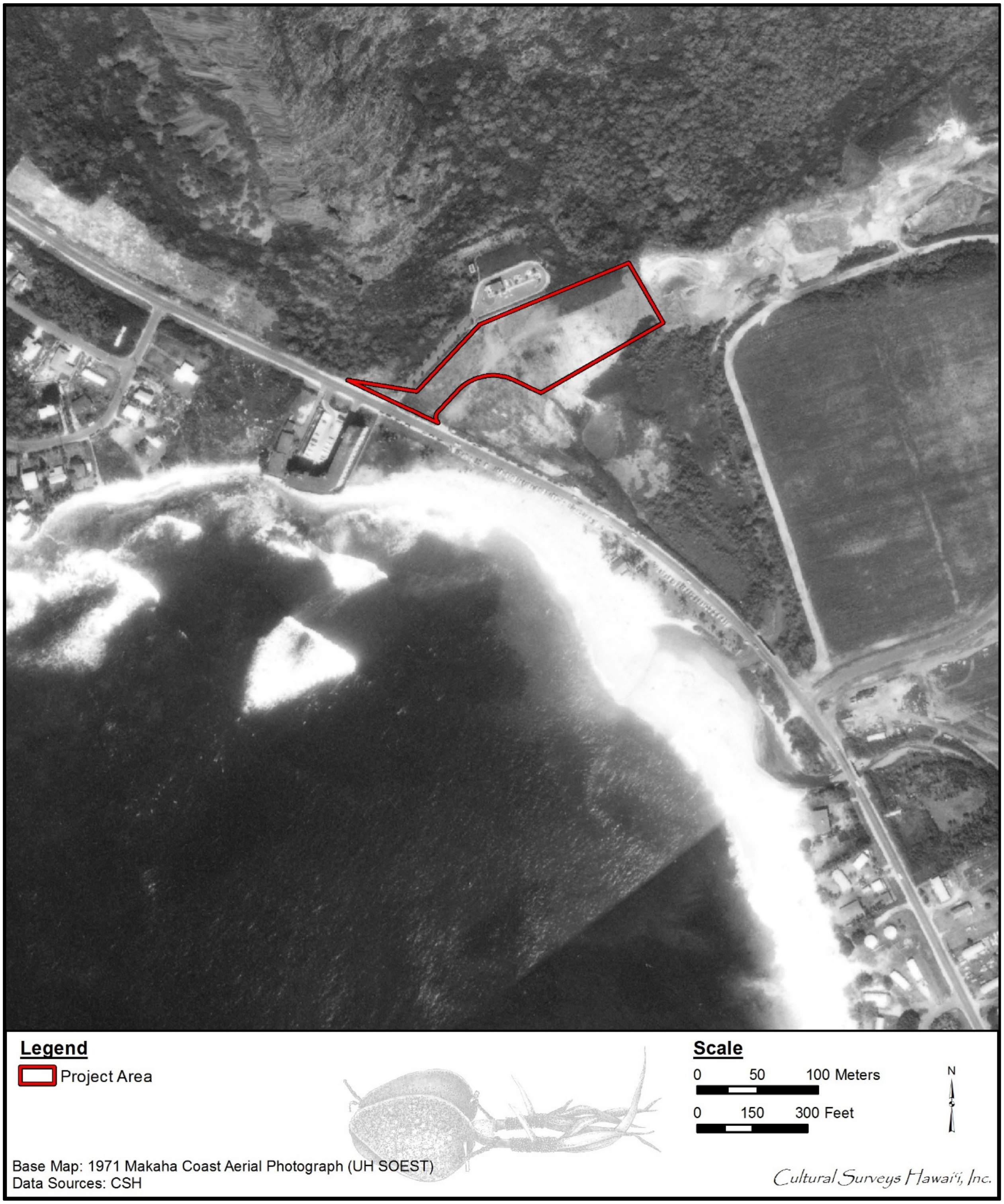

Figure 14. 1971 Makaha Coast aerial photograph (UH SOEST) showing the SEA-US Cable project area

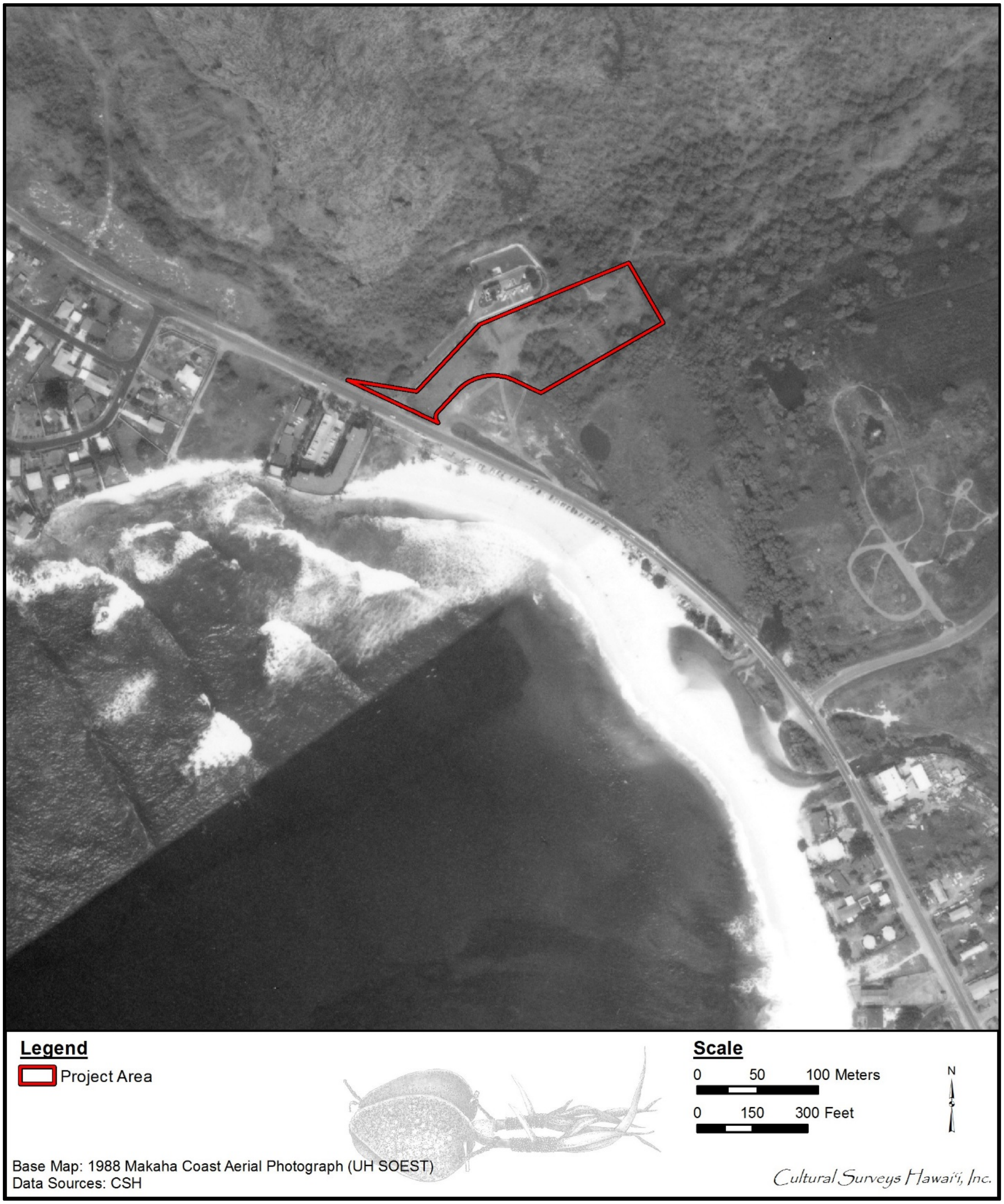

Figure 15. 1988 Makaha Coast aerial photograph (UH SOEST) showing the SEA-US Cable project area

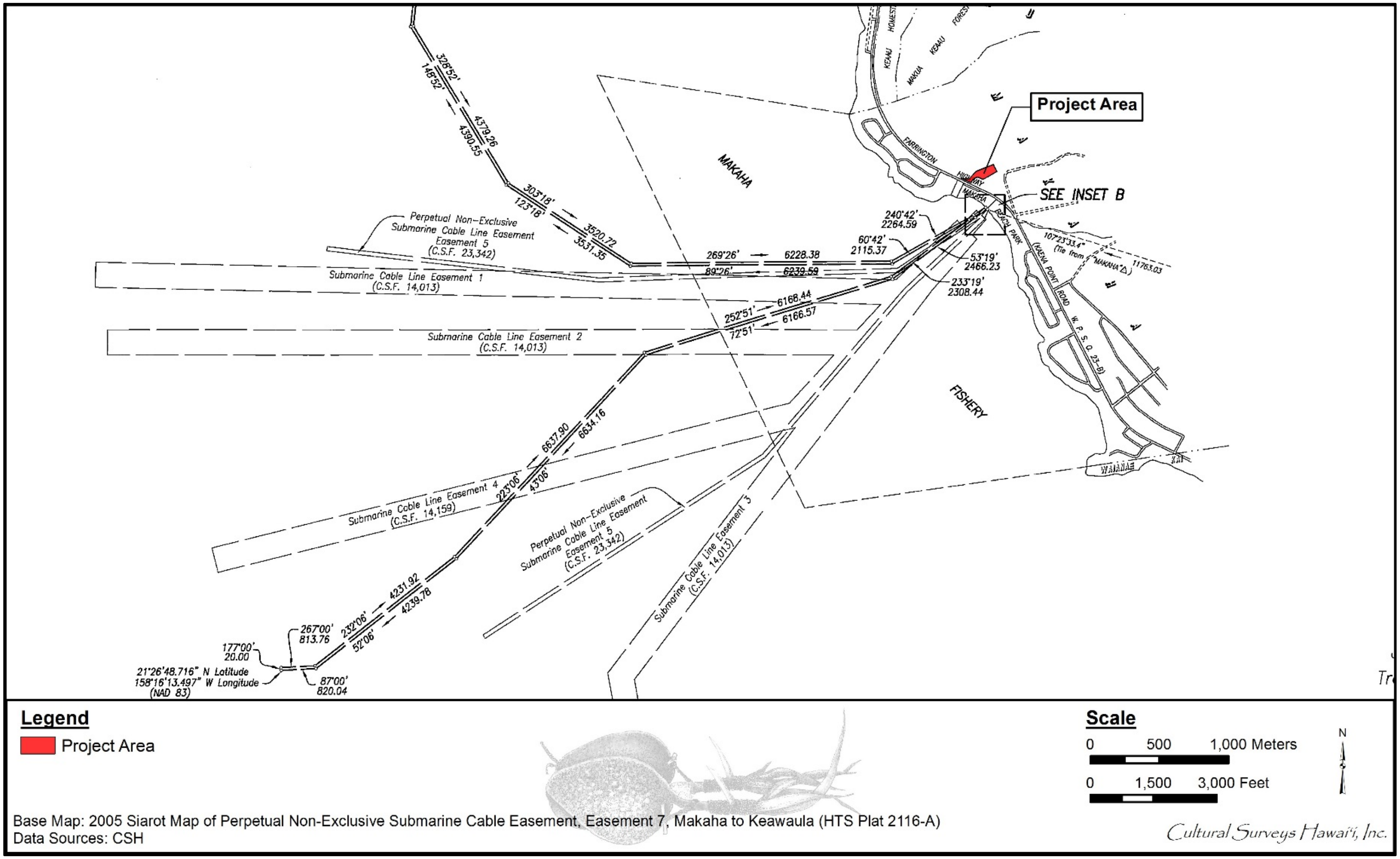

Figure 16. 2005 Siarot map of Perpetual Non-Exclusive Submarine Cable Easement, Easement 7, Makaha to Keawaula showing project area

3.2 Previous Archaeological Research

A number of archaeological studies have been carried out in Mākaha Ahupua‘a (Figure 17 and Table 2). Figure 18 shows the locations of the historic properties described in the following paragraphs.

In 1930, McAllister (1933) conducted an island-wide survey of sites on O‘ahu. These sites were designated with site numbers and later given historic property designations using the site number as the discrete site number. State Inventory of Historic Places (SIHP) # 50-80-07-173 (Site 173) is described as the probable location of a large rock reported in 1839 by E.O. Hall as “two or three miles distance” past the settlement at Pukahea (Pu‘u Kahea) that was once an object of worship. This sacrificial stone was reported by Hall as “in no peculiar sense striking” and “as undignified as any other hump or inanimate matter along the road” (McAllister 1933:121).

SIHP # -174 (Site 174), Laukīnui Heiau, was described as “the important one [*heiau*; non-Christian place of worship] in Mākaha Valley,” and said to be so old as to have been built by the *menehune*. McAllister places this site in the vicinity of Kepuhi Point and his description of the *heiau* incorporating a “coral outcrop” and “an amazing amount of coral” fits that locale (McAllister 1933:121).

SIHP # -175 (Site 175) known as Mololokai is located at the base of the ridge between Kea‘au and Mākaha on the sea side of the road. This site was described as two pits where early cannibals had come to wash the defleshed bodies of their victims at high tide. Associated with this site were said to be two prominent stones, Pōhaku O Kāne on the Mākaha side and Pōhaku O Kanaloa on the Kea‘au side (McAllister 1933:121–122).

The Mākaha Valley Historical Project (Green 1969, 1970, 1980; Ladd and Yen 1972; Ladd 1973) was a major study done on Mākaha Valley between 1968 and 1970. Neller (1984) noted that sites were lumped into large geographical districts and most of the valley was only surveyed at the reconnaissance level. The Mākaha Valley Historical Project research was unique in that it was funded by private enterprise without legal compulsion and the investigations covered parts of the valley beyond those due for development. More than 600 archaeological features were recorded in the upper valley and 1,131 features were recorded in the lower valley. The area was designated the Mākaha Valley Historical Project Site Complex (SIHP # -776).

The coastal strip and the central lower valley were not included because of previous development. Excavations were undertaken at 30 separate structural features, including ten field shelters, four stone mounds, three stepped-stone platforms, three house enclosures, two storage pits, a clearing, a possible shrine, a *heiau*, a pond field terrace system, a habitation feature, two historic house platforms, and a modern curbed foundation. Carbon dating indicated settlement as early as the thirteenth century. Settlements were focused near Mākaha Stream. Subsequently, settlements expanded into *kula* lands. By the sixteenth century, subsistence practices changed when irrigated taro farms appeared in the upper valley (Green 1980:75).

Green’s (1980) archival research, as part of the Mākaha Valley Historical Project, identified a number of small residences thought to correspond to late pre-Contact and early historic habitation in the vicinity of the current project area. This area, and presumably the associated settlement, is termed Kahaloko based on information provided by Clark (1977:91). This Kahaloko area

Table 2. Previous Archaeological Studies in Mākaha Ahupuaʻa

Study	Location	Type of Study	Results (SIHP # 50-80-07)
McAllister 1933	Island-wide	Island-wide survey	Described McAllister site number and SIHP #s -173, a legendary stone; -174, Laukīnui Heiau; and -175, Mololokai pits
Green 1969, 1970, 1980; Ladd and Yen 1972; and Ladd 1973	Mākaha Valley	Mākaha Valley historical project	Documented over 600 archaeological features in the upper valley and 1,131 features in the lower valley; provided evidence of permanent pre-Contact inland settlements in Mākaha Valley; the area designated the Mākaha Valley Historical Project Site Complex SIHP # -776
Kennedy 1986	Mauna Lahilahi	Archaeological inventory survey	Identified five sites (later designated features of SIHP # -3704 by Komori 1987), including a possible shrine, a *koʻa* (fishing shrine), linear mound, and enclosure
Komori 1987	Mauna Lahilahi	Archaeological survey and testing	Confirmed five sites identified by Kennedy (1986) and identified additional features including petroglyphs, enclosures, terraces, rock shelters, midden scatters, and lithic scatters; all sites associated with Mauna Lahilahi designated features of SIHP # -3704; subsurface testing yielded eight radiocarbon dates, clustered tightly between AD 1300 to 1650 period
Kawachi 1990	Mauna Lahilahi	Burial report	Described remains of at least two individuals, artifacts and sites associated with SIHP # -3704
Hammatt and Robins 1991	Water St/ Kili Dr area	Archaeological inventory survey	Identified a linear earthen berm associated with commercial sugarcane cultivation (SIHP # -4363)
Kawachi 1992	84-325 Makau St, Kepuhi Point	Burial report	Documented human remains eroding from a sand bank following Hurricane ʻIniki (SIHP # -4527); the burial reported to have included staghorn coral at major joints and a possible shell *niho palaoa* (pendant worn by the *aliʻi*)

Study	Location	Type of Study	Results (SIHP # 50-80-07)
Moore and Kennedy 1994	Northwest side of Mākaha Valley	Archaeological inventory survey	No historic properties observed
Cleghorn 1997	*Mauka* (inland, toward the mountains) of Farrington Hwy and north of Kili Dr	Archaeological inventory survey	Identified remains of OR&L railroad infrastructure (SIHP # 50-80-12-9714); subsurface testing revealed a cultural layer and a pond/wetland area (SIHP # 50-80-07-6572); radiocarbon dating of the cultural layer yielded a date range of AD 1440-1690
Elmore et al. 2000	South side of Kili Dr	Archaeological inventory survey	Identified SIHP # -5793 comprised of three features including a bi-faced wall (Feature A), a pavement (Feature B), and a platform (Feature C); located within the Mākaha Valley Historical Project Site Complex (SIHP # -776); subsurface testing within the features yielded traditional Hawaiian artifacts; features interpreted to be related to dryland agriculture and habitation
Moore and Kennedy 2000	North side of Kili Dr	Archaeological inventory survey	Identified SIHP # -5792 comprised of two features, including a remnant wall (Feature A) and a stone mound/boulder alignment (Feature B); located within the Mākaha Valley Historical Project Site Complex (SIHP # -776); subsurface testing did not yield any cultural material; features interpreted to be related to dryland agriculture and habitation
Kailihiwa and Cleghorn 2003	Lower Mākaha	Archaeological monitoring	Identified three historic properties, comprised of five features including a pit (SIHP # -6521), concrete flume (SIHP # -3325), two fire pits (SIHP # -6522), and a charcoal deposit
Tulchin and Hammatt 2003	Kili Dr and Farrington Hwy	Archaeological inventory survey	No historic properties identified

Study	Location	Type of Study	Results (SIHP # 50-80-07)
McDermott and Tulchin 2006	Mākaha Bridges 3 and 3A	Archaeological inventory survey	Identified five historic properties: SIHP # -6822, Mākaha Bridge 3; SIHP # -6823, Mākaha Bridge 3A; SIHP # -6824, Farrington Hwy; SIHP # -6825, a culturally enriched A-horizon, which contained a previously disturbed burial; and SIHP # 50-80-12-9714, the former OR&L railroad alignment
Hammatt 2006	Mākaha Bridges 3 and 3A	Archaeological monitoring	No historic properties identified
Hazlett and Hammatt 2007	Mākaha Bridge 3, Farrington Hwy, Mākaha	Archaeological monitoring	No historic properties identified
McElroy 2007	Makau St, Kepuni Point	Archaeological monitoring	No historic properties identified
Hunkin and Hammmatt 2008	Farrington Hwy between Jade St and Lawaiʻa St	Archaeological monitoring	No historic properties identified
McElroy 2008a	Farrington Hwy between Kili Dr and 200 m north of Hakimo Rd	Archaeological monitoring	No historic properties identified
McElroy 2008b	Kili Dr and Farrington Hwy	Archaeological monitoring	Identified SIHP # -7031, a subsurface cultural layer containing charcoal, marine shell, sea urchin, animal bone, a basalt flake, basalt shatter, and a possible seed; one volcanic glass core collected
McElroy and Nishioka 2008	Private residence at Kepuhi Point	Emergency archaeological monitoring	No historic properties identified
O’Hare et al. 2010	Board of Water Supply Fire Dip Tank	Archaeological assessment	No historic properties identified

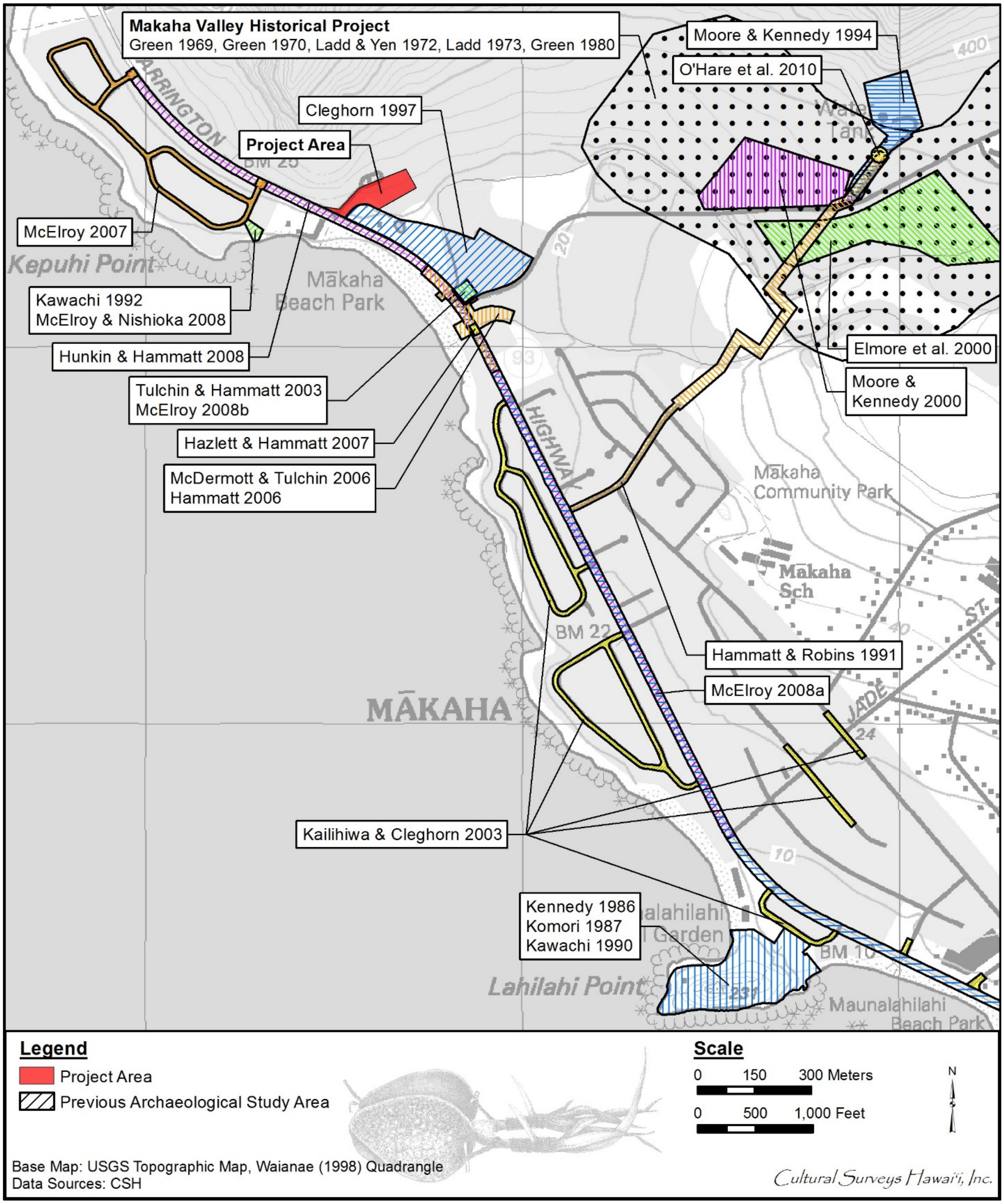

Figure 17. Portion of 1998 Waianae USGS topographic quadrangle showing previous archaeological studies within the vicinity of the project area

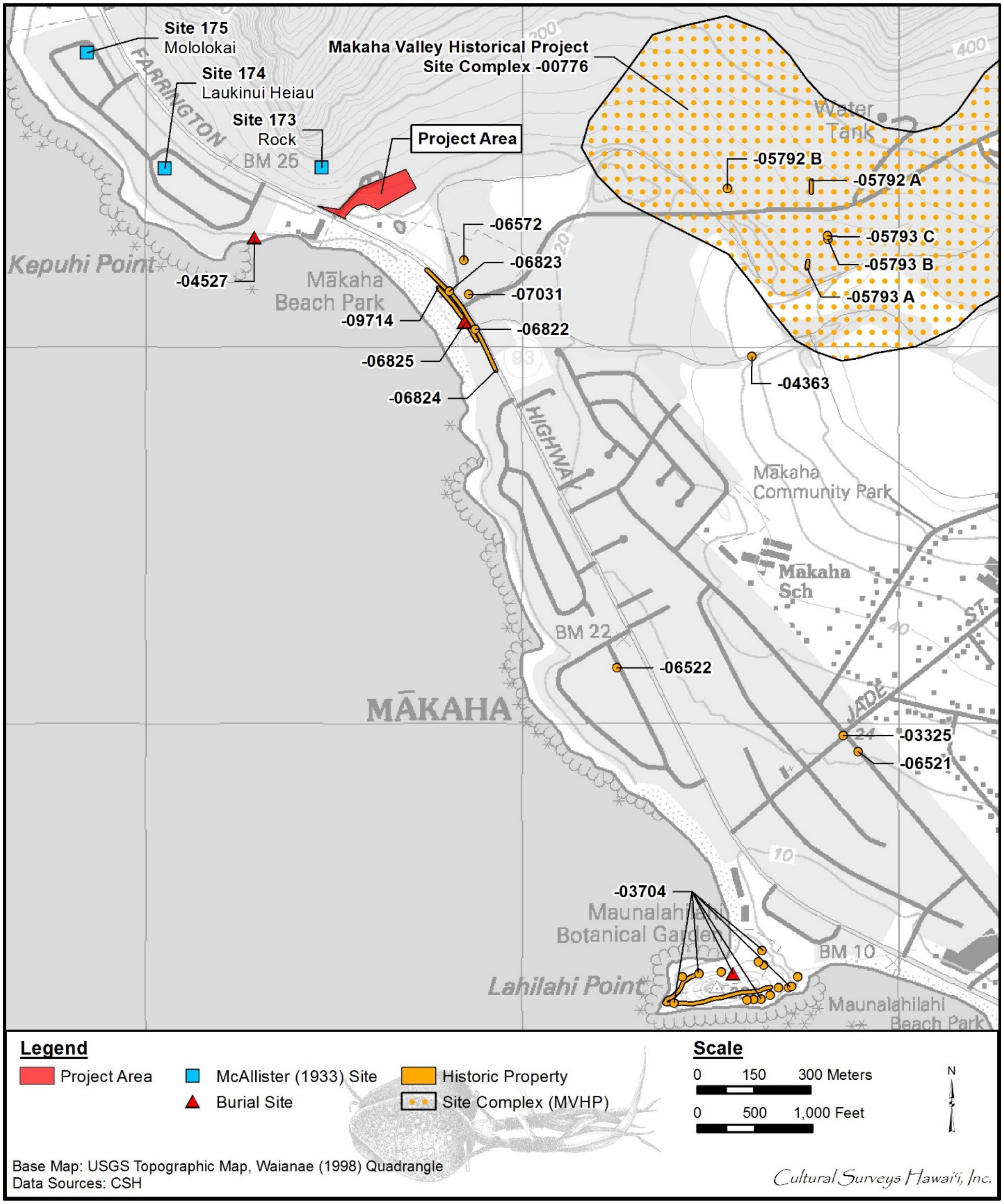

Figure 18. Portion of 1998 Waianae USGS topographic quadrangle showing previously identified historic properties in the vicinity of the project area

(see Figure 9) is depicted on Green's reconstructed map of Mākaha Valley settlement and land use for the period between 1855 and 1884 (Green 1980:22–23).

This settlement was at least generally geographically associated with a fishpond:

> It is highly probable that there was a brackish-water fishpond in the low area behind the beach where Mākaha Stream would have constantly been imponded . . . A pond appears in this position on the preliminary field map for the Oʻahu Railway and Land Company (Dillingham Files, n.d.). The use of the name Kahaloko (place of the fishpond) for Mākaha Beach strongly suggests its presence, and Clark (1977:92) gives Mākāhā [sluice gate of a traditional Hawaiian fishpond] as the name of a large as the name of a large fishpond here. [Green 1980:20]

Kennedy (1986) carried out archaeological investigations focused on the north (Mākaha) side of Mauna Lahilahi, and identified five sites including a possible shrine, a *koa*, a linear pile, and an enclosure. These sites were later designated features of SIHP # -3704, Mauna Lahilahi, by Komori (1987). Komori (1987) carried out archaeological survey and testing at Mauna Lahilahi, confirming Kennedy's (1986) five sites. An additional 11 sites including petroglyphs, enclosures, terraces, rock shelters, midden, and lithic scatters were identified. Komori (1987) reported eight radiocarbon dates within the AD 1300-1650 period. The sites associated with Mauna Lahilahi were designated SIHP # -3704. Kawachi (1990) documented remains of at least two individuals recovered from a crevice in Mauna Lahilahi (SIHP # -3704). The remains had been placed in a small hole with two large cobbles placed in the hole to seal it. These human remains are documented as features of SIHP # -3704, Mauna Lahilahi.

Hammatt and Robins (1991) carried out an archaeological inventory survey of an approximately 4,600-ft long route of a proposed 20-inch water main extending northeast from Farrington Highway, up Water Street, and then continuing northeast across Kili Drive. They documented a single historic property SIHP # -4363 described as "a linear earthen berm . . . buttressed along its stream side with cobbles and boulders" (Hammatt and Robins 1991:18). The berm was interpreted as "associated with the historic sugarcane cultivation" (Hammatt and Robins 1991:18). Based on historic maps, the berm likely represents an old ditch alignment, which was altered during construction of the adjacent golf courses. It functions currently as a flood control structure, protecting housing downslope. Subsurface testing within the corridor encountered no materials of archaeological significance.

Carol Kawachi (1992) documented a burial(s) (SIHP # -4527) eroding out of the sand at 84-325 Makau Street. This find was a pit burial, approximately 50 cm below the surface, extending 1.5 m long in a sand bank exposed by Hurricane ʻIniki. The burial included staghorn coral at major joints and a possible shell *niho palaoa*.

Moore and Kennedy (1994) carried out archaeological investigations on the northwest side of Mākaha Valley for a proposed reservoir at 242-ft elevation. The access corridor and reservoir site covered approximately 11 acres. No historic properties were observed.

In 1997, Cleghorn conducted test excavations associated with an archaeological inventory survey conducted for the new Mākaha Beach Park comfort station and parking area located east of Farrington Highway (Figure 19). The survey was conducted in two stages: the first being west of the AT&T Easement and the second east of the AT&T Easement. Stage one, west of the AT&T

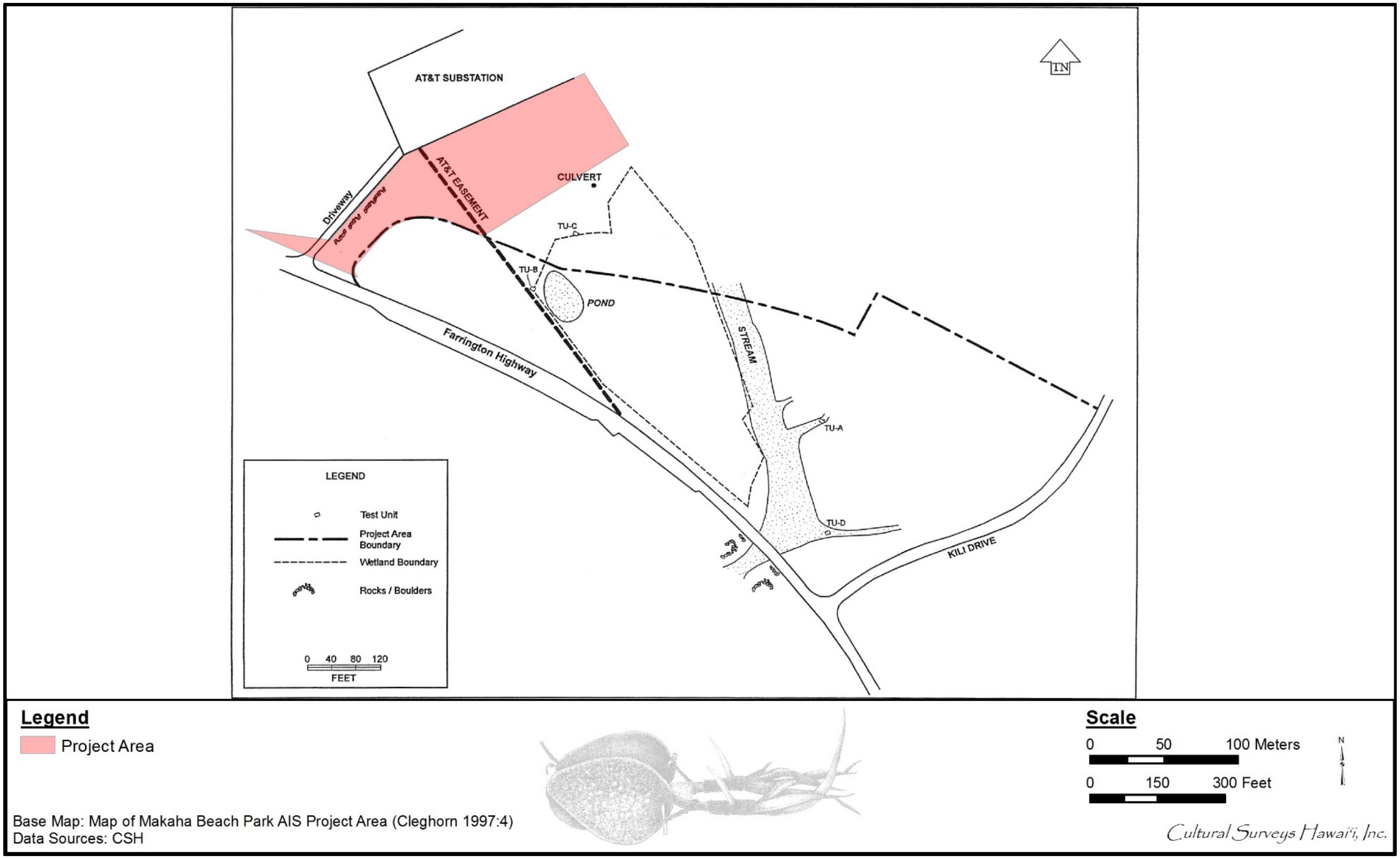

Figure 19. Map of Mākaha Beach Park AIS project area (Cleghorn 1997:4)

encompasses our current project area. Within this area, 14 test bores and two test pits were excavated (Figure 20). While no cultural material was observed, stratigraphic profiles were collected for the two test trenches. The soils in the units were extremely hard to excavate due to their extremely rocky nature. The coral bedrock was encountered at approximately 1.25 m below surface. Test unit 2 only reached about 30 cm below surface due to the difficult nature of the soils. As a result, excavation was terminated.

While not within the current project area, Cleghorn also excavated four test units east of the AT&T Easement that revealed cultural material. Cleghorn identified a subsurface pre-Contact cultural layer (SIHP # -6572) present in an area approximately 80 m *mauka* of Farrington Highway near its intersection with Kili Drive. Radiocarbon analysis indicated an age range of AD 1440-1690. The deposit contained “evidence of a small encampment near the coast” (Cleghorn 1997:32). Cleghorn also indicated the possible importance of a pond/wetland area just *mauka* of the highway at Mākaha Beach Park: “This pond and wetland may have offered rich resources for the Hawaiians of the area, and the pond may have been used as an inland fishpond during the prehistoric and early historic eras” (Cleghorn 1997:33). This pond/wetland area is likely the area Green (1980) identified as “Kahaloko.” Also present in the area are remains of infrastructure associated with the OR&L railroad (SIHP # 50-80-12-9714). Cleghorn noted the presence of a bridge foundation located in an unnamed stream just north of Kili Drive, *makai* of the highway and within the current Mākaha Bridges project area (Cleghorn 1997:11).

Elmore et al. (2000) conducted an archaeological inventory survey of an approximately 19.6- acre parcel located on the south side of Kili Drive and just west of the condominiums in a portion of previously identified SIHP # -776. A total of eight features were identified. Of these, five were determined to be modern disturbances, while the other three were thought to be possible traditional Hawaiian dryland agricultural and/or habitation features. These features, although in the boundaries of SIHP # -776, were designated SIHP # -5793A (bi-faced wall), SIHP # -5793B (pavement), and SIHP # -5793C (platform).

Moore and Kennedy (2000) conducted an archaeological inventory survey of an approximately 20-acre parcel located on the north side of Kili Drive in a portion of previously identified SIHP # -776. A total of 12 features were identified; ten of these were determined to be modern disturbances, while the other two were thought to be possible traditional Hawaiian dryland agricultural features. These features, although in the boundaries of SIHP # -776, were designated SIHP # -5792A (remnant wall) and SIHP # -5792B (mound/boulder alignment).

Kailihiwa and Cleghorn (2003) monitored the Mākaha Water System Improvements Phase II for ten streets in the *ahupua‘a* of Mākaha and Wai‘anae. A total of three sites were documented, which consisted of five features. The sites included a pit feature (SIHP # -6521), a concrete flume (SIHP # -3325), two fire features (SIHP # -6522), and a charcoal deposit (no SIHP # designated). No artifacts or human remains were found during the course of the project.

Tulchin and Hammatt (2003) conducted an archaeological inventory survey located at the corner of Kili Drive and Farrington Highway, associated with a proposed fiber optic cable facility. No historic properties were observed.

In August 2005, CSH conducted an archaeological inventory survey for the Mākaha Bridge Replacement project (McDermott and Tulchin 2006). Five historic properties were documented including SIHP # -6822, Mākaha Bridge 3 (constructed in 1937); SIHP # -6823, Mākaha Bridge

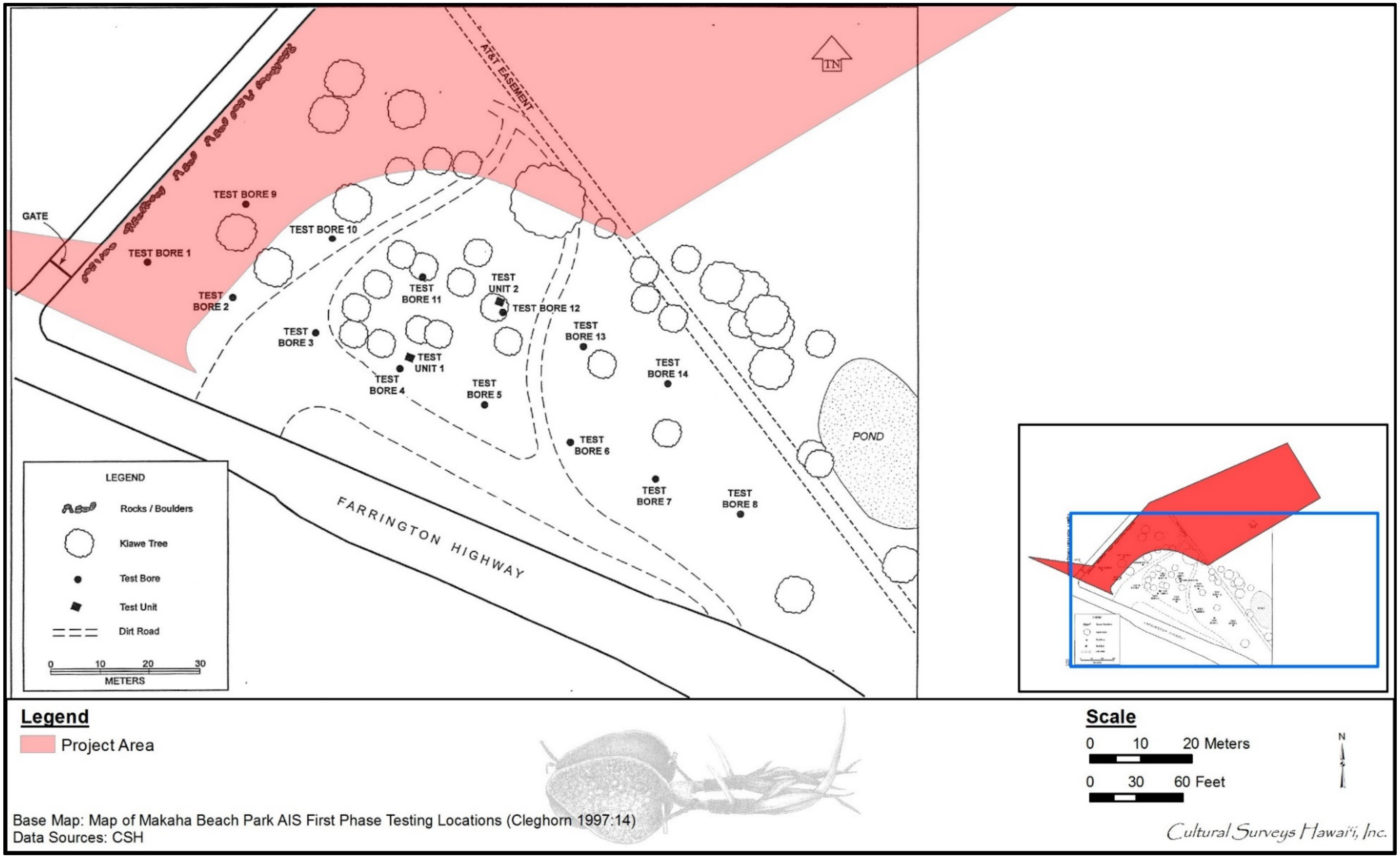

Figure 20. Locations of Cleghorn (1997) test bores and excavation pits in proximity to current project area

3A (constructed in 1937); SIHP # -6824, Farrington Highway (originally constructed in the 1930s); SIHP # -6825, a culturally enriched A horizon, a former land surface from the pre-Contact and historic period, which contained a previously disturbed burial that is most likely Native Hawaiian; and SIHP # 50-80-12-9714, the former OR&L railroad alignment (constructed in the 1890s). All of these recorded cultural resources were documented within the *makai* portions of the project area. *Mauka* of Farrington Highway, the project area appeared to have been disturbed by grading or other land alterations, most likely associated with commercial agriculture.

In 2005, CSH monitored geotechnical test borings for the Mākaha Bridge Replacement project, carried out as part of the design phase for the project (Hammatt 2006). Geotechnical testing consisted of nine test cores (7.5 cm diameter) near the footing of the existing bridges and along the route of the proposed temporary detour road as well as at the temporary bridge structures on the seaward (southwestern) side of Farrington Highway. The surface sediments of Borings 1-5 excavated within the existing Farrington Highway consisted of imported fill materials associated with the Farrington Highway and bridge construction overlying natural sand sediments and the limestone shelf. Subsurface sediments of Borings 6–9 generally consisted of varying thicknesses of imported fill material overlying natural silty sand sediments and the limestone shelf. No new historic properties were identified.

In 2006, CSH conducted additional archaeological monitoring for emergency repairs to Mākaha Bridge 3 (Hazlett and Hammatt 2007). Repair work included repairs to the wooden structure of Mākaha Bridge 3 and the removal of accumulated sediments from the drainage channel beneath the bridge and around the bridge footings. No new historic properties were identified.

McElroy (2007) conducted archaeological monitoring for the Board of Water Supply Makau Street project, which installed water main lines along the Kepuni Point community roadways. Sixty-three stratigraphic profiles were drawn during the course of project excavations. The coral shelf was uncovered from 18 to 116 cm below surface. No historic properties were observed.

Hunkin and Hammatt (2008) completed archaeological monitoring for the Farrington Highway Part IV project, which extended along Farrington Highway between Jade Street and Lawaiʻa Street. No significant subsurface cultural deposits were encountered. In general the observed and documented stratigraphy consisted of varying layers of imported fill, as well as backfilled natural sediment associated with subsurface utilities and road construction; a discontinuous buried A horizon (former land surface) disturbed by previous subsurface excavations; and naturally deposited marine sand and coral bedrock. No historic properties were observed.

McElroy and Nishioka (2008) conducted emergency archaeological monitoring at a private residence located at TMK: [1] 8-4-009:005 northwest of Mākaha Beach Park. No historic properties were observed.

McElroy (2008a) conducted archaeological monitoring for the Department of Hawaiian Homelands Fiber Optic Cable Installation project along Farrington Highway beginning northwest of Kili Drive (Mākaha) and ending 200 m north of Hakimo Road in Lualualei. Stratigraphy generally consisted of modern asphalt roadway overlying multiple fill layers and either natural sand or coral shelf. No historic properties were observed.

McElroy (2008b) conducted archaeological monitoring at the corner of Farrington Highway and Kili Drive for the construction of a fiber optic cable landing site. A subsurface cultural layer, SIHP # 50-80-07-7031, was identified very near the corner of Farrington Highway and Kili Drive, i.e., just *mauka* of the current project area. SIHP # -7031 consisted of a buried cultural layer containing abundant charcoal, marine shell, sea urchin, animal bone, a basalt flake, basalt shatter, and a possible seed. In addition, a possible isolated volcanic glass core was found on the ground surface during light grading of the area.

In 2010, CSH completed an archaeological assessment for the development of a fire dip tank facility, comprised of less than 1 acre (O’Hare et al. 2010). No historic properties were observed.

3.3 Background Summary and Predictive Model

Archaeological data suggest a decent sized pre-Contact population once occupied Mākaha Valley. Roger C. Green, in his summary of the findings of the Makaha Valley Historical Project proposed that the earliest Hawaiian settlement was probably focused along the coast at the mouth of Mākaha Stream (Green 1980). Following this initial settlement, exploitation of the surrounding *kula* lands prompted an expansion into the surrounding lower valley. Subsequently, as the population increased, expansion into the upper valley occurred along with the development of *lo‘i* (irrigated taro fields) fed by the Mākaha Stream. Increased rainfall in the inland areas of Mākaha Valley would have also supported seasonal dryland cultivation of crops such as sweet potatoes. Following the development of the extensive agricultural system in the upper valley, the inland areas of Mākaha Valley became the focus of settlement, contrary to the typical pre-Contact *ahupua‘a* settlement pattern of having the population concentrated on the coast. Associated with the inland settlement was the principal *heiau* of Mākaha, Kāne‘ākī Heiau.

By the mid-1800s, the traditional Hawaiian way of life in Mākaha was in decline. The sandalwood trade, which ended ca. 1829, undoubtedly had a negative effect on the Native Hawaiian population and the lands that supported them. Land Commission Awards of the mid-1800s were located in a cluster along Mākaha Stream in the mid-valley area of Mākaha Ahupua‘a. The location of the LCA cluster corresponds to the aforementioned inland settlement area. The Holt family dominated the economy, land use, and social scene in Mākaha from the mid- to late 1800s. The family’s Mākaha lands were developed into a commercial ranch known as Mākaha Ranch. In the late 1800s, the Holt Estate began to lease lands in the *makai* portions of Mākaha Valley for sugarcane cultivation.

In the early 1900s, the Waianae Sugar Company expanded into Mākaha and placed large portions of the lower valley under sugarcane cultivation. Water to irrigate the growing plantation was generally supplied by Mākaha Stream, with reservoirs and ditches constructed to divert, store, and distribute the water to the cane fields. Little water remained for irrigation of taro *lo‘i*, contributing to the demise of traditional agriculture in Mākaha and displacement of the native population.

Following the sale of the Waianae Sugar Company in the mid-1930s and the end of sugar cultivation in 1946, the Capital Investment Company led by Chinn Ho purchased the Mākaha lands with plans to develop the area. Along with the sale of residential and agricultural lots in the coastal areas of Mākaha, Ho began a resort development in the lower valley area, including a hotel, recreational facilities, two golf courses, and condominiums. Much of the lands in the lower valley were disturbed by development activities at this time.

Based on the archaeological findings, and the relative lack of development within the current study area as depicted on the aerial photographs, as well as the clearing and grading of the area, the likelihood that remnants of traditional Hawaiian *kula* (dryland) agriculture and/or habitation sites is low.

Section 4 Results of Fieldwork

Fieldwork conducted for the AA included a 100% pedestrian inspection and subsurface testing. The pedestrian survey was conducted to identify and document any potential surface historic properties within the project area and to describe the overall project area including ground visibility, modern use or disturbance, and vegetation.

Subsurface testing consisted of five test excavations. Fieldwork was conducted on 28 October 2015 and 9 November 2015 by CSH archaeologists Scott Belluomini, B.A., Lisa Manirath, M.A., and Megan Hawkins, M.A., under the general supervision of Trevor Yucha, B.S., and Principal Investigator Hallett H. Hammatt, Ph.D.

4.1 Pedestrian Inspection Results

No surface historic properties were identified within the project area. As indicated in a 1971 aerial photograph, nearly the entire surface of the project area has been graded and filled (see Figure 14). The evidence of grading within the project area was documented during the surface survey and also confirmed during AIS subsurface testing. Numerous stockpiles and push piles of basalt boulders, concrete rubble, coral boulders, and modern debris were observed throughout the project area (Figure 21 through Figure 23). These piles were generally sorted by material type and in some cases by size. The piles also contained loose soils and broken *kiawe* trunks and branches. Each pile was investigated for archaeological significance, but all were determined to be constructed within the last 50 years as raw material stockpiles that could be easily accessed and loaded into a truck.

In addition to the material stockpiles, two small, single-course basalt constructions were observed adjacent to a low circular fence and surrounding a small *koa haole* tree (Figure 24 through Figure 26). The circular fence was constructed of rebar posts and rope mesh and is visible on a modern aerial photograph of the project area within a dry, cleared area in the center of the project area (see Figure 3). The alignments, which included a mix of sub-angular and waterworn basalt stone as well as concrete chunks, were determined to be modern and assumed to be related to either a small-scale agriculture venture or possibly to a homeless encampment.

Vegetation observed within the project area included *kiawe* (*Prosopis pallida*), *koa haole* (*Leucaena leucocephala*), and various grasses such as *pili* grass (*Heteropogon contortus*) (Figure 27 and Figure 28). *Kiawe* trees cover much of the coastal habitats (Sohmer and Gustafon 1987:44). *Koa haole* is common in lowlands and lower mountain slopes throughout Hawaiʻi (Sohmer and Gustafon 1987:150). These grasses are common on the leeward slopes and coasts and were used by Hawaiians during the pre-Contact period for roofs and the sides of their homes (Sohmer and Gustafson 1987:9).

Figure 21. Overview of two basalt rock stockpiles located within the central portion of the project area, view to southeast

Figure 22. Overview of a stockpile of concrete rubble within the central portion of the project area, view to south

Figure 23. General view of a basalt boulder push pile containing *kiawe* trunks and branches and a concrete chunk located in the *mauka*-most portion of the project area, view to north

Figure 24. Overview of the circular rebar and rope mesh fence located near the central portion of the project area, view to north

Figure 25. Modern circular rock enclosure surrounding a small *koa haole* tree located adjacent to the circular rebar and rope mesh fence, view to southwest

Figure 26. Overview of a modern linear rock alignment comprised of basalt and concrete chunks located adjacent to the circular rebar and rope mesh fence, view to north

Figure 27. General view of *kiawe* trees and grasses within the project area, view to north

Figure 28. General view of *kiawe* trees, various grasses, and *koa haole*, view to northeast

4.2 Subsurface Testing Results

Five test excavations (T-1 through T-5) were excavated within the project area (Figure 29). The test excavations were on average 6.0 m long by 0.6 m wide, and the depth was an average of 132 cm below surface (cmbs). The test excavations were terminated upon reaching natural sediment or massive boulders larger than the width of the trench that could not be excavated. No historic properties were identified during the subsurface testing program. The fieldwork results of the subsurface testing program are presented below.

4.2.1 Test Excavation 1 (T-1)

T-1 was located approximately 20 m northwest of the entrance gate of the project area (Figure 29). T-1 measured 6.4 m long by 0.65 m wide with a maximum depth of 1.1 m. The northeast wall of T-1 was documented as a representative profile of the observed stratigraphy at this location. This stratigraphy consists of a stony and cobbly silty clay loam fill (Stratum I) associated with modern grading activities overlying the natural coral shelf (Stratum II) (Figure 30, Figure 31, and Table 3).

4.2.2 Test Excavation 2 (T-2)

T-2 was located approximately 15 m north of the storage shed at Mākaha Beach Park (see Figure 29). T-2 measured 6.2 m long by 0.8 m wide with a maximum depth of 1.80 m. The southwest wall of T-2 was documented as a representative profile of the observed stratigraphy at this location. The top layer is a stony and cobbly silty clay loam fill (Stratum I) related to modern grading activities, overlying a natural clay deposit (Stratum II) (Figure 32, Figure 33, Table 4).

4.2.3 Test Excavation 3 (T-3)

T-3 was located approximately 30 m northeast of T-2 (see Figure 29). T-3 measured 6.6 m long by 0.8 m wide. The base of excavation measured 1.3 m below surface. The southeast wall of T-3 was documented as a representative profile of the observed stratigraphy at this location. Three fill layers associated with modern grading activities were documented. A stony and cobbly silty clay fill (Stratum I) overlies a layer of crushed coral fill (Stratum II) and a stony clay loam fill (Stratum III). Excavation was terminated upon reaching massive boulders extending beyond the width of the trench that could not be excavated (Figure 34, Figure 35, and Table 5).

4.2.4 Test Excavation 4 (T-4)

T-4 was located in the central southeast portion of the project area approximately 50 m southeast of T-3 (see Figure 29). T-4 measured 4.8 m long by 0.85 m wide with a maximum depth of 0.8 m. The southwest wall was documented as a representative profile of the observed stratigraphy at this location. The stratigraphy of T-4 consists of one layer of stony and cobbly silty clay loam fill (Stratum I) associated with modern grading activities (Figure 36, Figure 37, Figure 38, and Table 6). Excavation was terminated upon reaching massive boulders extending beyond the width of the trench that could not be excavated.

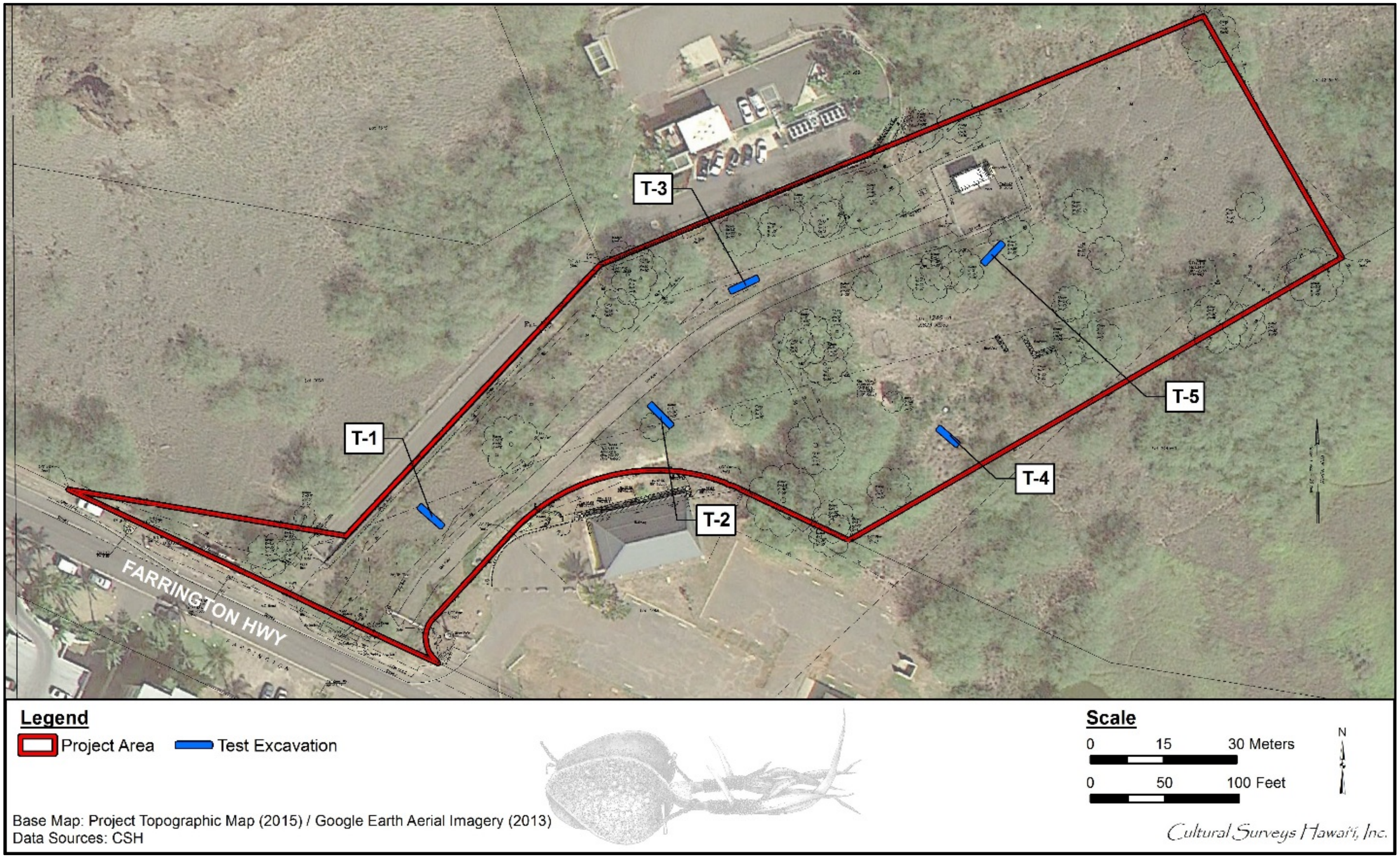

Figure 29. Aerial photograph with an overlay of the project topographic map depicting locations of Test Excavations 1–5 within the project area (Google Earth 2013)

Figure 30. T-1, northeast wall, view to south

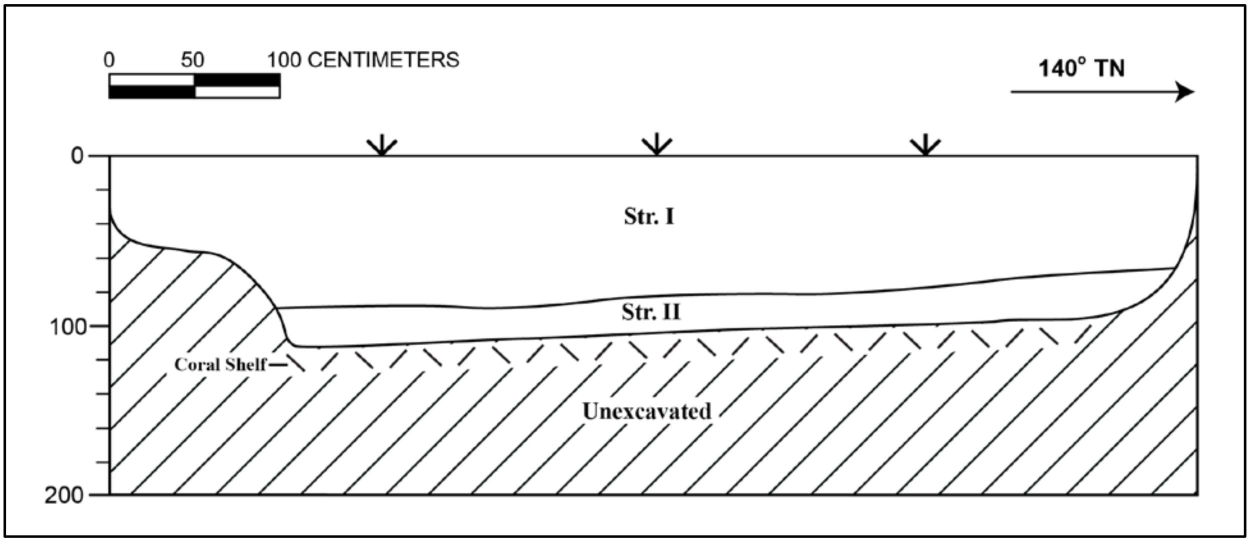

Figure 31. T-1, northeast wall profile

Table 3. T-1 Stratigraphic Description

Stratum	Depth (cmbs)	Description
I	0–90	Fill; 10YR 3/2, very dark grayish brown; stony and cobbly silty clay loam; moderate, medium, granular structure; moist, firm consistence; no cementation; slightly plastic; terrigenous origin; diffuse, smooth lower boundary; many, fine roots; fill material related to modern grading activities
II	60–110 (BOE)	Natural; 10YR 6/3, pale brown; extremely gravelly sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; lower boundary not visible; no roots; decomposing coral shelf

Figure 32. T-2, southwest wall, view to northwest

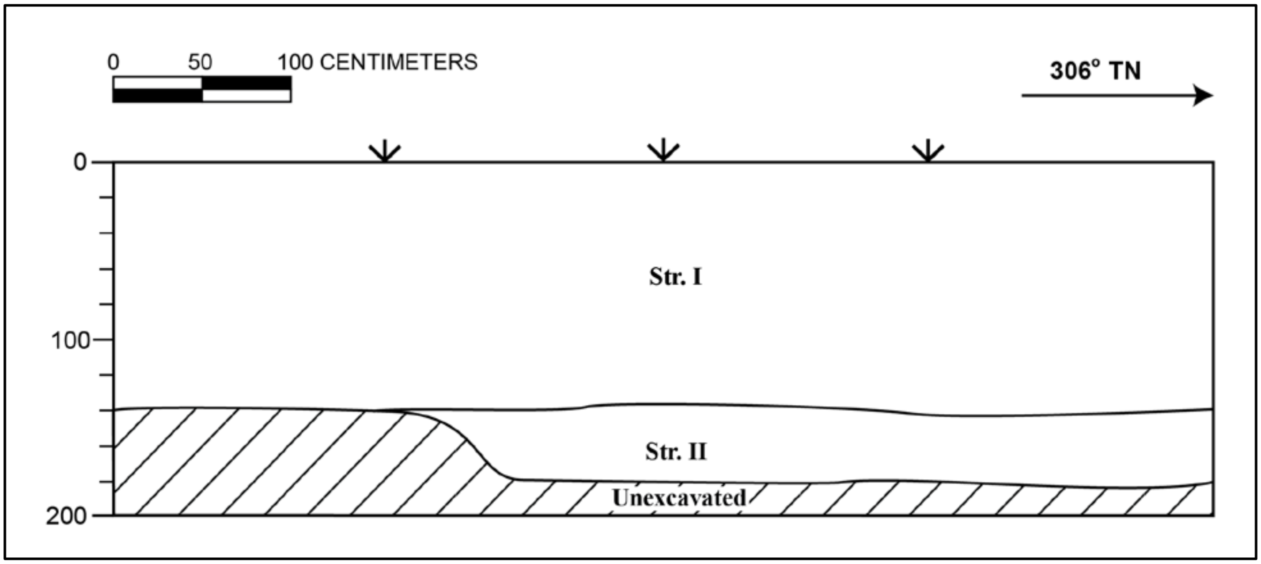

Figure 33. T-2, southwest wall profile

Table 4. T-2 Stratigraphic Description

Stratum	Depth (cmbs)	Description
I	0–140	Fill; 10YR 3/2, very dark grayish brown; stony and cobbly silty clay loam; moderate, medium, granular structure; moist, firm consistence; no cementation; slightly plastic; terrigenous origin; diffuse, smooth lower boundary; common, fine and medium roots; fill material related to modern grading activities
II	140–180 (BOE)	Natural; 10YR 3/1, very dark gray; clay; structureless (massive); moist, firm consistence; no cementation; plastic; terrigenous origin; lower boundary not visible; no roots; natural clay deposit with some wind-blown sand

Figure 34. T-3, southeast wall, view to south

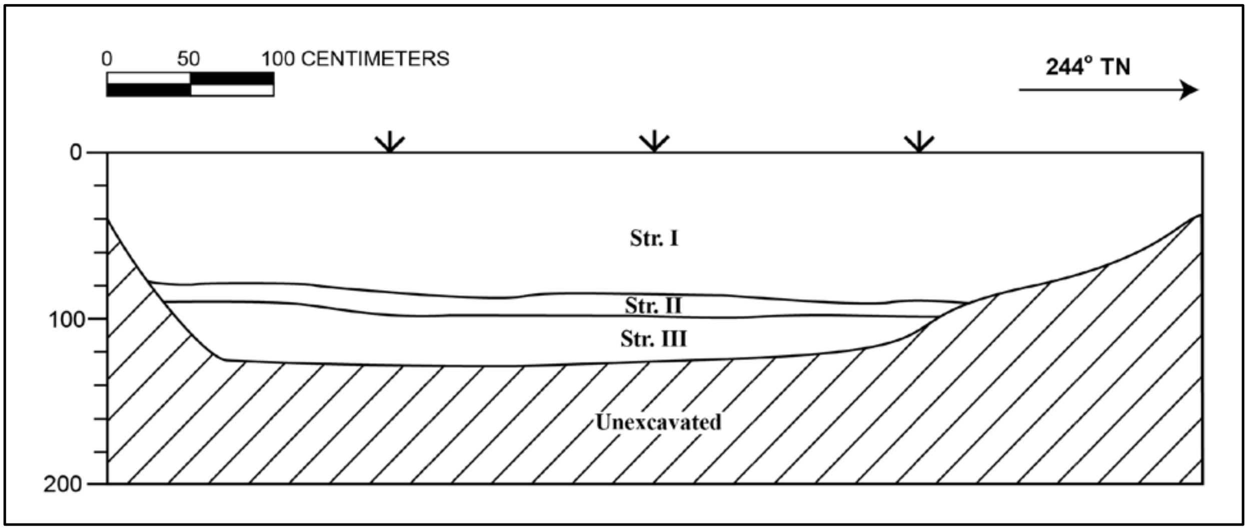

Figure 35. T-3, southeast wall profile

Table 5. T-3 Stratigraphic Description

Stratum	Depth (cmbs)	Description
I	0–90	Fill; 10YR 3/2, very dark grayish brown; stony and cobbly silty clay loam; moderate, medium, granular structure; moist, firm consistence; no cementation; slightly plastic; terrigenous origin; clear, smooth lower boundary; common, fine and medium roots; fill related to modern grading activities; sheets of plastic found within this fill layer
II	80–100	Fill; 10YR 6/4, light yellowish brown; extremely gravelly sand; structureless (single-grain); moist, loose consistence; no cementation; non-plastic; marine origin; clear, smooth lower boundary; no roots; crushed coral fill related to modern grading activities
III	90–130 (BOE)	Fill; 10YR 3/1, very dark gray; stony clay loam, moderate, medium blocky structure; moist, firm consistence; no cementation; slightly plastic; terrigenous origin; lower boundary not visible; no roots; fill related to modern grading activities

Figure 36. T-4, southwest wall, view to southwest

Figure 37. T-4, southwest wall, view to southeast

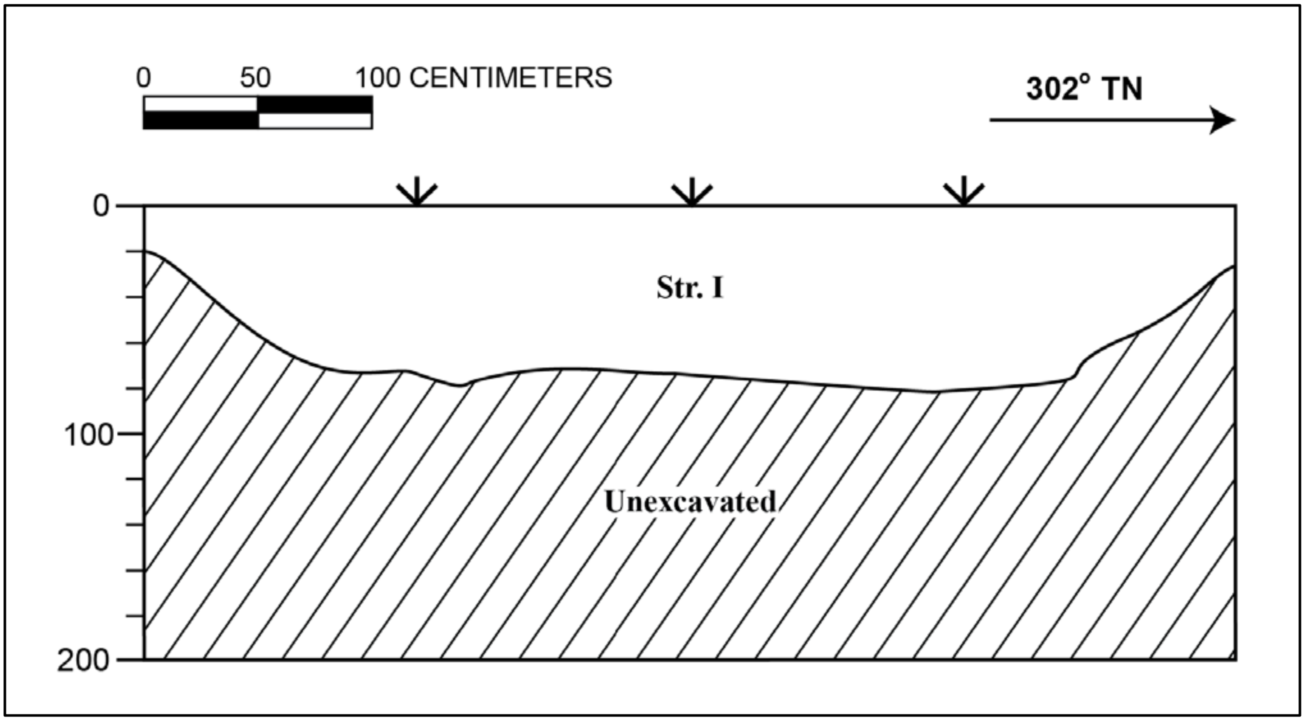

Figure 38. T-4, southwest wall profile

Table 6. T-4 Stratigraphic Description

Stratum	Depth (cmbs)	Description
I	0–80 (BOE)	Fill; 10YR 3/2, very dark grayish brown; stony and cobbly silty clay loam; moderate, medium, granular structure; moist, firm consistence; no cementation; slightly plastic; terrigenous origin; lower boundary not visible; many, fine and medium roots; redeposited fill mixed with coral inclusions, redeposited fill related to modern grading activities

4.2.5 Test Excavation 5 (T-5)

T-5 was located southeast of the commercial building owned by Hawaiian Telcom (see Figure 29). T-5 measured 6.6 m long by 0.7 m wide with a maximum depth of 1.6 m. The northwest wall was documented as a representative profile of the observed stratigraphy at this location. The stratigraphy consisted of a stony and cobbly silty clay fill (Stratum I) associated with modern grading activities (Figure 39, Figure 40, and Table 7). Excavation was terminated upon reaching massive boulders extending beyond the width of the trench that could not be excavated.

Figure 39. T-5, northwest wall, view to west

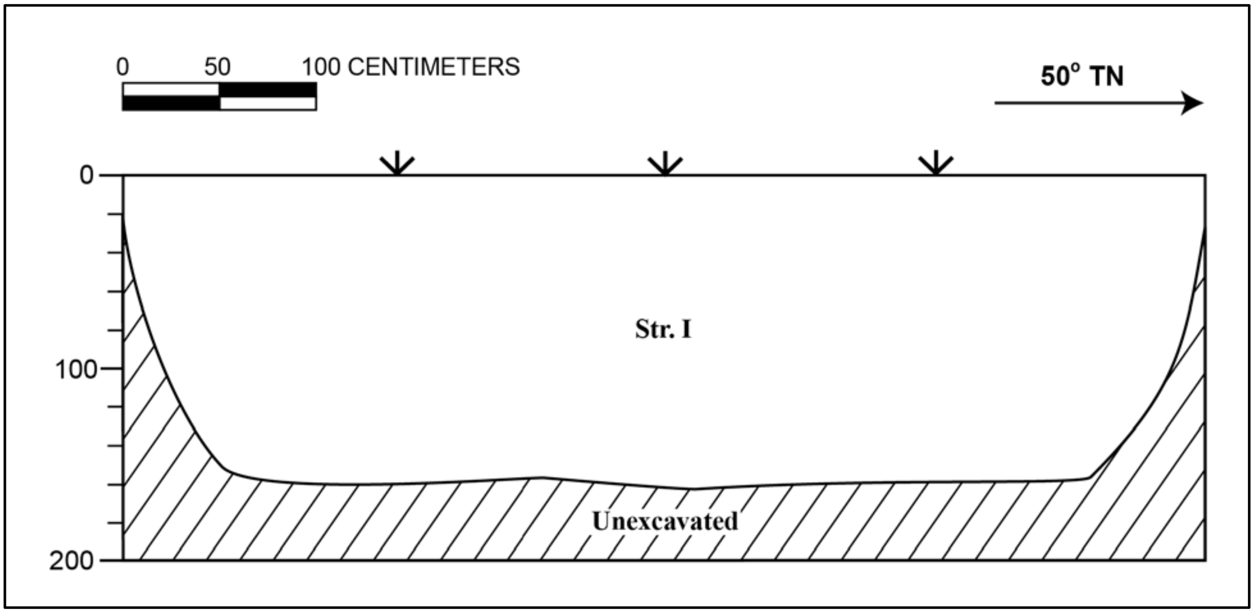

Figure 40. T-5, northwest wall profile

Table 7. T-5 Stratigraphic Description

Stratum	Depth (cmbs)	Description
I	0–160 (BOE)	Fill; 10YR 3/1, very dark gray; stony and cobbly silty clay; moderate, medium, blocky structure; moist, firm consistence; no cementation; slightly plastic; terrigenous origin; lower boundary not visible; common, fine and medium roots; fill mixed with coral inclusions, redeposited fill material related to modern grading activities

Section 5 Summary and Interpretation

In compliance with and to fulfill applicable Hawaiʻi State historic preservation requirements, CSH completed the archaeological assessment for the Southeast Asia-U.S. (SEA-US) Cable project Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: [1] 8-4-002:059.

According to the archaeological and historical research, Mākaha Valley supported dryland cultivation of crops such as sweet potatoes and taro during the pre-Contact and early historic periods. The development of a dryland agricultural system made it possible for the expansion of settlements into the upper valley of Mākaha. By the mid-1800s, the traditional way of life changed when the lands within Mākaha were transformed into a ranch by the Holt family. The Holt Ranch began selling its lands in the early 1900s, and these lands were used for sugar cultivation. After sugar cultivation came to end in the mid-1950s, further development activities occurred within Mākaha such as the construction of recreational facilities, condominiums, resorts, and golf courses.

The results of pedestrian survey revealed that no surface traditional Hawaiian cultural materials or significant historic properties were identified. Modern raw material stockpiles and push piles were observed along with a modern circular enclosure and adjacent modern rock constructions.

Based on the subsurface testing program, stratigraphy within the project area consists of thick fill sediment comprised primarily of boulders and cobbles. Natural sediment or substrate observed within the project area included the decomposing coral shelf observed within T-1 and clay observed at the base of excavation in T-2. The remainder of sediment within the project area was identified as fill sediment based on inclusions of foreign material and modern trash such as concrete rubble, rebar, plastic sheets, and machine-crushed basalt. No subsurface historic properties were identified.

The project area had been graded and cleared ca. 1960 to 1970 as depicted in Figure 14. The complete clearing and grading of the project area explains the absence of surface and subsurface traditional Hawaiian cultural materials and historic properties within the project area.

Section 6 Project Effect and Mitigation Recommendations

6.1 Project Effect

In accordance with Hawaiʻi State historic preservation review legislation HAR §13-284-7, CSH's project-specific effect recommendation is "no historic property affected." No evidence of traditional Hawaiian cultural materials was observed and no significant historical properties were present. The proposed project will not have any adverse effects on traditional Hawaiian cultural materials or deposits and historic properties.

6.2 Mitigation Recommendations

This project was completed in accordance with Hawaiʻi State historic preservation review legislation, HAR §13-284-8. The results from the AA show the project area contains no significant historic properties; therefore, no further mitigation in the form of archaeological historic preservation work is recommended.

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Draft

Cultural Impact Assessment for the Southeast Asian – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu TMK: [1] 8-4-002:059

Prepared for
R.M. Towill Corporation

Prepared by
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Cultural Surveys Hawaiʻi, Inc.
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(Job Code: MAKAHA 16)

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Management Summary

Reference	Cultural Impact Assessment for the Southeast Asia – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: [1] 8-4-002:059 (Ishihara et al. 2016)
Date	January 2016
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: MAKAHA 16
Agencies	Department of Health, Office of Environmental Quality Control (DOH/OEQC)
Land Jurisdiction	Hawaiian Telcom Services
Project Location	The project area is bound by a portion of Farrington Highway and Makaha Beach Park to the south. A building is to the northwest of the project area, while the western and eastern portions are surrounded by vegetation.
Project Description	The proposed project involves the installation of a submarine fiber optic (F/O) telecommunications cable in offshore waters approximately ¼ to ½ mile seaward of Mākaha Beach, Oʻahu, Hawaiʻi. Installation of the F/O cable will involve use of horizontal directional drilling (HDD) equipment positioned on land owned by Hawaiian Telcom. HDD will be used to create a borehole and will continue beneath the ground until it is ready to daylight in sandy ocean bottom at a depth of approximately 15 to 20 meters (m). There is no specific timeframe for the period of drilling but it is expected to last several months. Conduit will be placed into the borehole as the drill progresses. Following HDD, the remaining conduit will be used to pull the F/O cable to a specially prepared manhole at the Hawaiian Telcom property. The F/O cable will then be connected to a newly constructed Cable Landing Station at the project site. The land owned by Hawaiian Telcom and site for the proposed project is north of the existing Mākaha Beach parking lot on the *mauka* (toward the mountain) side of the Farrington Highway. The location for the daylighting of the borehole and conduit in off-shore coastal waters was selected to minimize disturbance to the environment, disruption to users of Mākaha Beach, interference with existing cables, and to secure long-term protection of the SEA-US Cable System. Landing and positioning the cable within the extensive sand deposits off-shore of the Mākaha Beach will reduce cable exposure to ocean forces, eventually allowing it to be buried beneath the sand. This is expected to allow for the protection of corals and other marine species that depend on the area for food, foraging, and habitat. Once completed, the location of the cable in 15 to 20 m of water depth is not expected to

	affect beach users including surfers, divers, boaters, swimmers, or fishermen. Ultimately, the final build-out of the SEA-US project will result in telecommunications connectivity among Southeast Asia, Hawaiʻi, Guam, and the U.S. West Coast. The project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided.
Project Acreage	The project area is 2.823 acres.
Document Purpose	This CIA was prepared to comply with the State of Hawaiʻi's environmental review process under Hawaiʻi Revised Statutes (HRS) §343, which requires consideration of the proposed 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 to 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 Hawaiʻi significance criterion "e," pursuant to Hawaiʻi 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 also intended to support the project's environmental review.
Results of Background Research	Background research for this study yielded the following results which are presented in approximate chronological order: 1. Mary Kawena Pukui translates Mākaha as "fierce" in reference to the inhabitants of the land (Pukui et al. 1974:139). Alexander (1902 in Sterling and Summers 1978:60) interprets Mākaha as "robbery" in reference to a well-known *moʻolelo* (story) regarding cannibal robbers who threatened travelers on the coastal trail through Waiʻanae Moku. 2. Older families from Waiʻanae Moku believe these negative interpretations of the meaning of the place name Mākaha and the inhabitants of the area being robbers and/or cannibal robbers are propaganda intended to discredit Native Hawaiians who continue to have a stronghold of residency on the coast (Monahan and Silva 2007). 3. The demi-god Māui is said to have spent a great deal of time on

	the Waiʻanae coast. Two *kaʻao* (legend) are associated with the demi-god. The first is Māui's mother, Hina, encourages him to find the birds who have the power to make fire. Māui captures the *alae ʻula* (Hawaiian gallinule or mudhen; *Gallinula chloropus sandvicensis*) and obtains the secret from it. The mudhen explains "that fire is in the water" and shows Māui how to obtain it (Beckwith 1970:229–230). The second *kaʻao* is of how Māui slowed the sun for Hina. Māui and Hina lived at Kāne-ana (Kāne's cave) at Puʻu-o-hulu. Hina was skilled in tapa making. To dry Hina's tapa, Māui found a way to slow the sun (Westervelt 1910:199). 4. Several *heiau* (pre-Christian place of worship) stood in Mākaha Ahupuaʻa including Kamaile Heiau, Kāneʻaki Heiau, and Laukīnui Heiau. Other important *wahi pana* (storied places) include Mauna Lahilahi; Malolokai Cave; Pōhaku o Kāne ("stone of the god Kāne"); the *pōhaku* (rock, stone) known as Pāpale o Kāne ("hat of Kāne"); Pōhaku o Kīkēkē ("clapping" or "knocking" rock), which produces a sound when you clap 4 to 5 ft away from it (Clark 1977:94); and a talking stone at Malolokai. 5. Early foreign accounts describe Waiʻanae Moku as rocky and barren (Vancouver 1798:217). Captain George Vancouver places a village south of Mauna Lahilahi situated in a coconut grove. The village is most likely Kamaile, as the beach and off-shore fishery were adjacent to the area. Behind the village was a freshwater spring where extensive taro lands existed. 6. According to Māhele documentation, Land Commission Awards (LCAs) were awarded in the *mauka* (toward the mountain) sections and along Mākaha Stream. No LCAs were found in the vicinity of the project area. 7. Chief Abner Pāki, father of Bernice Pauahi, was given the entire *ahupuaʻa* of Mākaha by Liliha after her husband, Boki, disappeared in 1829 (Green 1980). Pāki died in 1855 and the administrators of his estate sold his Mākaha lands to James Robinson and Company. Later, one of the partners, Owen Jones Holt, bought out the shares of the others (Ladd and Yen 1972). The Holt family dominated the economic and social scene in Mākaha until the end of the nineteeth century. From 1997 to 1899, Holt Ranch raised horses, cattle, pigs, goats, cattle, and peacocks (Ladd and Yen 1972:4). 8. In 1880, the Waianae Sugar Company cultivated cane in three valleys: Mākaha, Waiʻanae, and Lualualei. During this time they also altered the Waiʻanae coastline by constructing a railroad. The railroad impacted the natural features of the area such as sand dunes and man-made features such as fishponds and salt

	ponds. 9. Holt Ranch began selling off its land in the early 1900s (Ladd and Yen 1972). The Waianae Sugar Company moved their operations to Mākaha and by 1923, the lower portion of Mākaha Valley was under sugarcane cultivation. For half a century, Mākaha was predominantly sugarcane fields until 1946 a manager's report announced plans to liquidate due to increased wages making operations no longer profitable (Condé and Best 1973:358). 10. Lack of water played a role in Waianae Sugar Company's liquidation. In the 1930s the plantation sold out to American Factors Ltd. (Amfac, Inc.). Amfac initiated a geologic study of the ground water in the mountain ridges in the back of Mākaha and Waiʻanae valleys. In 1945, James W. Golver, Ltd. was contracted to create a tunnel into the ridge in back of Mākaha Valley. Approximately 700,000 gallons of water was pumped daily for the irrigation of sugar. The following year the plantation liquidated all of its acres of land to the Honolulu Stock Exchange. Parts of the property were sold off as beach lots, shopping centers, and house lots. 11. Previous archaeological studies locate several cultural sites northwest of the project area (Site 173, *pōhaku*; Site 174, Laukinui Heiau; Site 175, Mololokai; McAllister 1933) and human remains (State Inventory of Historic Properties [SIHP] # 50-80-07-4527) with staghorn coral at major joints and a possible *niho palaoa* (whale tooth pendant worn by *aliʻi* [chief]) (Kawachi 1992). Southeast of the project area includes a pre-Contact cultural layer (SIHP # -6572); the Mākaha Bridge 3A constructed in 1937 (-6823); a subsurface cultural layer (-7031); Mākaha Bridge 3 (-6822); remains of the OR&L railroad infrastructure (-9714); a culturally enriched A horizon with a previously disturbed burial (-6825); and Farrington Highway (-6824) (McDermott and Tulchin 2006). Two burials were found farther south at Mauna Lahilahi (-3704) in addition to artifacts and sites associated to the burials (Kawachi 1990).
Results of Community Consultation	CSH attempted to contact Native Hawaiian Organizations (NHOs), agencies, and community members. Consultation was received from the following community members: 1. Jan Becket, retired Kamehameha Schools teacher, author, photographer, knowledgeable in cultural sites, Kona Moku Representative for the Committee on the Preservation of Historic Sites and Cultural Properties 2. Eric Enos, cultural practitioner and operates Kaʻala Farms 3. Paulette Kaʻanohi Kaleikini, descendant, cultural monitor, cultural practitioner, and resident of Nānākuli

	4. Shad Kāne, Oʻahu Island Burial Council (OIBC), ʻEwa moku and Chair for the Committee on the Preservation of Historic Sites and Cultural Properties, founder of the Kalaeloa Heritage & Legacy Foundation 5. Donna LaFrance, Associa Hawaiʻi – property management for Mauna Olu Estates 6. Kaʻahiki Solis, Cultural Historian – Oʻahu, State Historic Preservation Division (SHPD)
Impacts and Recommendations	Based on information gathered from the background and community consultation, the proposed project may potentially impact undetected *iwi kūpuna* (ancestral bones). CSH identifies potential impacts and makes the following recommendations. 1. Previous archaeology conducted in the vicinity of the project area has yielded *iwi kūpuna* (SIHP #s 50-80-07-4527 and -6825). In addition, no archaeology has been conducted within the project area. There is also a community concern regarding impact to a possible cultural layer, which may include burials (such as SIHP # -6825). Based on these findings, there is a possibility *iwi kūpuna* may be present within the project area and that land disturbing activities during construction may uncover presently undetected burials or other cultural finds. Should burials (or other cultural finds) be encountered during ground disturbance or via construction activities, all work should cease immediately and the appropriate agencies should be notified pursuant to applicable law, HRS §6E. 2. Another community concern was minimal disturbance to the environment and Mākaha Beach users (which may include cultural practitioners such as surfers and fishermen). The community's recommendation was to have more discussion with the community and to discuss plans prior to construction.

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Section 1 Introduction

1.1 Project Background

At the request of R.M. Towill Corporation, Cultural Surveys Hawaiʻi Inc. (CSH) has completed a cultural impact assessment (CIA) for the Southeast Asia – United States (SEA-US) Cable System, Mākaha Beach Landing project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu, TMK: [1] 8-4-002:059. The project area is approximately 2.823 acres (Figure 1 through Figure 3).

The proposed project involves the installation of a submarine fiber optic (F/O) telecommunications cable in offshore waters approximately ¼ to ½ mile seaward of Mākaha Beach, Oʻahu, Hawaiʻi. Installation of the F/O cable will involve use of horizontal directional drilling (HDD) equipment positioned on land owned by Hawaiian Telcom. HDD will be used to create a borehole and will continue beneath the ground until it is ready to daylight in sandy ocean bottom at a depth of approximately 15 to 20 meters (m). There is no specific timeframe for the period of drilling but it is expected to last several months. Conduit will be placed into the borehole as the drill progresses. Following HDD, the remaining conduit will be used to pull the F/O cable to a specially prepared manhole at the Hawaiian Telcom property. The F/O cable will then be connected to a newly constructed cable landing station at the project site.

The land owned by Hawaiian Telcom and site for the proposed project is north of the existing Mākaha Beach parking lot on the *mauka* (toward the mountain) side of the Farrington Highway. The location for the daylighting of the borehole and conduit in off-shore coastal waters was selected to minimize disturbance to the environment, disruption to users of Mākaha Beach, interference with existing cables, and to secure long-term protection of the SEA-US Cable System.

Landing and positioning the cable within the extensive sand deposits off-shore from the Mākaha Beach will reduce cable exposure to ocean forces, eventually allowing it to be buried beneath the sand. This is expected to allow for the protection of corals and other marine species that depend on the area for food, foraging, and habitat. Once completed, the location of the cable in 15 to 20 m of water depth is not expected to affect beach users including surfers, divers, boaters, swimmers, or fishermen.

Ultimately, the final build-out of the SEA-US project will result in telecommunications connectivity among Southeast Asia, Hawaiʻi, Guam, and the U.S. West Coast. The project will further benefit Hawaiʻi with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided.

1.2 Document Purpose

This CIA was prepared to comply with the State of Hawaiʻi's environmental review process under Hawaiʻi Revised Statutes (HRS) §343, which requires consideration of the proposed 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 to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control's *Guidelines for Assessing*

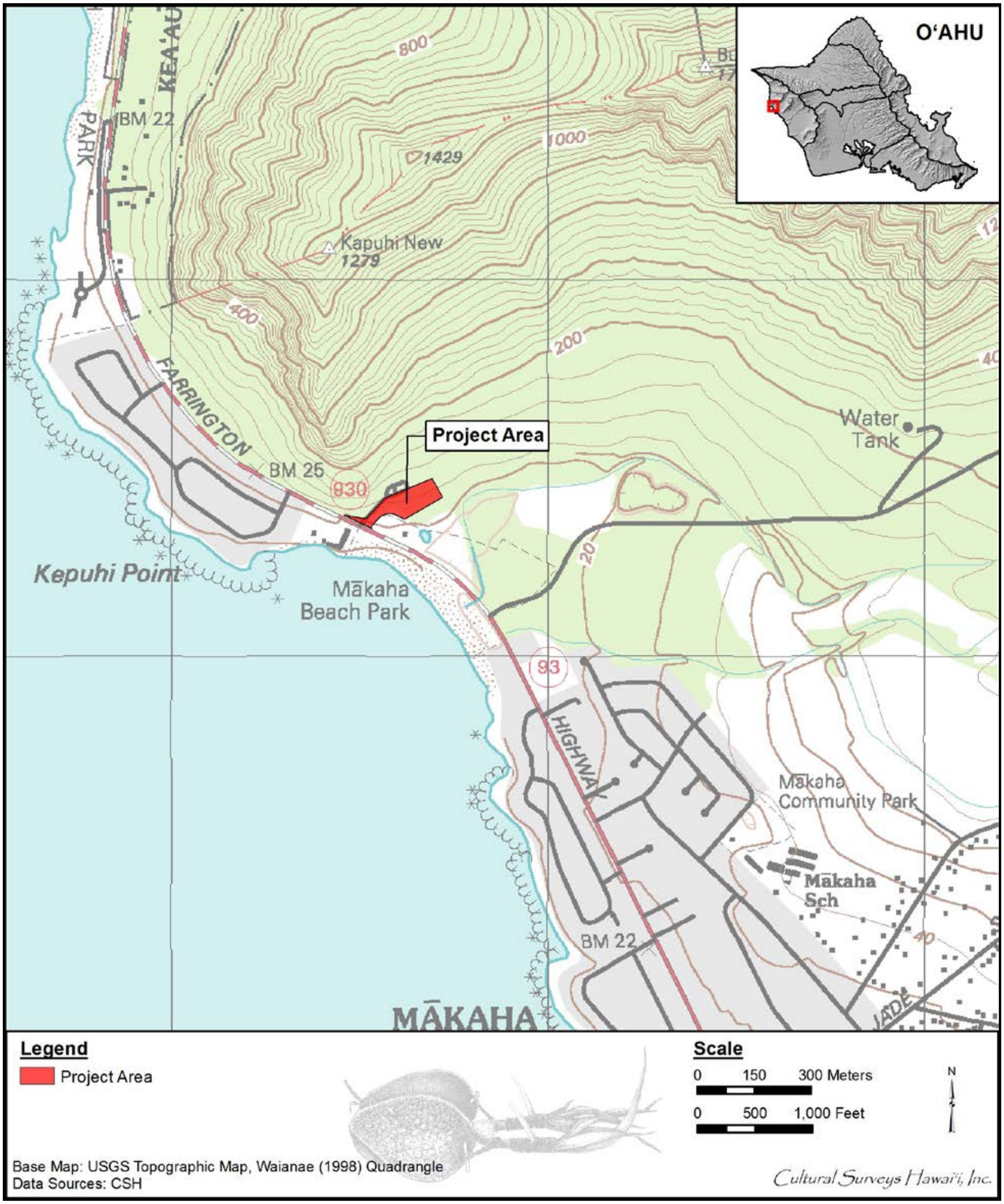

Figure 1. Portion of 1998 Waianae USGS topographic quadrangle depicting project area

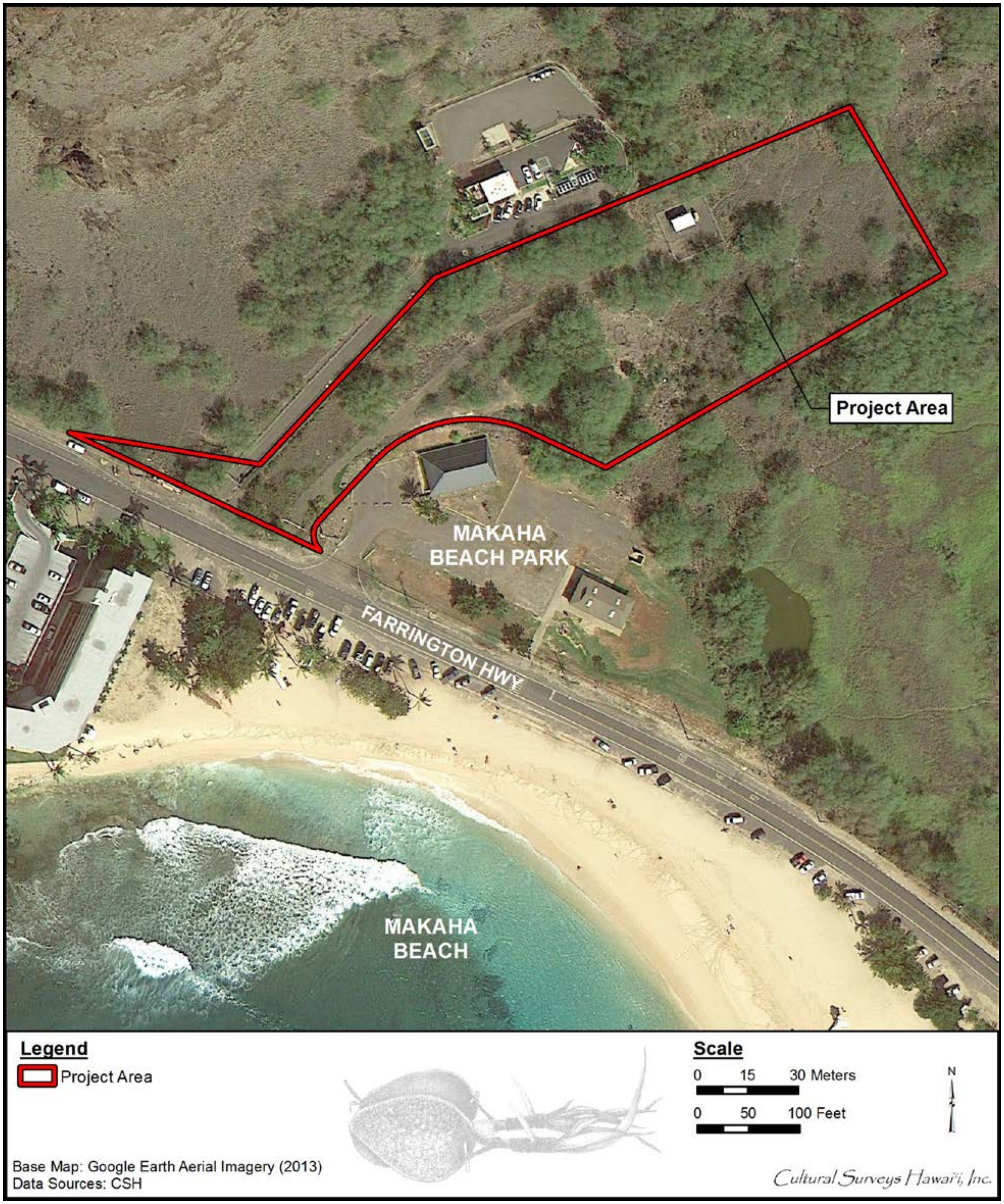

Figure 2. 2013 Google Earth Imagery showing project area

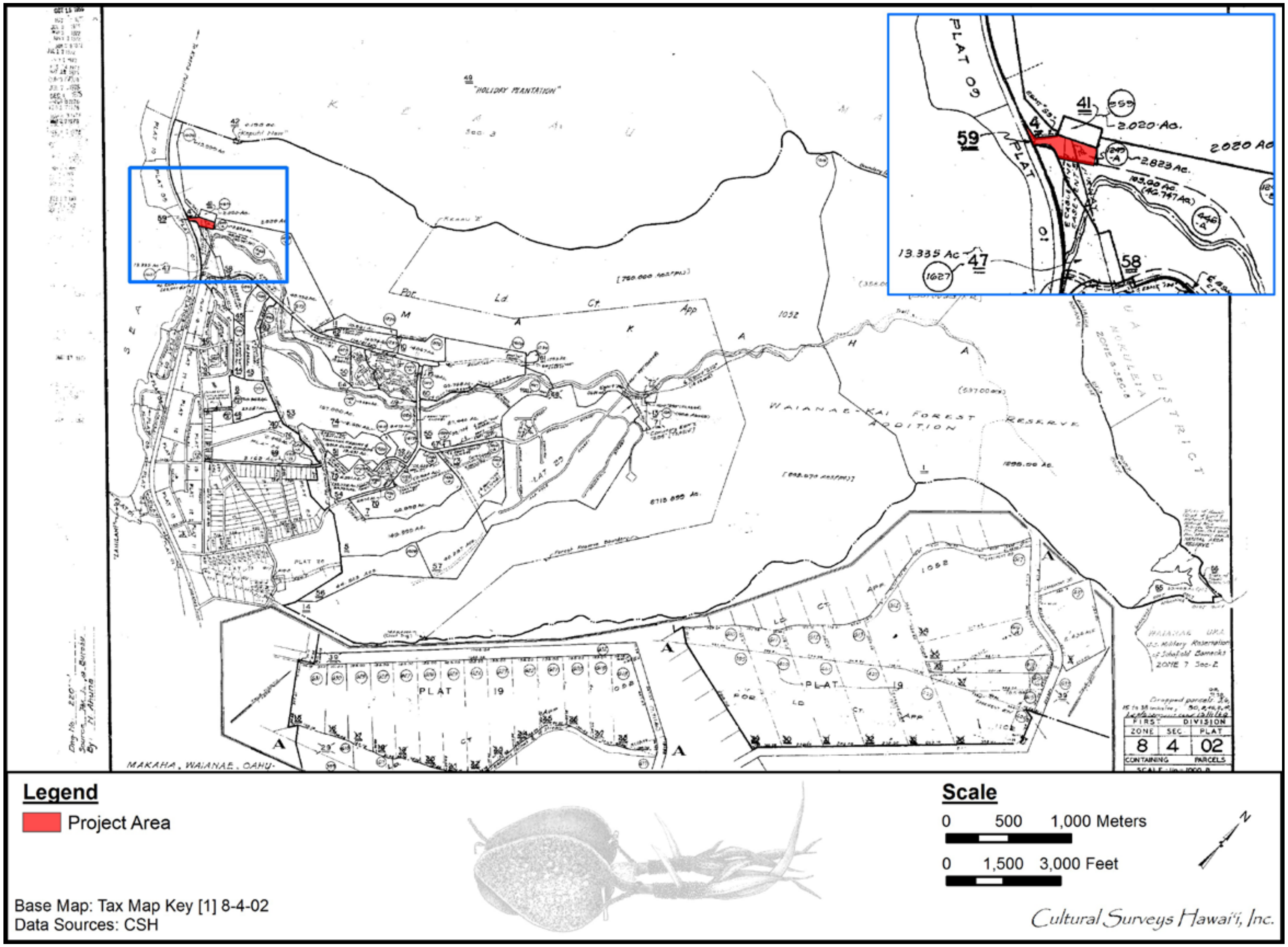

Figure 3. Tax Map Key (TMK): [1] 8-4-002 with project area

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 also intended to support the project’s environmental review.

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 for 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 within and near the subject parcel that may be relevant to reconstructing 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 Environmental Setting

1.4.1 Soils

Generally, the coastal areas of this part of Wai‘anae are characterized by white sand beaches with low dunes and narrow back dunes (Cordy 1998). In addition, there are localized areas of old, uplifted coral reefs and limestone flats. Much of the coastal area has been disturbed by both historic and modern development; most of the narrow back dunes have been graded.

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 soils consist of Haleiwa Silty Clay, 0 to 2% slopes (HeA); Coral outcrop (CR); and Stony land (rST). South of the project area is Beaches (BS).

The Haleiwa Series is described below:

> This series consists of well-drained soils on fans and in drainageways along the coastal plains. These soils are on the islands of Oahu and Molokai. They developed in alluvium derived from basic igneous material. They are nearly level

> to strongly sloping. Elevations range from sea level to 250 feet. The annual rainfall amounts to 30 to 60 inches, most of which occurs between November and April. [Foote et al. 1972:33]

The Haleiwa Series are primarily used for sugarcane, truck crops, and pasture. Natural vegetation on these soils include *koa haole* (*Leucaena leucocephala*), lantana (*Lantana camara*), guava (*Psidium guajava*), Christmas berry (*Schinus terebinthifolius*), Bermuda grass (*Cynodon dactylon*), and finger grass (*Chloris sp.*).

Haleiwa silty clay, 0 to 2% slopes, occurs in large areas on alluvial fans or long, narrow areas of drainageways (Foote et al. 1972:33). The soil is neutral to slightly acidic and permeability is moderate. Runoff tends to be slow and there is a slight erosion hazard.

Coral outrcrop is described below:

> Coral outcrop (CR) consists of coral or cemented calcareous sand on the island of Oahu. The coral reefs formed in shallow ocean water during the time the ocean stand was at a higher level. Small areas of coral outcrop are exposed on the ocean shore, on the coastal plains, and at the foot of the uplands. Elevations range from sea level to approximately 100 feet. The annual rainfall amounts to 18 to 40 inches. Coral outcrop is geographically associated with Jaucas, Keaau, and Mokuleia soils.
>
> Coral outcrop makes up about 80 to 90 percent of the acreage. The remaining 10 to 20 percent consists of a thin layer of friable, red soil material in cracks, crevices, and depressions within the coral outcrop. This soil material is similar to that of the Mamala series.
>
> This land type is used for military installations, quarries, and urban development. Vegetation is sparse. It consists of *kiawe* (Algaroba; *Prosopis allida*), *koa haole*, and fingergrass. [Foote et al. 1972:29]

Stony land is described below:

> Stony land (rST) occurs in valleys and on side slopes of drainageways on the island of Oahu. It is mainly between Barbers Point and Kaena Point. It consists of a mass of boulders and stones deposited by water and gravity. The slope ranges from 5 to 40 percent. Elevations range from nearly sea level to 500 feet. The annual rainfall amounts to 18 to 60 inches. Stony land is geographically associated with Lualualei and Ewa soils.
>
> Stones and boulders cover 15 to 90 percent of the surface. The soil among the stones consists of reddish silty clay loam that is similar to Ewa soils and very dark grayish-brown clay that is similar to Lualualei soils. In most places there is enough soil among the stones to provide a foothold for plants.
>
> This land type is used for wildlife habitat and recreation. The natural vegetation consists of *kiawe*, lantana, *koa haole*, bermudagrass, and annuals. [Foote et al. 1972:120-121]

See Figure 4 for aerial with soil study overlay.

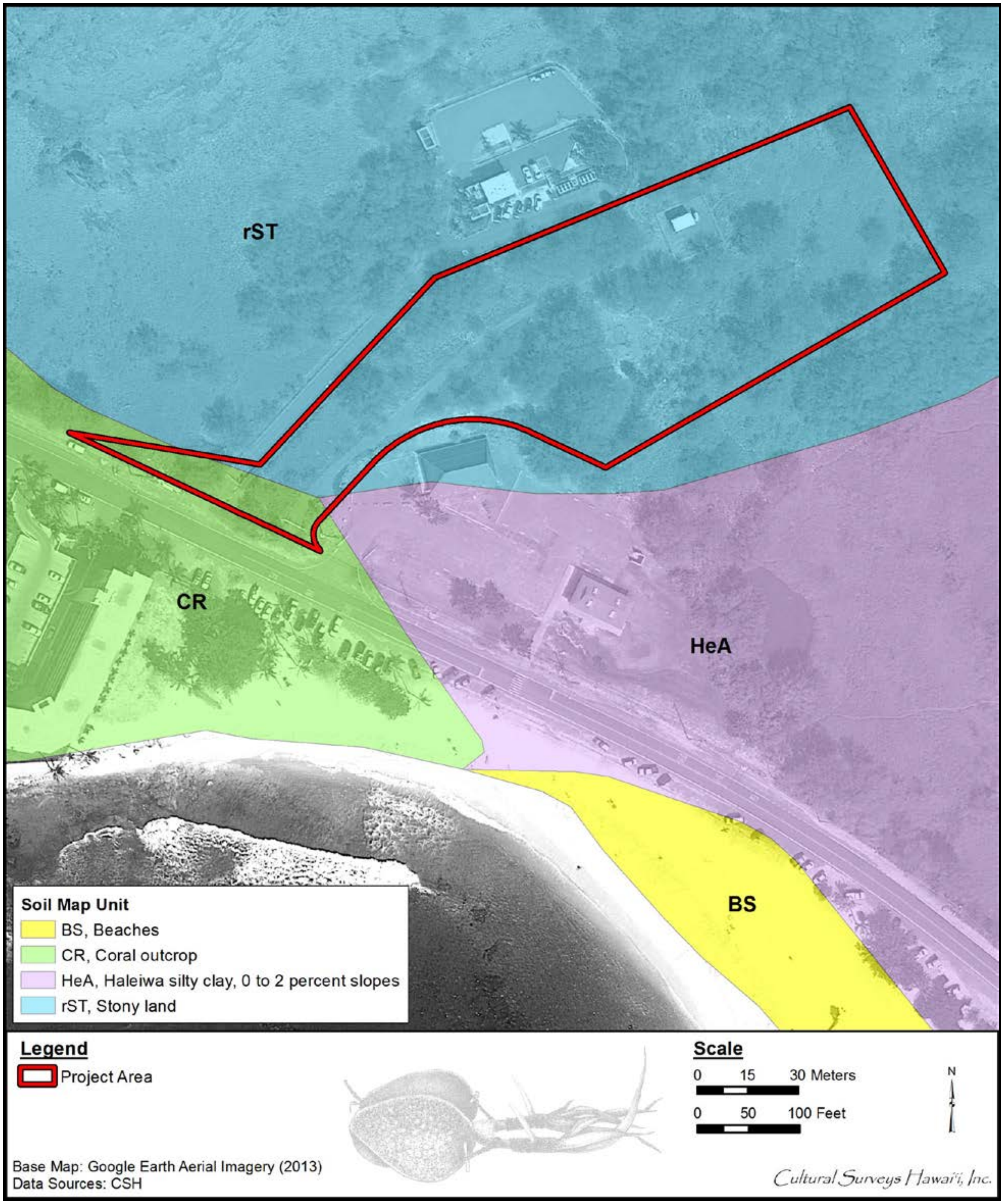

Figure 4. 2013 aerial photograph (Google Earth 2013) with an overlay of the USDA SSURGO database (2001) and soil survey data gathered by Foote et al. 1972

1.4.2 Rain and Vegetation

Rainfall is less than 500 mm (20 inches) annually along the coast with winter storms being the major source of precipitation. December through February are the relatively wet months for the region (Armstrong 1973). The project area is generally without relief, with the exception of the minor topography associated with the south branch of Mākaha Stream. This stream's intermittent drainage is usually blocked from the sea by the active sand beach berm.

Vegetation along this arid coast is sparse. With 500 mm (20 inches) or less of rain annually, only the hardiest plants adapted to coastal environments can thrive. The vegetation is typical of dry seashore environments in Hawaiʻi and is dominated by alien species. Indigenous species include *hau* (*Hibiscus tiliaceus*), *kou* (*Cordia subcordata*), *kamani* (*Calophyllum inophyllum*), *naupaka* or *naupaka kahakai* (*Scaevola sericea*), *paʻu o Hiʻiaka* (*Jacquemontia ovalifolia sandwicensis*), the native beach morning glory or *pohuehue* (*Ipomea pes-caprae*) and the coconut or *niu* (*Cocos nucifera*). Introduced species found bordering the Farrington Highway include sea grape (*Coccoloba uvifera*), *kiawe* trees, Madagascar olive trees (*Noronhia emarginata*), and *koa haole. Kiawe*, *koa haole*, and various grasses are dominant within the project area.

A study conducted by Kelly and Quintal (1977) depicted the approximate location of rare plant species in Waiʻanae, with some in upper Mākaha, outside the project area. It is, however, useful to keep people informed as to their location, which is mainly in the Peacock Flats to Makua-Mākaha Ridge area.

Kelly and Quintal list the most famous plant in Mākua, also true for Mākaha, as the *maile-lau-liʻi* (small-leafed *maile;* Alyxia *olivaeformis maile*). John Dominis Holt's interview also speaks to the fame of this plant in Mākaha (see Section 5

1.4.3 Winds and Sun of Mākaha Mentioned in Literature

In *The Epic Tale of Hiʻiakaikapoliopele*, Mākaha is drenched in sun:

> 5. Spared by the Kaiāulu wind
> And the Koholālele, the wind from below
> The sun assails the lands of Mākua
> And pours its wrath upon ʻŌhikilolo
> Keaʻau's districts are consumed by the sun
>
> 10. The sun dances over Mākaha
> The sun's teeth are sharp at Kūmanomano
> The plains of Aliʻo are hot in the sun
> Pained is Kuaiwa by the Malamapō
> Waiʻanae is refreshed by the Kaiāulu wind.
> [Hoʻoulumāhiehie 2008:263]

Similar lines are found in Nathaniel B. Emerson's translation of the Hiʻiaka tale, as she pays her respects to her ancestor, Pohaku-o-Kauai, while climbing the Waiʻanae mountains:

> Haoa ka La i na Makua;
> Lili ka La i Ohiki-lolo;

Haʻa-hula leʻa ke La i ke kula
Ka Haʻa ana o ka La i Makaha;
Oi ka niho o ka la i Ku-manomano;
Ola Ka-maile i ka huna na niho;
Moʻa wela ke kula o Wailio;
Ola Kua-iwa i ka malama po;
Ola Waianae i ka makani Kai-a-ulu, (a)
Ke hoa aku la i ka lau o ka niu.

Fierce glows the sun at Makua
How it quivers at Ohiki-lele
'Tis the Sun-god's dance o'er the plain,
A riot of dance at Makaha.
The sun-tooth is sharp at Kumano;
Life comes again to Maile ridge,
When the Sun-god ensheaths his fang.
The plain Walio is sunburned and scorched;
Kua-iwa revives with the nightfall;
Waianae is consoled by the breeze
Kai-a-ulu and waves its coco fronds.
[Hoʻoulumāhiehie 2008:157–158]

Each small geographic area on Oʻahu had a Hawaiian name for its own wind, rain, and seas. The name of the winds of Oʻahu are listed in a chant concerning a powerful gourd called *The Wind Gourd of Laʻamaomao*. When the gourd was opened, a specific wind could be called to fill the sails of a canoe and take the person in the desired direction. The chant names the wind of Waiʻanae. The wind Kaiāulu is associated with Waiʻanae (Nakuina 1990:51). The wind consoles or gives comfort.

1.4.4 Stars Associated with Mākaha

Maud Makemson, an early astronomer who collected information regarding celestial information in Hawaiʻi and the Pacific, indicates her informants told her there was a benevolent relationship between some stars and thieves:

> Among the Hawaiian stars listed by Kamohoula, Āuhaele and Paikauhale were said to patronize beggars, vagabonds, and thieves. Two other stars, *Makaha* and *Makohilani*, situated near the Pleiades, were benevolent toward thieves and murderers. The star *Makahai-aku* informed fishermen of the proper time to go out shark *(aku)* fishing. [Makemson 1941:139].

See Section 3.1.4 and Section 3.2 for more on the association of Mākaha and thieves.

1.4.5 Built Environment

The present-day built environment within and in the immediate vicinity of the project area consists of paved roads, and graded, unpaved road-shoulder, pull-off parking areas, and commercial development.

Paved roads are located both within and in the immediate vicinity of the project area. Farrington Highway is located *makai* (toward the ocean) of the project area running roughly west-east, continuing in both directions.

On the southern boundary of the project area, and adjacent to Farrington Highway, a paved parking lot is within the vicinity of the project area utilized by patrons of Mākaha Beach Park, especially those with boat tow accessories as there is ample space to maneuver. On the northern boundary of the parking lot sits a covered structure that serves as a storage area for outrigger canoes and associated equipment.

Section 2 Methods

Research centers on Hawaiian activities including *kaʻao* (legends), *wahi pana* (storied places), *ʻōlelo noʻeau* (proverbs), *oli* (chants), *mele* (songs), traditional *moʻolelo* (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. Other archives and libraries where CSH cultural researchers gather information include the Hawaiʻi State Archives, the Bishop Museum Archives, the University of Hawaiʻi at Mānoa's Hamilton Library, Ulukau, the Hawaiian Electronic Library (Ulukau 2014), the State Historic Preservation Division (SHPD) Library, the State of Hawaiʻi 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 ʻAina Corporation's Māhele database (Waihona ʻAina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ʻĀina website (Ava Konohiki 2015).

2.1 Community Consultation

2.1.1 Scoping for Participants

The cultural department commences our consultation efforts by utilizing our previous community contact list to facilitate the interview process. We then review an in-house database of *kūpuna* (elders), *kamaʻāina* (native born), 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. CSH also contacts agencies such as SHPD, OHA, and the appropriate Burial Council for the island on which the proposed project is located for their response to 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 *ʻike* (knowledge) and *manaʻo* (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 later.

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 are always 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* (traditional land division extending from the mountain to the sea); 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 transcribe and create an interview summary based on information provided by the interviewee. Cultural researchers give a copy of the transcription and interview summary to the interviewee for review and ask that they make any necessary edits. Once the interviewee has made those edits, CSH incorporates 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.

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 community contacts if we have lost our *kūpuna*. CSH makes it a point to reach out to the *‘ohana* of our *kūpuna* who have passed on and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have on file for genealogical and historical reference.

Section 3 *Kaʻao* and *Moʻolelo* of Mākaha

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 word to the written word and *kaʻao* (legends) are often full of *kaona* or double meanings.

Martha Beckwith (1940:1) notes that Hawaiians use the term *kaʻao* "for a fictional story or one in which fancy plays an important part." Beckwith defines *moʻolelo* as "a narrative about a historical figure, one which is supposed to follow historical events. Stories of the gods are moʻolelo" (Beckwith 1940:1). In reality, the distinction between *kaʻao* and *moʻolelo* as fiction and fact, respectively, cannot be "pressed to closely" as "it is rather in the intention than in the fact" (Beckwith 1940:1). Thus a *moʻolelo*, which may be enlivened by fantastic adventures of *kupua* (supernatural beings) "nevertheless corresponds with the Hawaiian view of the relation between nature and man" (Beckwith 1940:1). A *kaʻao* "is consciously composed to tickle the fancy rather than to inform the mind as to supposed events" (Beckwith 1940:1).

3.1 *Kaʻao* and *Moʻolelo*

3.1.1 The Demi-God Māui

Hawaiian *kaʻao* contain numerous traditional accounts of the demi-god Māui. Like many ancient accounts of deities, each of the Hawaiian Islands held their own versions of similar stories, and the tales of Māui are no different. The Hawaiian concept of genealogy and kinship is a crucial structure for piecing together the similarities in Hawaiian stories.

Kamakau's 1991 text, *Tales and Traditions of the People of Old*, outlines the ʻUlu genealogy as it leads down to Māui-akalana, the legendary Hawaiian trickster whose exploits are recorded in one of the oldest genealogical chants, the Kumulipo (name of Hawaiian creation chant). In the fifteenth epoch of the Kumulipo, Māui, the youngest of four sons, is born to Akalana (k = *kane* = male) and Hinaakeahi (w = *wahine* = female). In the sequence of Hawaiian genealogies, Māui is associated with the line of ʻUlu and the sons of Kiʻi (Westervelt 1910:4). Kamakau articulates the same kinship chart following seven generations of fathers that stretch back to Nanaʻie and his marriage to Kahaumokuleʻia, leading down to the marriage of Hina-kawea to the chief Akalana and their four offspring, all with the name Māui: Māui-mua, Māui-waena, Māui-kiʻikiʻi, and Māui-akalana (Kamakau 1991:135). Māui-akalana is the Māui whose stories fill legendary accounts on the island of Oʻahu. From Kamakau's reading, it's stated that there are four sons named Māui born to Hina. This is an important concept to understand as each of the four main Hawaiian Islands may have had their very own Māui, and each would have been a descendant of Hina, and each would have *wahi pana* associated with them.

Samuel Kamakau tells us that Māui's genealogy can be traced from the ʻUlu line through Nanaʻie:

> *Nanaʻie lived with Kahaumokuleʻia at Waiʻalua, and Nanaialani, a male was born;*

> *Nanaialani lived with Hina-kinau, and Waikūlani, a male, was born;*
> *Waikūlani lived with Kekauilani, and Kūheleimoana, a male, was born;*
> *Kūheleimoana lived with Mapunaiaʻaʻala, and Konohiki, a male was born;*
> *Konohiki lived with Hīkaʻululena, and Wawana, a male, was born;*
> *Wawena lived with Hina-mahuia, and Akalana, a male, was born;*
> *Akalana lived with Hina-kawea, and Māui-mua, Māui-waena, Māui-kiʻikiʻi, and Māui-akalana, all males, were born.* [Kamakau 1991:135]

> Ulehawa and Kaʻōlae, on the south side of Waiʻanae, Oahu, was their birthplace. There may be seen the things left by Māui-akalana and other famous things: the tapa-beating cave of Hina, the fishhook called Mānai-a-kalani, the snare for catching the sun, and the places where Māui's adzes were made and where he did his deeds. However, Māui-akalana went to Kahiki after the birth of his children in Hawaiʻi. The last of his children with Hina-a-kealoha was Hina-a-ke-kā. His children became ancestors for the oceanic islands as far as the islands called New Zealand by the haole. In the islands of the ocean, Māui performed his famous deeds, which will never be forgotten by this race. [Kamakau 1991:135]

3.1.1.1 Māui and the Secret of Fire

Māui's mother encourages him to find the birds who have the power of fire making. He finds them and follows them to Waiʻanae, on the island Oʻahu. Here he captures the little *alae ʻula* (Hawaiian gallinule or mudhen; *Gallinula chloropus sandvicensis*) and obtains the secret (Westervelt 1910:65).

> Maui's first feat is getting fire from the mud hens while they are roasting bananas. Hina teaches him to catch the littlest one. He finds them at Waianae on Oahu. Each time he approaches they scratch out the fire. When he finally succeeds in seizing the littlest mud hen she tries to put him off by naming first the taro stalk, then the ti leaf as the secret of fire. That is why these leaves have hallows today, because Maui rubbed them to try to get fire. At last the mud hen tells him that fire is in the water (wai), meaning the tree called 'sacred water' (wai-mea), and shows how to obtain it. So, Maui gets fire, but he first rubs a red streak on the mud hen's head out of revenge for her trickery before letting the bird escape. [Beckwith 1970:229–230]

3.1.1.2 How Māui Slowed the Sun

The following *kaʻao* describes how Māui, the demi-god, slowed the sun for his mother Hina so she could dry her *kapa* (tapa, as made from *wauke* [paper mulberry; *Broussonetia papyrifera*] or *māmaki* [*Pipturus spp.*] bark).

> [The] history of Maui and his grandmother Hina begins with their arrival from foreign lands. They dwelt in Kane-ana (Kane's cave), Waianae, Oahu. This is an 'ana,' or cave, at Puu-o-hulu. Hina had wonderful skill in making all kinds of tapa according to the custom of the women of ancient Hawaii. Māui figures out how to capture the sun, and then makes the sun promise to go slower so Hina's tapa can dry each day. [Westervelt 1910:199]

> Thus arose the saying, ‘Long shall be the daily journey of the sun and he shall give light for all the people’s toil’ Hina learned that she could pound until she was tired while the farmers could plant and take care of their fields. Thus also this hill received its name Hele-a-ka-la. This is one of the hills of Waianae near the precipice of the hill Puu-ohulu. [Westervelt 1910:123]

3.1.2 Hula in Waiʻanae

In the *Romance of Keaomelemele*, we find that Waiʻanae is part of the *hula* tradition:

> Closely connected with the knowledge thus gained of the shape and motions of clouds is that which governs the art of the hula or dance. The movements of the dance are definitely related in this nature romance to the motions of leaves and blossoms swaying in various ways according to the particular wind that blows. It is by watching the dancing trees, the shifting clouds, and the shadows which they cast that the girl learns their motions. Hiʻi-lani wai teaches the hula to girls at Waianae; Malu-a-ka teaches on Kauai. Kapo, sister of the poison-tree gods of Maunaloa and proficient in the arts of herb medicine and sorcery, teaches Ke-ao-melemele on the dancing field near Waolani in Nuʻuanu valley until she can dance in the skies and over the sea. Clearly these are the Pele sisters. [Beckwith 1940:522]

3.1.3 The Magic Whistle of Kawiwi Hill

An article in the newspaper *Ke Aloha Aina*, tells of a magic whistle found on Kawiwi hill, which transforms a mute boy into an articulate member of his family. Keakaoku is the mute son of Kahelekulani. Keakaoku wanted very much to talk but was unable to do so.

> His favorite occupation was to play on flutes. His grandfather sent kahunas and men to the forest to make flutes for him, but though he played them beautifully, they did not suit him. The goddess, Haumea, who was the adopted mother of his mother, told them of a coconut whistle at Waianae on Kawiwi hill, well guarded by supernatural beings. She sent two blossoms from her favorite tree near Kawiwi hill. Lured by their beauty the supernatural beings tried all day to catch them. They flew just out of reach all the way up to Kaala. Only a hairless dog watched the whistle while they ran about after the blossoms. This was repeated several days and then one day, she sent her bird, Lulukuahiwi, to peck the eyes of the lone guard and to steal the whistle. While the others ran after the pretty blossoms, they heard a howl from the hill. They ran back, too late. The dog was blinded in one eye and the whistle was gone. The bird flew with it until he came near the boy’s house. There he changed into a man and walked into the house with the whistle. The boy blew on it. All the words in his heart, the words that his mouth could not utter, were heard plainly whenever he blew on the whistle. Thus he made himself understood by his relatives. [*Ke Aloha Aina*, 22 July 1911 in Sterling and Summers 1978:76]

3.1.4 The “Fierce” People of Mākaha

There is a large body of *moʻolelo* related to the fierceness of the old residents of Mākaha and neighboring lands, who are variously described in these oral-historical accounts as “robbers” and/or “cannibals.” One of the places closely linked with these legends is a cave known as Malolokai located near the seashore around the base of the ridge dividing Mākaha and Kea‘au.

Harry G. Poe, Sr., born in Mākua Valley in 1882, recounted in his diary that robbers threw their victims into a pit that went underground to the ocean (McGrath et al. 1973:11). He explains, “The reason is, they wants a man’s legs without no hair on to make [an] aku [tuna] fishhook. They believed in those days that the human leg is best, lucky hook for aku” (McGrath et al. 1973:11). Such an account supports the definition given by Mary Kawena Pukui et al. (1974:139) for “Mākaha” as “fierce” and especially the suggestion by Green (1980:5) that the translation refers to the “fierce or savage people” who once inhabited the valley.

John Papa ‘Ī‘ī relates the traditional *mo‘olelo* regarding the robbers of Mākaha:

> A place where robbers operated was located between Nahikilalo and Makaha. The robbers remained in a cave while their watchman kept a lookout from the top of the cliff. When he saw one or two travelers, he called, ‘Malolo kai e (Low tide!).’ When there was a large company; he called, ‘Nui kai e! (High tide!)’ Those who traveled alone or in pairs were robbed, but those who came in a large company went unmolested. [‘Ī‘ī 1959:97]

3.1.5 Malolokai

Malolokai is also the location of a talking stone. It was also known to be a place where robbers used to live. A newspaper article in *Ka Nupepa Kuokoa* discusses the plain of Kamanomano where the stone is located:

> Holo aku la makou i ke kula o Kamanomano, a ilaila olelo aku la au la Mr. D.K. Kahaulelio: ‘O ke kula ia o Kamanomano, a no keia wahi ka oleloio ana, oi na niho o ka la i Kumanomano.’ Kau mai la hoi o Makaha iluna me he ao opua la. Kaalo ae la makou ma ke alo o kahi pali kaulana o ‘Malolokai.’ Ike aku la au ia pohaku olelo e ku mai ana. [Sterling and Summers 1978:79]
>
> Translation:
>
> Moving on to the plain of Kamanomano, then Mr. D.K. Kahaulelio said, ‘Of the plain of Kamanomano, and for this place it is said, the sharp teeth of the sun at Kumanomano.’ As the sun rises above Makaha with the clouds. We pass by at the front of the famed cliff of ‘Malolokai.’ Then looking out toward the existing talking stone. [1 December 2015 by Aulii Mitchell]

In trying to understand the reference of the talking stone, Aulii Mitchell shared the following information about the *kumu pōhaku* (stone teacher) in his *‘ohana* (family).

> My grandmother Kathleen Puakalehua Cash and her daughter, my mother were the healers, dream tellers, *kumu hula* and *kumu pōhaku* in my family. Tūtū Lady and my mother were both sources of the stones within our family home and tended to them as if they were alive.
>
> I remember when I was a child how I would go along with them to visit someone’s home and before we got to the front door my Tūtū and Mama would

> discuss what they felt and then as they met the person at the door of the house Tūtū would ask, ‘What kind of stone is in your home?’
>
> I was taught that whenever a *pōhaku* speaks (*pōhaku ʻōlelo*) to you and you bring it to your home a relationship has started. The stone is to be left outside of the door of the house. The *pōhaku* is left outside for 3 to 5 days, no more. During this time you will dream and in the dream it will tell you what is the function of the stone or for whatever purpose it is to be used. If you do not dream of the stone, then it is to be taken back to where it came from. If the stone is brought in the home it must be cared for as one of your family. My Tūtū and Mama often talked to the stones and if it needed sea water or fresh water it was always tended to. They always told me that if one does not care for the stone in these ways, it will eat you. Stones teach us many things and in my family they were used to guard certain things, and for healing. [Personal communication with Aulii Mitchell, 1 December 2015]

Talking stones are recognized by certain Hawaiians, who are gifted at understanding a stone’s powers to heal or teach. Evidently, the one seen at Malolokai is not moveable and those who “talked to/with stones” went there to communicate with it.

3.2 *Wahi Pana*

In general, Hawaiian place names convey a wide variety of information about the relationships between people, landscapes, and other natural and cultural resources. Place names may also express cultural, historical and/or spiritual values and concepts important to Hawaiian world views. It is common for places and landscape features to have multiple names, some of which may only be known to certain *ʻohana* (families) or even certain individuals within *ʻohana*, and many of which have been lost, forgotten and/or kept secret through time. Place names may also convey *kaona* (hidden meanings) and/or *huna* (secret) information that may even have political or subversive undertones. This is especially true in Waiʻanae Moku (District), as described below, where alternative names for important cultural sites such as *heiau* (pre-Christian place of worship) are quite common.

In traditional times, when cultural information was exclusively preserved and perpetuated orally—rather than in writing—Hawaiians gave names to literally everything in their environment, including individual garden plots and *ʻauwai* (irrigation ditches), intangible phenomena such as meteorological and atmospheric effects (e.g., the famous Kaiaulu wind of Waiʻanae), *pōhaku* (rocks), *pūnāwai* (freshwater springs), and many others (cf. Handy and Handy 1972; Pukui et al. 1974; Pukui 1983; Sterling and Summers 1978).

There are different interpretations of Mākaha, which Pukui et al. (1974:139) translate as “fierce” in reference to the inhabitants of the land. Alexander (1902 in Sterling and Summers 1978:60) interprets Mākaha as “robbery,” in reference to a well-known story about so-called cannibal robbers who threatened travelers on the coastal trail through Waiʻanae Moku. Mākaha is commonly referred to in writings from the nineteenth and early twentieth century as the “valley of robbery.”

Some older families from Waiʻanae Moku believe these negative interpretations of the meaning of the place name Mākaha, and of the inhabitants of Mākaha as robbers (or cannibal robbers) waiting to ambush travelers along the coastal road, are pure propaganda intended to discredit the old Oʻahu natives for whom Waiʻanae was and remains a stronghold of residency and/or to rationalize their disenfranchisement (Monahan and Silva 2007).

In earlier historic times, there was a second stream channel (now a dry gully) traversing the northern side of the base of Kamaileʻunu Ridge. This stream may have been called ʻEku, which Clark (1977) interprets as "to root, as does a pig." A knowledgeable resident of the area in the early twentieth century, the well-known cultural "informant" Harry G. Poe, Sr., once wrote, "Eku Stream, now called Ke-aupuni Stream. At its mouth in the sea is Kau-puni. It [Ke-aupuni] runs from Kāne-wai Mountain to the shore of Honus [?]" (Poe n.d.:3). This stream drained into a swampy area on the Kamaile shore in Waiʻanae Ahupuaʻa, in the area now known as Mauna Lahilahi Beach Park. Mr. Poe's use of the name Kāne-wai ("water of the god Kāne" or "the god Kāne's water") for one of the peaks of the Waiʻanae Mountains is interesting. Also, Ke-aupuni is not defined in any place name source, however, one of its literal definitions would be something like "the government" or "the kingdom" (Pukui and Elbert 1986).

The mountain ridge known as Kamaile (literally "the *maile* vine") separates the valleys and *ahupuaʻa* of Mākaha and Waiʻanae. Kamaile is also the name of a large well-known (and still standing) *heiau* along this ridge and an old village at the base of the ridge centered around a famous *pūnāwai* (spring) (Figure 5). The ridge separating Mākaha from Waiʻanae is also sometimes known as Kamaileunu or Kamaileʻunu (literally "the striped *maile* vine"), with the highest point of the ridge called Puʻu Kamaile. There is some *kaona* associated with this place name. According to Pukui and Elbert (1986), one of the meanings of the word *unu* is "altar" or "*heiau*," and some old Waiʻanae families associate this particular ridge, *puʻu* (peak) and *heiau* with the Oʻahu and Waiʻanae warriors sacrificed by the victorious armies of King Kamehameha I in the early nineteenth century (Monahan and Silva 2007). Further inland and higher in elevation along this ridge, there are two other named *puʻu*: Puʻu Kēpaʻuala ("red gum hill"; Soehren 2009) and Puʻu Kawiwi, also known as "the fortress" because of the famous war stories associated with it. The northern, *mauka* point of Mākaha is at Mount Kaʻala, the highest peak on Oʻahu, which may be interpreted as "laughter" (Thrum 1922:635), "fragrance" (Sterling and Summers 1978:68), or possibly "the path" or "the way" (*ka* meaning "the," and *ala* meaning "way" or "path").

Kūmanomano ("stand in greatness," Kelsey n.d.:2), also known as Ke Kula o Kūmanomano, is an old name for the flat plain stretching inland from the Mākaha shoreline area to Kamaile.

According to Pukui et al. (1974), Kāneʻaki (also spelled Kāneʻakī in many other sources), the large restored *heiau*, translates as "hair-switch Kāne" (as in "the whip of Kāne").

The southern boundary of Mākaha Ahupuaʻa is dominated by the promontory called Mauna Lahilahi (literally "thin mountain") (Figure 6). The division between Mākaha and Waiʻanae Ahupuaʻa runs along the center of the promontory. Pukui (cited in Sterling and Summers 1978:77) says of the feature: "This hill is very thin [in profile] as though it had been sliced with a knife and so it was called Mauna Lahilahi."

Offshore from Mauna Lahilahi (on the Waiʻanae side) is a small islet today known as Shark Island. The island was known as the mother of the family, the reefs "following [the] shore line in scallops known as children" (Tutu Ana Kahawai, November 1954, Waianae, in Sterling and

Figure 5. Photo of Kamaile Heiau (center) (CSH 2015)

Figure 6. Eastern portion of Mauna Lahilahi (CSH 2015)

Summers 1978:77). Pukui (cited in Sterling and Summers 1978:77) indicates the name of the islet was Lau-kia-nui, meaning “large concentration.”

At the coast, the division between the *ahupuaʻa* of Mākaha and Keaʻau is at Ka Lae o Mākaha, or Mākaha Point. The area, noted for a rocky, raised reef good for pole fishermen, was also called “Takato” in the historic period, probably named for a resident or fisherman (Clark 1977:94). Another point located immediately south of Mākaha Point is known as Kepuhi Point (or Ka Lae o Kepuhi). The word *kepuhi* translates as “to blow,” and Kepuhi Point was probably named for the numerous “blow holes” found along the reef in this area (Clark 1977:93). Puʻu Kepuhi is known as a “Guard’s Peak” (Poe n.d.:1), which may refer to a legend of robbers in Mākaha who watched from the ridge for unwary travelers or to local *kaiʻa* (guardians or watchmen) of Waiʻanae who guarded against invaders from afar. The legendary cave known as Malolokai (“low tide”) purportedly used by robbers is located along the *makai* end of Kepuhi Ridge, although McAllister (1933:121) placed Malolokai Cave near Mākaha Point. Above the coastal trail that leads from Mākaha to Keaʻau are two *pōhaku*: Pōhaku o Kanaloa (“stone of the god Kanaloa”) on the Keaʻau side and Pōhaku o Kāne (“stone of the god Kāne”) on the Mākaha side (McAllister 1933:121–122; Site 174). According to Clark (1977:94), the stone on the Mākaha side is also called Pāpale o Kāne, the “hat of Kāne.” Regardless of its specific name, this prominent Kāne stone, in particular, is widely known in Waiʻanae and is still recognized and frequented by many.

East of Kepuhi Ridge, near the intersection of Lawaʻiʻa Street and Farrington Highway, is a *pōhaku* called Pōhaku o Kīkēkē (“clapping” or “knocking” rock). According to Clark (1977:94), if a person stands 4 or 5 feet (ft) away from the rock and claps his/her hands, it produces an echo of the sound. Many long-time residents of Waiʻanae believe there is a hollow area below the *pōhaku*, perhaps a lava tube, which creates the unusual sound. A long-time resident called the rock Pōhaku Paʻipaʻi (“clapping stone”), where “a person would hide under this stone and slap it to attract attention” (Poe n.d.:2).

McAllister (1933:121) described a large rock (Site 173) “once an object of worship” according to an 1839 visitor. He placed it east of Malolokai Cave, suggesting the *pōhaku* associated with the robbers and the “clapping rock” are different stones. Others seem to suggest the two stones are the same. A note in an 1899 Hawaiian language newspaper describes Malolokai as: “A famous hill at which there is a talking stone” (*Kuokoa*, 11 August 1988:4 in Sterling and Summers 1978:79).

South of Kepuhi Ridge is a beach once called Kahaloko (Poe n.d.:2) or “pond place” (Pukui and Elbert 1986). Clark (1977:92) says it was called Mākāhā (“sluice gate”). The inland pond was later filled in during construction of the Oʻahu Railway and Land Company (OR&L) railroad, but its outline and basic morphology are still visible today. There was once a small settlement near the beach, which can be seen as a coconut grove on a drawing by Bingham in 1826. ʻĪʻī (1959:98) mentioned the settlement as being adjacent to the coastal trail: “There were many houses at Makaha, where a fine circle of sand provided a landing place for fleets of fishing canoes.” South of the mouth of Waiʻele Stream, the beach was known as Pōmokupā, and the rocky area south of the beach was called Kumukū. Clark (1977:204) suggests Kumukū may translate as “school of red goatfish.” Today the entire coastal area from Kahaloko to Kumukū is known as Mākaha Beach, or Mākaha Surfing Beach, famous for surfing contests.

Laukīnui Beach extends south of Kumukū around a point known as Laukīnui, or “large *kī* leaf.” The *ti* (*Cordyline fruticosa*) leaf, *lau kī*, was worn around the neck, especially by *kahuna* (traditional priests or ritual specialists), as a charm against evil spirits. There was once a *heiau* called Laukīnui in this area (McAllister’s Site 174). The Holt family, who owned most of Mākaha in historic times, used this coastal area to pasture cows, and thus it was referred to by fisherman as Pipi, or “beef” (Clark 1977:91). Continuing south, the next beach was known as Papaoneone (“sandy shelf”). Modern names include Lahilahi Crescent, Turtle Beach, or Keawaiki Beach. At the southern end of the beach, adjacent to Mauna Lahilahi, is a small cove known as Keawaiki (“the little bay”). Poe (n.d.:6) said that Keawaiki Beach was a net-fishing place (*kuʻuna*) where *honu* (green sea turtles), *kala* (surgeonfish, unicornfish), *ʻenenue* (pilotfish), *pualu* (surgeonfish), and *uhu* (parrotfish) were caught.

Along the ridge separating Mākaha from Keaʻau Ahupuaʻa, there are three named *puʻu*: Puʻu o Papano (“dark hill”), Puʻu o Kahononahu, and Puʻu Keaʻau.

The names of several *ʻili* (subdivisions of *ahupuaʻa*) in Mākaha are known from Land Commission documents. Soehren (2009) suggests meanings for several of these based on translations in Pukui and Elbert (1986). The *ʻili* are Ahakea, Kahihi, Kahueiki (“the small gourd”), Kapuaʻa (“the pig”), Kekio, Laukīnui (“large ti leaf”), Laulauwaʻe (“lauaʻe fern frond”), Maka (which has many possible meanings including “source,” and / or “sight or vision”) and Waikani (“sounding water”).

3.3 *ʻŌlelo Noʻeau*

Mary Kawena Pukui is known to many as a scholar and ethnologist, and one of the greatest contributors to preservation of the Hawaiian language. The following section draws from Pukui’s knowledge of Hawaiian folk tales and proverbs.

3.3.1 *ʻŌlelo Noʻeau* #691

The following *ʻōlelo noʻeau* (proverb) describes the famed mud hen who taught the demi-god Māui the secret of fire.

> *He keʻu na ka ʻalae a Hina*
>
> A croaking by Hina’s mudhen.
>
> A warning of trouble. The cry of a mudhen at night is a warning of distress.
>
> [Pukui 1983:77]

3.3.2 *ʻŌlelo Noʻeau* #2830

The following *ʻōlelo noʻeau* describes the cause and effect from the demi-god Māui looking for the secret of fire; the secret of fire was only known to the mudhen who guarded the knowledge from Māui.

> *Ua moʻa ka maiʻa, he keiki māmā ka Hina.*
>
> The bananas are cooked, [and remember that] Hina has a swift son.
>
> Let’s finish this before we are caught. This saying comes from the legend of Māui and the mudhens, for a long time he tried to catch them in order to learn the secret

of making fire. One day he overheard one of them saying these words. He caught them before they could hide and forced them to yield the secret of fire.

[Pukui 1983:310]

3.3.3 *‘Ōlelo No‘eau* # 2495

The following *‘ōlelo no‘eau* describes the particular leeward winds that blow across the channel from Kaua‘i.

Ola Wai‘anae i ka makani Kaiaulu.

Wai‘anae is made comfortable by the Kaiaulu breeze.

Chanted by Hi‘iaka at Ka‘ena, O‘ahu, after her return from Kaua‘i.

[Pukui 1986:273]

3.3.4 *‘Ōlelo No‘eau* #2112

The following proverb talks about one who has lost their way:

Mākole iho hewa I Mākua.

Red-eyed one goes to Mākua by mistake.

Applied to one who has gone off his course. Once, a red-eyed person left Mokule‘ia, O‘ahu, intending to go to Makaha, but went by way of Kawaihāpai and arrived at Mākua instead. [Pukui 1983:230]

3.4 *Oli*

A variation of the *mo‘olelo* of Hi‘iaka-i-ka-poli-o-Pele by Emerson places Hi‘iaka, Lohi‘au, and Wahine‘ōmao in a canoe en route to Mokulē‘ia. The party of three land in Mokulē‘ia where Hi‘iaka parts ways and tells Lohi‘au and Wahine‘ōmao that she will call for them at a designated place at a later time. Hi‘iaka pays her respects to her *kūpuna*, Pōhaku-o-Kaua‘i, then to Ka‘ena (Emerson 1915:156–157). Passing through Ka‘ena, the western cape of O‘ahu, she turns and passes through the slopes of the Wai‘anae Mountain Range and chants the following:

Kunihi Kaena, holo i ka malie;

Wela i ka La kea lo o ka pali;

Auamo ma ii ka La o Kilauea;

Ikiiki i ka La na Ke-awa-ula,

Ola i ka makani Kai-a-ulu Koholā-lele—

He makani ia no lalo.

Haōa ka La in a Makua;

Lili ka La i Ohiki-lolo;

Ha‘a-hula le‘a ke La i ka kula,

Ka ha‘a ana o ka La i Makāha;

Oī ka niho o ka La i Ku-manomano;

Ola Ka-maile i ka hunā na niho;

Moʻa wela ke kula o Waliō;

Ola Kua-iwa i ka malama po;

Ola Waianae i ka makani Kai-a-ulu, (a)

Ke hoā aku la i ka lau o ka niu.

Uwē o Kane-pu-niu (b) i ka wela o ka La;

Alaila kuʻu ka luhi ka maloʻeloʻe,

Auaua aku i ka wai i Lua-lua-lei.

Aheahe Kona, (c) Aheahe Koolau-wahine, (d)

Ahe no i ka lau o ka ilima.

Wela, wela i ka La ka pili i ka umauma,

I Puʻu-liʻiliʻi, i Kalawalawa, i Pahe-lona,

A ka piʻina i Wai-ko-ne-nē-he;

Hoʻomaha aku i Ka-moa-ula;

A ka luna i Poha-kea

Ku au, nana i kai o Hilo:

Ke hoʻomoe aʻe la i ke kehau

O aʻu hale lehua i kai o Puna,

O aʻu hale lehua i kai o Ku-kiʻi.

(a) *Kai-a-ulu*, a sea-breeze that comforted Waianae.

(b) *Kane-pu-niu*, a form of god Kane, now an uncarved bowlder [boulder]; here used in a tropical sense to mean the head. The Hawaiians, impelled by the same vein of humor as ourselves, often spoke of the human head as a coconut (pu-niu).

(c) *Kona*, here used as a local name for the sea-breeze.

(d) *Koolau-wahine*, a wind, stronger, but from the same direction as the Kona.

Translation:

Kaena’s profile fleets through the calm,

With flanks ablaze in the sunlight—

A furnace-heat like Kilauea;

Ke-awa-ula swelters in heat;

Koholā-lele revives in the breeze,
That breath from the seam, Kai-a-ulu.
Fierce glows the sun of Makua;
How it quivers at Ohiki-lele—
‘Tis the Sun-god’s dance o’er the plain,
A riot of dance at Makaha.
The sun-tooth is sharp at Kumano;
Life comes again to Maile ridge.
When the Sun-god ensheaths his fang.
The plain Wailiō is sunburned and scorched:
Kua-iwa revives with the nightfall;
Waianae is consoled by the breeze
Kai-a-ulu and waves its coco fronds;
Kane-pu-niu’s fearful of sunstroke; (e)
A truce, now, to toil and fatigue:
We plunge in the Lua-lei water
And feel the kind breeze of Kona,
The cooling breath of the goddess.
As it stirs the leaves of ilima.
The radiant heat scorches the breast
While I sidle and slip and climb
Up one steep hill then another:
Thus gain I at last Moa-ula.
The summit of Poha-kea.
There stand I and gaze oversea
To Hilo, where lie my dewy-cool
Forest preserves of lehua
That reach to the sea in Puna—
My lehus that enroof Kuki‘i.

(e) The author begs to remark that sunstroke is unknown in all Hawaii.

[Emerson 1915:157–158]

Section 4 Traditional and Historical Accounts of Mākaha

4.1 Early Historic Period

Waiʻanae has been portrayed in many historical accounts as a land of dual purpose: a refuge for the dispossessed (including many of the old Oʻahu natives who were driven away from their lands elsewhere by invaders from Maui and Hawaiʻi islands) and a hideout for the rebellious and outlawed. Certain landmarks in Waiʻanae attest to this dichotomy. For example, *kāhuna* (priest) dedicated Kawiwi, a mountain between Wai'anae and Mākaha Ahupuaʻa, as a refuge during times of war (McAllister 1933). Pōkaʻī Bay was used as a school administered by exiled *kāhuna* who took refuge in Waiʻanae after Kamehameha I gained control of Oʻahu (Sterling and Summers 1978:68). It was also near Pōkaʻī Bay, at a place named Puʻu Kāhea, that the eighteenth-century prophet and *kahuna nui* (supreme high priest) of Oʻahu, Kaʻopulupulu, made his last famous prophecy before he was killed in Poʻolua (Sterling and Summers 1978:71).

4.1.1 Foreign Accounts

In 1793, Captain George Vancouver (1798:217), the first explorer to document in writing his observations about the leeward side of the island, described the Waiʻanae coast as "composed of one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants." He also, however, described a village located south of Mauna Lahilahi, situated in a grove of coconuts (Vancouver 1798:219). The village is Kamaile, which Green likens to a miniature *ahupuaʻa* "with the beach and fishery in front and the well-watered taro lands just behind" (Green 1980:8). Its freshwater spring gave life to this land and allowed for the existence of one of the largest populations on the Waiʻanae coast.

The *ʻōkuʻu* (to squat on the haunches) epidemic of 1804 (thought to be cholera) had a major effect on the native population, not only in Waiʻanae, but throughout Hawaiʻi. John Papa ʻĪʻī (1959:16) relates that the *ʻōkuʻu* "broke out, decimating the armies of Kamehameha [I, on Oʻahu]." Other diseases also took their toll. Although census numbers from historic times are probably underestimates to some extent, given the vagaries of counting methods used at that time, the combined population of the Waiʻanae and ʻEwa Districts in 1831–1832 was determined to be 5,883 (Schmitt 1977:12). Twenty years later, the combined census for the two districts was only 2,451.

Levi Chamberlain, a member of the first party of missionaries to the Hawaiian Islands, probably traveled along this coastal trail on a tour of Oʻahu in 1826. Chamberlain traveled clockwise around the island, stopping wherever the population was large enough to support a school for teaching reading, writing, and religious instruction. He examined two schools in Waiʻanae, indicating a large population for that *ahupuaʻa*, and next traveled to Mākaha, where he stopped to give a sermon:

> We travelled till about 5 o'ck when we arrived at Makaha the land of Kanepaiti [Kanepaiki] the Chief of Pearl River. Shortly after our arrival the people assembled to hear the word of God . . . The people to the number of 50 or 60 listened with breathless attention to what was said. [Chamberlain 1956a:8]

In 1828, Chamberlain made a second tour of O‘ahu, this time travelling counterclockwise along the coast. His party reached the settlement of Mākaha at sunset and spent the night.

> Having given out word last night that I would inspect the school in the morning, after attending prayers & eating breakfast, I took a walk along the sea shore to view the rocks & search for curious shells, I thus passed the time away till nine o-clock, and began to be impatient, when the scholars were discovered going down the valley walking in procession. They proceeded to a small enclosure near the beach partly shaded by a few cocoanut trees, under which they sat down; and thither I repaired to attend to the examination . . . [Chamberlain 1956b:38]

Chamberlain was somewhat disappointed in the number of scholars in the Wai‘anae District. In the most populous *ahupua‘a*, Wai‘anae, he found only 16 scholars. Boki, and later his wife Liliha, who were in charge of the Wai‘anae District were hostile to the missionaries, and thus this probably explains the low number of students receiving language and religious instruction (Bishop 1916:43).

A visitor to the Wai‘anae District in 1839, described it as follows:

> . . . [having] about 1,600 inhabitants . . . less advanced in improvement than the inhabitants of any other portions of the island . . . rocky and barren; still, the arable land is not all cultivated . . . shallow basins in its [white rock] surface are used by the natives as vats for the solar evaporation of sea water. [Hall 1839:100–101]

Starting around 1810 and lasting only two or three decades, the sandalwood trade, introduced by foreign traders traveling between the Northwestern United States and China, greatly impacted Hawaiian culture and traditional lifestyles. In an effort to acquire western goods, ships, guns, and ammunition, the *ali‘i* (chiefly class) incurred massive debts to the American merchants (‘Ī‘ī 1959:155). These debts were paid off in shiploads of sandalwood harvested by *maka‘āinana* (commoners) for the *ali‘i*. When Kamehameha I found out how valuable the sandalwood trees were, he ordered people not to let the felled trees crush the young saplings, to ensure their protection for future trade (Kamakau 1992:209–210).

4.1.2 Mākaha Ahupua‘a

Early accounts specific to Mākaha describe a good-sized inland settlement and a smaller coastal settlement. In his summary volume of the Makaha Valley Historical project, Green (1980:20-21) describes Mākaha’s coastal settlement as “restricted to a hamlet in a small grove of coconut trees on the Kea‘au side of the valley, some other scattered houses, a few coconut trees along the beach, and a brackish water pool that served as a fish pond, at the mouth of the Mākaha Stream.” The fishpond was known in early historic times as Kahaloko or Mākāhā. Laukīnui Heiau was located near the coastal settlement, and was described by McAllister (1933:121) as “so old as to be accredited to the menehunes.”

As described above, the primary early historic settlement in Mākaha was situated inland, associated with irrigated taro fields along Mākaha Stream. Associated with the inland settlement was the principal *heiau* of Mākaha, Kāne‘aki. The perennial Mākaha Stream supported wetland agriculture pursuits such as taro in the pre-Contact and early historic periods, and later, with the aid of an extensive system of flumes, artesian wells, and resevoirs, commercial sugarcane. Modest rainfall in the inland areas of Mākaha Valley also supported seasonal dryland cultivation of non-irrigated cultivars such as sweet potatoes.

One well-known chief during the early historic period was Boki. Boki was governor of Oʻahu under Kamehameha I, and was also nephew to Kamehameha's favorite wife Kaʻahumanu. Boki had a residence in Waiʻanae Village and appointed the chiefs Aua and Kanepaiki to oversee the Waiʻanae and ʻEwa Districts, respectively. Control of Waiʻanae was later given to Kanepaiki as well (Bingham 1847:296; Chamberlain 1956b:38).

The first Catholic missionaries arrived in the Hawaiian Islands in 1825. They found a ready patron in Boki, who had been baptized in 1819 by a French Catholic priest on the French ship *Uranie* under Captain Freycinet. The *aliʻi*, who were generally aligned with the Protestant missionaries (who arrived in the islands several years earlier than the Catholics), sought to stop the conversion of Native Hawaiians to Catholicism. They persecuted the converts and priests in Honolulu, and as a result, many of these new Catholics fled to isolated areas of the island. Originally, Boki supported the Protestant missionaries and agreed with the breaking of *kapu* (taboo). However, out of growing resentment of the power of Kaʻahumanu and her missionary advisors, Boki soon after ceased to support the Protestants.

Among other business ventures, Boki also tried his hand at the sandalwood trade. In 1829, he heard of a South Pacific island covered with sandalwood:

> Boki fitted out two ships, the *Kamehameha* and the *Becket*, put on board some five hundred of his followers, and sailed south. Somewhere in the Fiji group the ships separated. Eight months later the *Becket* limped back to Honolulu with only twenty survivors aboard . . . Boki and two hundred and fifty of his men apparently died at sea when the *Kamehameha* burned in 1830, possibly when gunpowder stored in the hold blew up as a result of careless smoking. [Day 1984:14]

Some historians believe Boki, in his South Pacific adventure, may have also been trying to establish a separate kingdom (Sahlins 1992). That same year, supporters of Boki and his wife Liliha, along with traders and sea captains, attempted to overthrow Kaʻahumanu. This attempt was known as the Pahikaua War and was supported by quite a few people of the Waiʻanae District, but ended when Ulumaheihei talked his daughter Liliha into ending the war.

The Waiʻanae District was a favored area for displaced Catholics, since Boki's widow Liliha was sympathetic to the Catholic converts (Schoofs 1978:3). In 1839, the Waiʻanae Catholics built a chapel in the mid-valley area of Mākaha in the native style, and by the 1840s or 1850s, it was replaced with a stone chapel. In 1881, the chapel was rebuilt and dedicated to St. Philomena. The construction was funded by the Holts, a Catholic family who controlled most of Mākaha Valley, and who lived near the church. After about 1896, few records mention the Mākaha Catholic church, and it is not shown on any twentieth century maps. The Mākaha church probably never had a very large congregation, and in the twentieth century worship seems to have shifted to the Sacred Heart Catholic Church in Waiʻanae Ahupuaʻa (Schoofs 1978:113–115).

After Boki's death, Liliha gave the entire *ahupuaʻa* of Mākaha to Kuhoʻoheihei (Abner) Pākī, father of Bernice Pauahi (Green 1980:14–15). Soon after Pākī was Christianized, and by the time

Liliha died in 1839, the majority of people in Mākaha had accepted Christianity. Although several individuals are recorded as having charge over Mākaha at various times, including Aua, Kanepaiki "chief of the Pearl River," and the present "King," Pākī claimed the entire *ahupua‘a* of Mākaha.

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—which introduced private property into Hawaiian society. In 1848, the crown and the *ali‘i* received their land titles. Kuleana awards for individual parcels within the *ahupua‘a* were subsequently granted in 1850. Mākaha Ahupua‘a had 13 claims of which seven were awarded (Waihona ‘Aina 2000). Note that not all the Land Commission Awards (LCA) shown in the Figure 7 are listed in 1850 to 1900

By ancient custom, the sea for a mile off the shores belonged to the *ahupua‘a* as part of its resources. The ruling chief could prohibit the taking of a certain fish or he could prohibit all fishing at specific times. Pākī filed two such prohibitions, one in 1852 for the taking of *he‘e* or octopus (*Polypus* sp.) and the other in 1854 for the taking of *‘ōpelu* (mackerel scad; *Decaqpterus pinnulatus*) (Barrère in Green 1980:7).

In 1855, Chief Pākī died and the administrators of his estate sold his Mākaha lands to James Robinson and Company. Later, in 1862, one of the partners, Owen Jones Holt, bought out the shares of the others (Ladd and Yen 1972). The Holt family dominated the economic, land use, Table 1. Six of the seven Mākaha LCA parcels were located inland attesting to the importance of the inland settlement (see Figure 7). The seventh Mākaha LCA claims a *muliwai* (river, river mouth) as its western boundary. The reference to it as a boundary suggests this LCA was probably situated near the coast. Two unawarded claims also mention the *muliwai* as their boundary. Based on this information, it is possible these claims were for Mākaha lands in the vicinity of the current project area. Appendix A contains translated versions of the Native and Foreign Registers of LCAs.

Land use information for the Mākaha LCA parcels is sparse. *Lo‘i* (terraced field) lands and *kula* (plain) lands were an important part of sustenance for dryland agriculture.

Kuho‘oheihei (Abner) Pākī, father of Bernice Pauahi, was given the entire *ahupua‘a* of Mākaha by Liliha after her husband Boki disappeared in 1829 (Green 1980). Although several individuals are recorded as having charge over Mākaha including Aua, Kanepaiki "chief of the Pearl River," and the present "King," A. Pākī felt entitled to the entire *ahupua‘a* of Mākaha. It is uncertain how much of his claim was granted. Whatever the case, it is suggested Paki was able to wield a certain amount of control over the residents of Mākaha during the Māhele resulting in the limited number of LCA applications. The number of taxpaying adult males in 1855 numbered 39, suggesting there were more families living and working the Mākaha lands (Barrère 1970:7) than was reflected in Māhele awards. Based on the Māhele documents, Mākaha's primary settlement was inland where waters from Mākaha Stream could support *lo‘i* and *kula* cultivars. Although there is evidence for settlement along the shore, for the most part this was limited to scattered, isolated residents. The only "cluster" of habitation structures was concentrated near Mākaha Beach, near the Kea‘au side of Mākaha where there is also reference to a fishpond.

Table 1. List of LCAs in Mākaha Ahupua‘a

LCA Number	**Claimant**	***‘Ili***	**Land Use**
877	Kaana	Kapuaa	*Mo‘o ‘āina* (narrow strip of land, smaller than an *‘ili*), 1.587 acres, *kahawai* (stream), bounded on all sides by Alapai
9689	Nahina	Kekio	16 *lo‘i*, in Laulauwaa/Laulauwae (*mo‘o ‘āina*), *kahawai*, 0.957 acres
9862	Kanehaku	Kekio, Mooiki	Five *lo‘i*, one *kula*, 2.402 acres
9863	Kala	Waikani	Land and house site, stream
9864	Kapea	Laukinui	19 *lo‘i*, one *kula*, 1.217 acres
10613	Paki, Abner	Makaha	Ahupua‘a, Laulauwae Makaha Waianae (‘Āpana [lot] 5); two parts
10923	Uniu	Information not available	One *‘āpana* (parcel).; 0.522 acres; Makaha, Waianae; one *‘āpana*.; 0.576 acres
10923B	Alapai		*Mo‘o ‘āina* 0.576 acres, *kahawai*

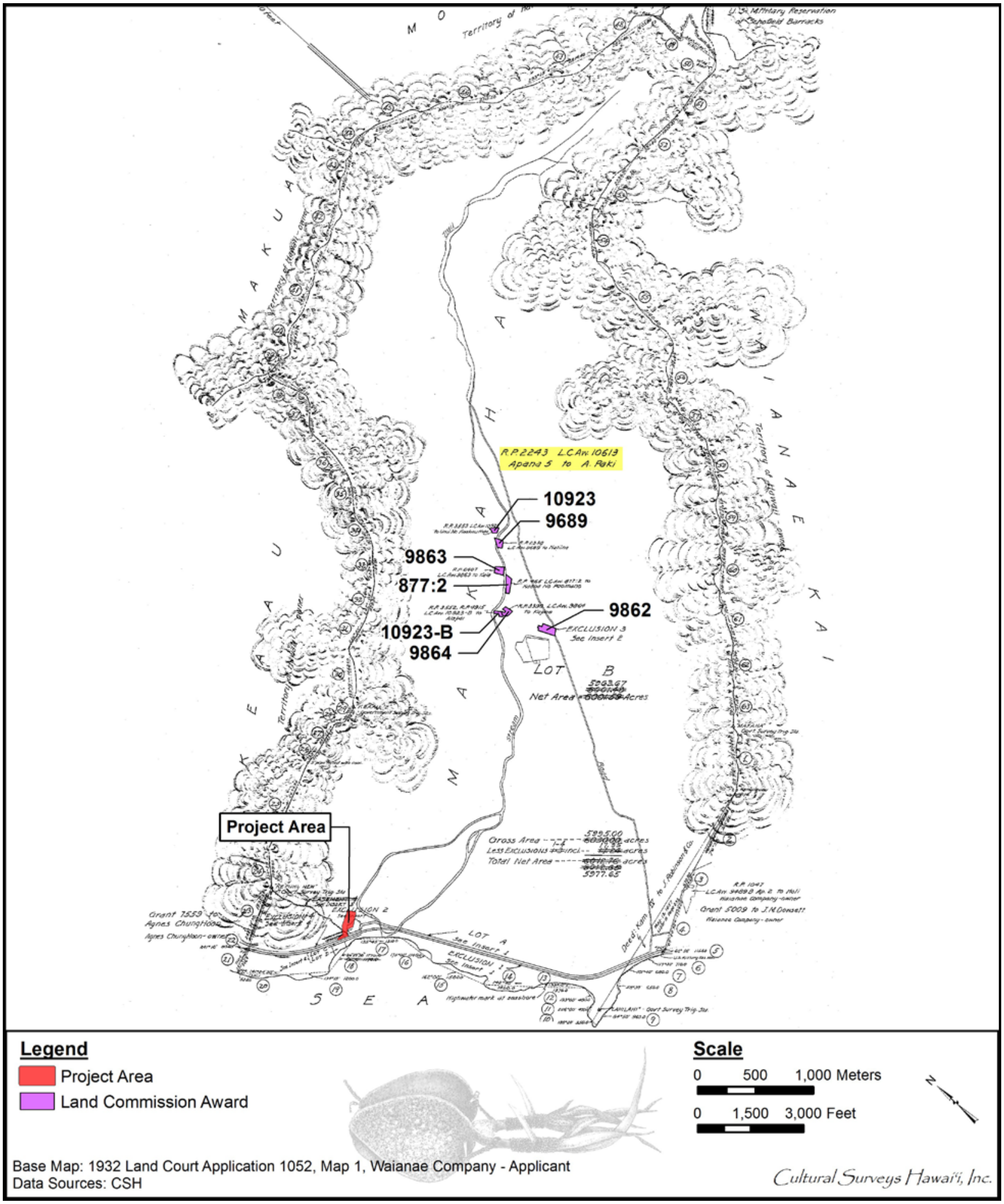

Figure 7. 1932 Land Court Application 1052 with LCAs found within Mākaha Valley; note there are no LCAs in the vicinity of the project area

4.2.1 1850 to 1900

By ancient custom, the sea for a mile off the shores belonged to the *ahupuaʻa* as part of its resources. The ruling chief could prohibit the taking of a certain fish or he could prohibit all fishing at specific times. Pākī filed two such prohibitions, one in 1852 for the taking of *heʻe* or octopus (*Polypus* sp.) and the other in 1854 for the taking of *ʻōpelu* (mackerel scad; *Decaqpterus pinnulatus*) (Barrère in Green 1980:7).

In 1855, Chief Pākī died and the administrators of his estate sold his Mākaha lands to James Robinson and Company. Later, in 1862, one of the partners, Owen Jones Holt, bought out the shares of the others (Ladd and Yen 1972). The Holt family dominated the economic, land use, and social scene in Mākaha from this time until the end of the nineteenth century. During the height of the Holt family dynasty, from about 1887 to 1899, the Holt Ranch raised horses, cattle, pigs, goats and peacocks (Ladd and Yen 1972:4). Makaha Coffee Company also made its way into the valley, buying up land for coffee cultivation, although they never became a prosperous industry. Upon Holt's death in 1862, the lands went into trust for his children.

4.2.2 Alterations to the Waiʻanae Coastline (1880 to 1930)

Prior to the 1880s, the Waiʻanae coastline may not have undergone much alteration. The old coastal trail probably followed the natural contours of the local topography. With the introduction of horses, cattle, and wagons in the nineteenth century, many of the coastal trails were widened and graded to accommodate these new introductions. However, the changes probably consisted of superficial alterations to the existing trails and did not entail major realignments. Kuykendall (1953) describes mid-nineteenth century road work:

> Road making as practiced in Hawaiʻi in the middle of the nineteenth century was a very superficial operation, in most places consisting of little more than clearing a right of way, doing a little rough grading, and supplying bridges of a sort where they could not be dispensed with. [Kuykendall 1953:26]

The first real alteration to the Waiʻanae coastline probably came with the growth of the Waianae Sugar Company. The company cultivated cane in three valleys—Mākaha, Waiʻanae, and Lualualei—and to more easily transport their cane to the dock and to the mill at Waiʻanae Kai, a railroad was constructed in 1880 (Figure 8 and Figure 9). The construction of the railroad had an impact on the natural features in the area such as the sand dunes as well as the human-made features, particularly the fishponds and salt ponds maintained in the coastal zone. Additional alteration to the Waiʻanae coastline occurred in the late nineteenth century with the extension of Dillingham's Oahu Railway and Land Company (OR&L) rail line into the Leeward Coast. One reporter writes a glowing story of the railroad trip to Waiʻanae at its opening on 4 July 1895:

> For nine miles the road runs within a stone's throw of the ocean and under the shadow of the Waiʻanae Range. With the surf breaking now on the sand beach and now dashing high on the rocks on one side, and with the sharp craigs and the mountains interspersed with valleys on the other, patrons of the road are treated to some of the most magnificent scenery the country affords. [McGrath et al. 1973:56]
>
> This report suggests the railroad hugged the ocean during a good portion of the trip. The railway's grade requirements demanded considerable alterations to

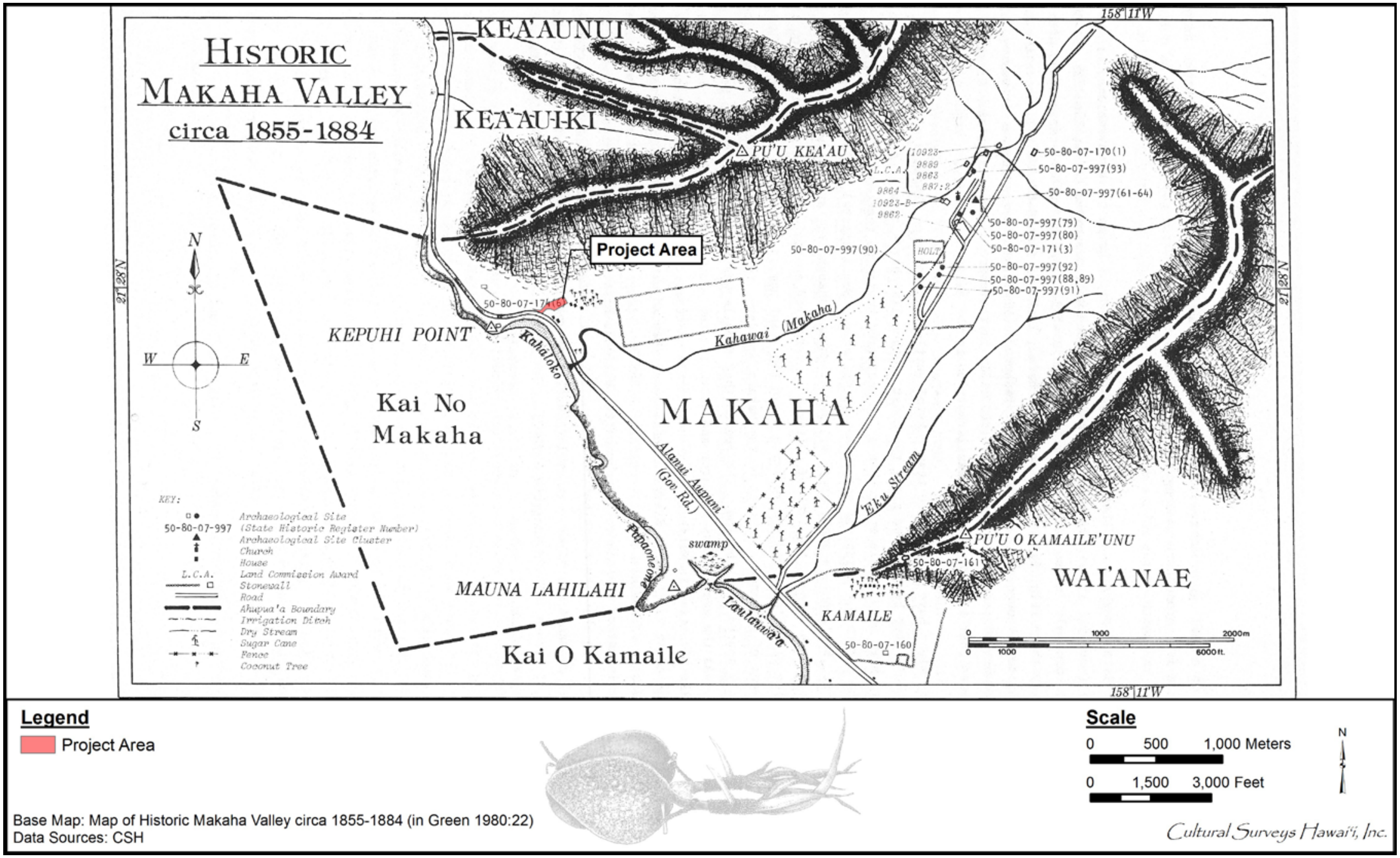

Figure 8. Map of Mākaha Valley from 1855 to 1884 (from Green 1980:22) with project area highlighted in red

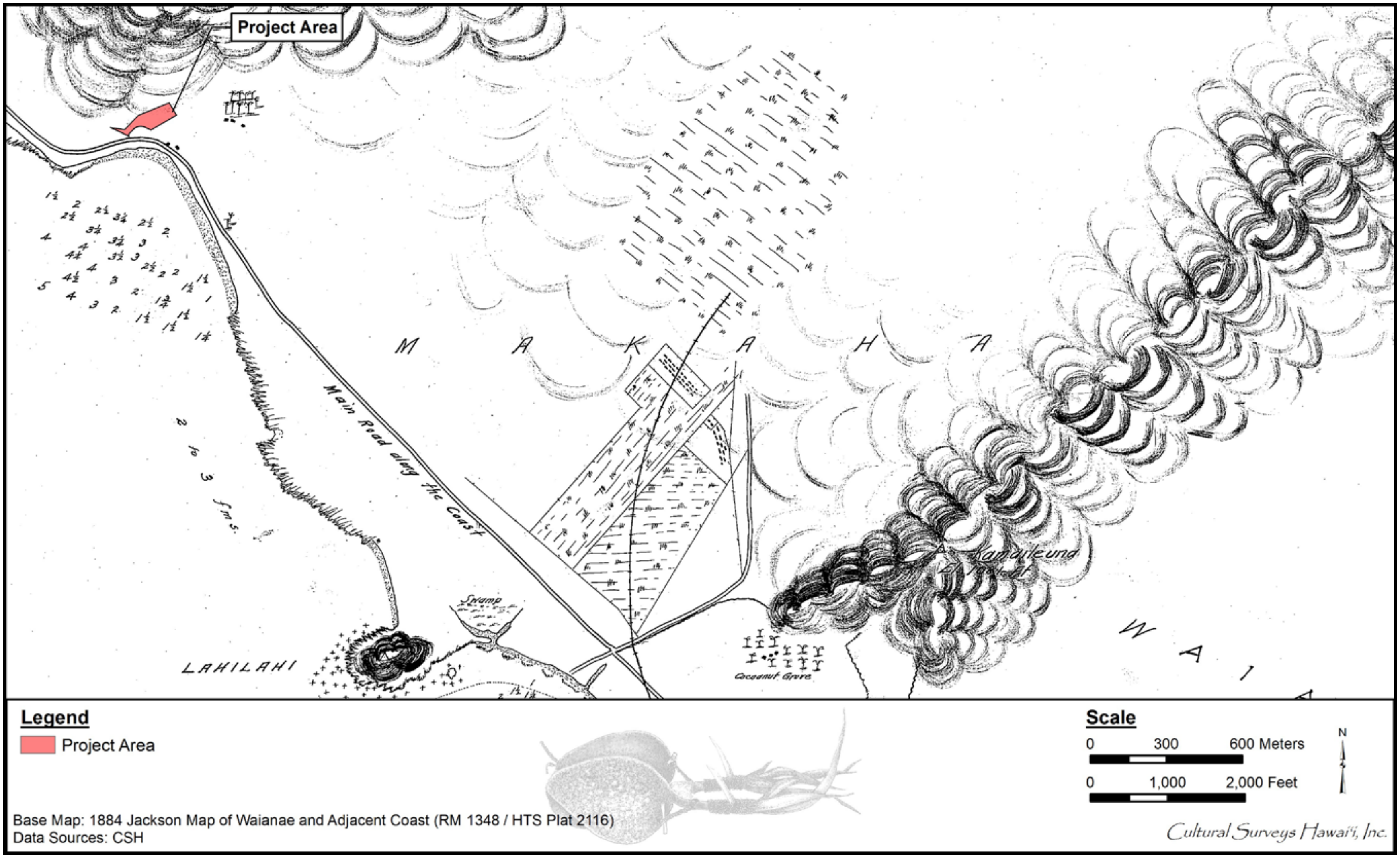

Figure 9. 1884 Jackson map of Waianae and the adjacent coast with project area in red

> natural landscapes in order to make them feasible for transport, including curve and slope reduction. An 1884 map illustrates the alignment of the old Government Road, which was likely a modified version of the original coastal trail. After the Belt Road was completed, further roadwork was carried out in the 1930s on what was called the ʻWaiʻanae Road,ʼ later named Farrington Highway. Kili Drive was built ca. 1970s to provide additional access into Mākaha Valley. The additional access was necessary due to the increased population related to residential, golf supplying bridges of a sort where they could not be dispensed with. [Kuykendall 1953:26]

4.2.3 1900 to Present

The Holt Ranch began selling off its land in the early 1900s (Ladd and Yen 1972). In 1907, the Waianae Sugar Company moved into Mākaha and by 1923, virtually all of lower Mākaha Valley was under sugarcane cultivation. The plantation utilized large tracks of Lualualei, Waiʻanae, and Mākaha valleys. The manager's report for 1900 described the plantation as having some 400 acres of new land cleared, fenced, and planted, 2 miles of railroad, and nearly 3 miles of flumes laid to said lands (Condé and Best 1973:357). For a half century, Mākaha was predominantly sugarcane fields but by 1946, the manager's report announced plans to liquidate the property because of the additional increase in wage rates, making the operations no longer profitable (Condé and Best 1973:358).

The lack of water resources played a role in Waianae Sugar Company's low profitability. In the 1930s, Waianae Plantation sold out to American Factors Ltd. (Amfac, Inc.). American Factors initiated a geologic study of the ground water in the mountain ridges in the back of Mākaha and Waiʻanae valleys. The study indicated that tunneling for water would be successful, but before tunneling could commence, World War II came about and plans were put on hold (Green 1980). In 1945, American Factors contracted the firm of James W. Glover, Ltd. to tunnel into a ridge in the back of Mākaha Valley. The completed tunnel (i.e., Glover Tunnel) was 4,200 ft long and upon completion had a daily water capacity of 700,000 gallons. The water made available was mainly used for the irrigation of sugar. In 1946, Waianae Plantation announced in the *Honolulu Advertiser* (18 October 1946) that it planned to liquidate its nearly 10,000 acres of land. The day before, news of the impending sale was circulated among the investors at the Honolulu Stock Exchange. Chinn Ho managed to broker the deal the following day by 2 p.m, when the Waianae Plantation sold the Mākaha lands to the Capital Investment Corporation, which stills maintains ownership of much of Mākaha Valley. There was an attempt to convert the sugar lands back to ranching but the perennial problem of water continued.

Parts of the property were sold off as beach lots, shopping centers, and house lots. Many of the former plantation workers bought house lots. Chinn Ho also put his personal investment into Mākaha and initiated resort development including a luxury hotel and in 1969, the Mākaha Valley Golf Club, an 18-hole course with tennis courts, restaurant and other golf facilities was opened for local and tourist use (McGrath et al. 1973:146–163). Numerous other small-scale agricultural interests were pursued during this time period including coffee, rice, and watermelons (Ladd and Yen 1972). Water from Glover Tunnel was now used to water Mākaha Valley farms, the lush grounds of the Mākaha Inn and Country Club, and its associated golf course.

Figure 10 through Figure 16 illustrate the changes Mākaha Ahupua‘a has experienced in the last century.

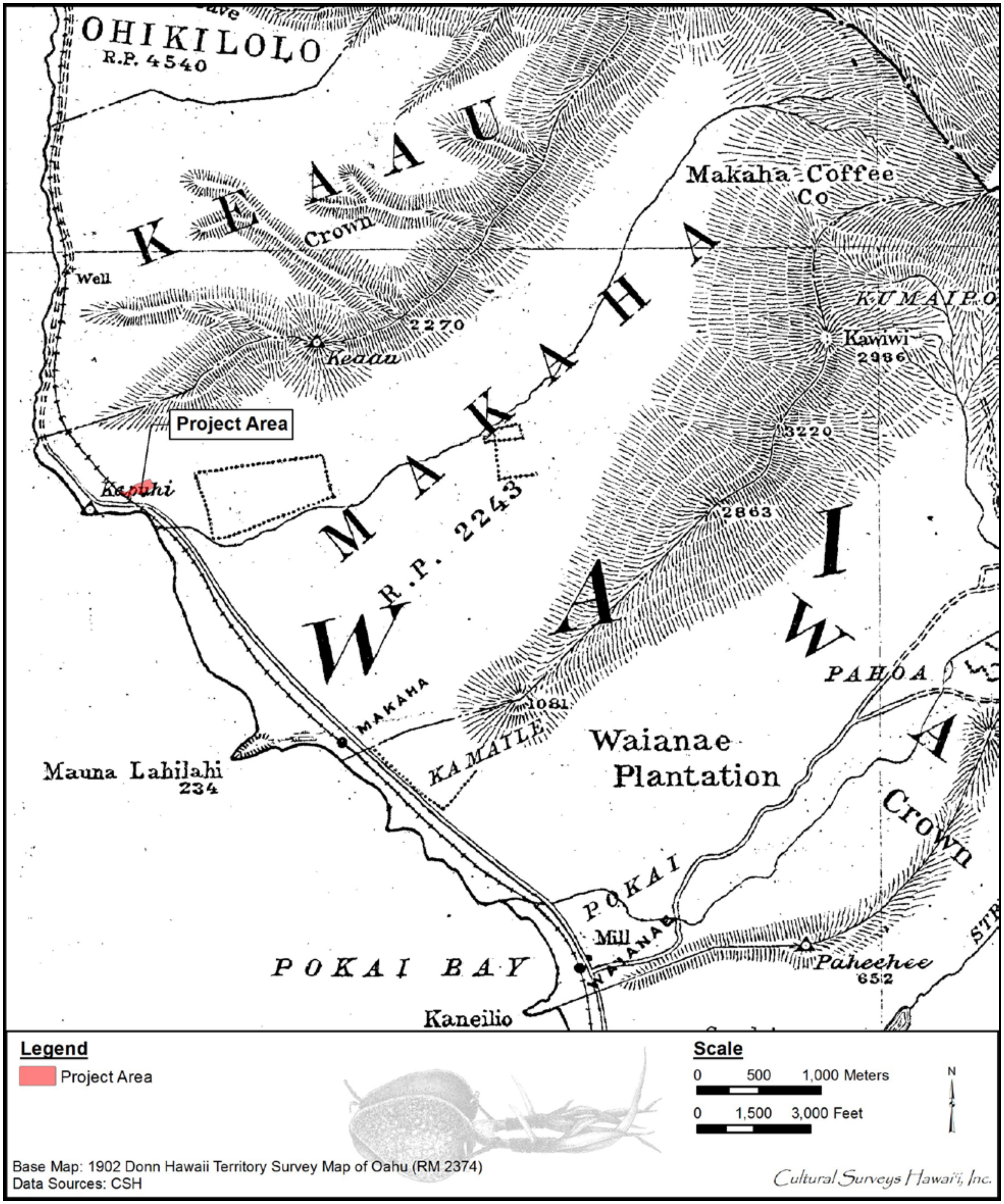

Figure 10. 1902 Donn Hawaii Territory Survey map of O‘ahu with project area; note the railroad tracks that border the western portion of the current project area

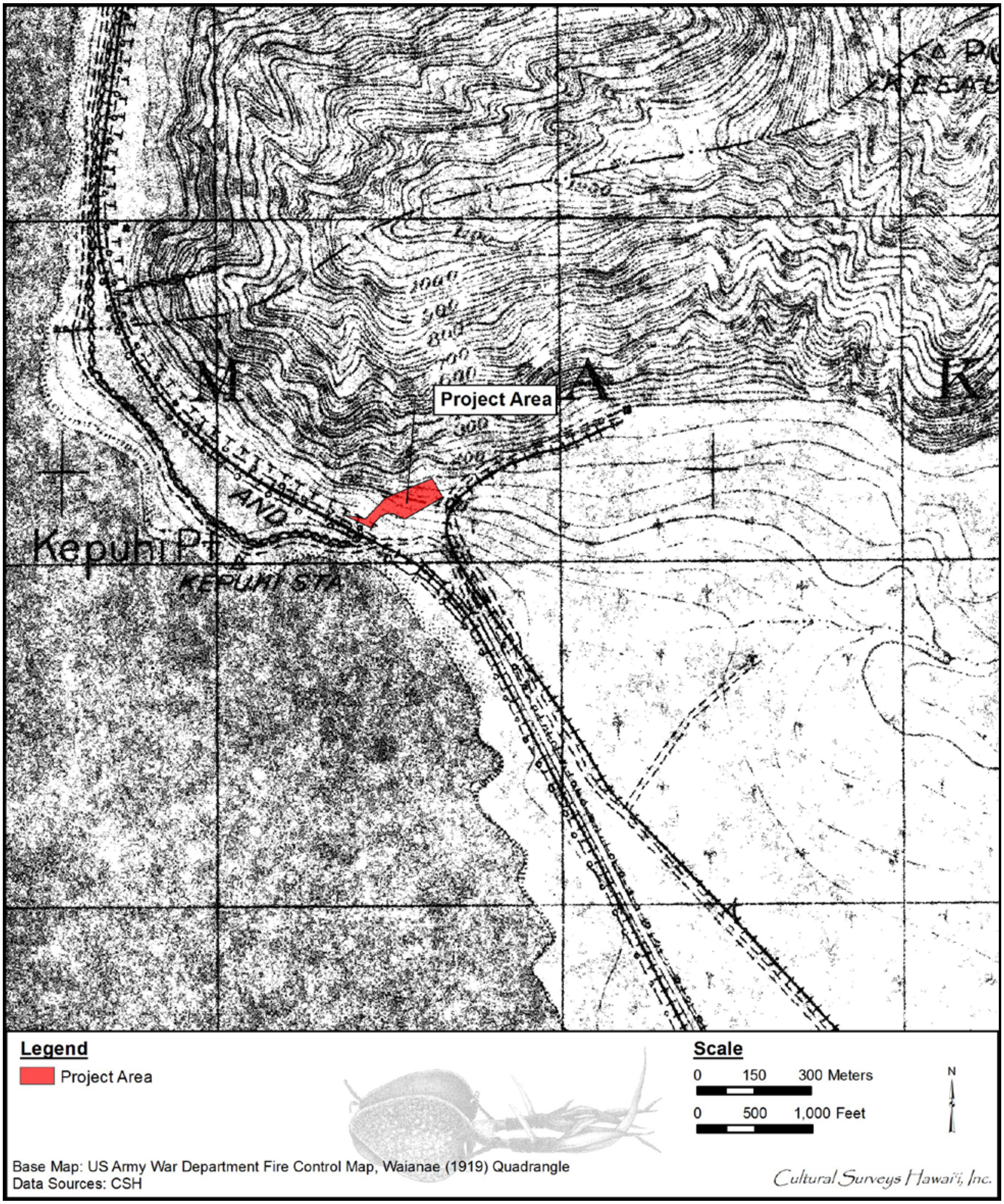

Figure 11. 1919 U.S. Army War Department Fire Control map, Waianae Quadrangle, with project area; note the rail system borders the western portion of the current project area and a section traverses northeast of the project area as well

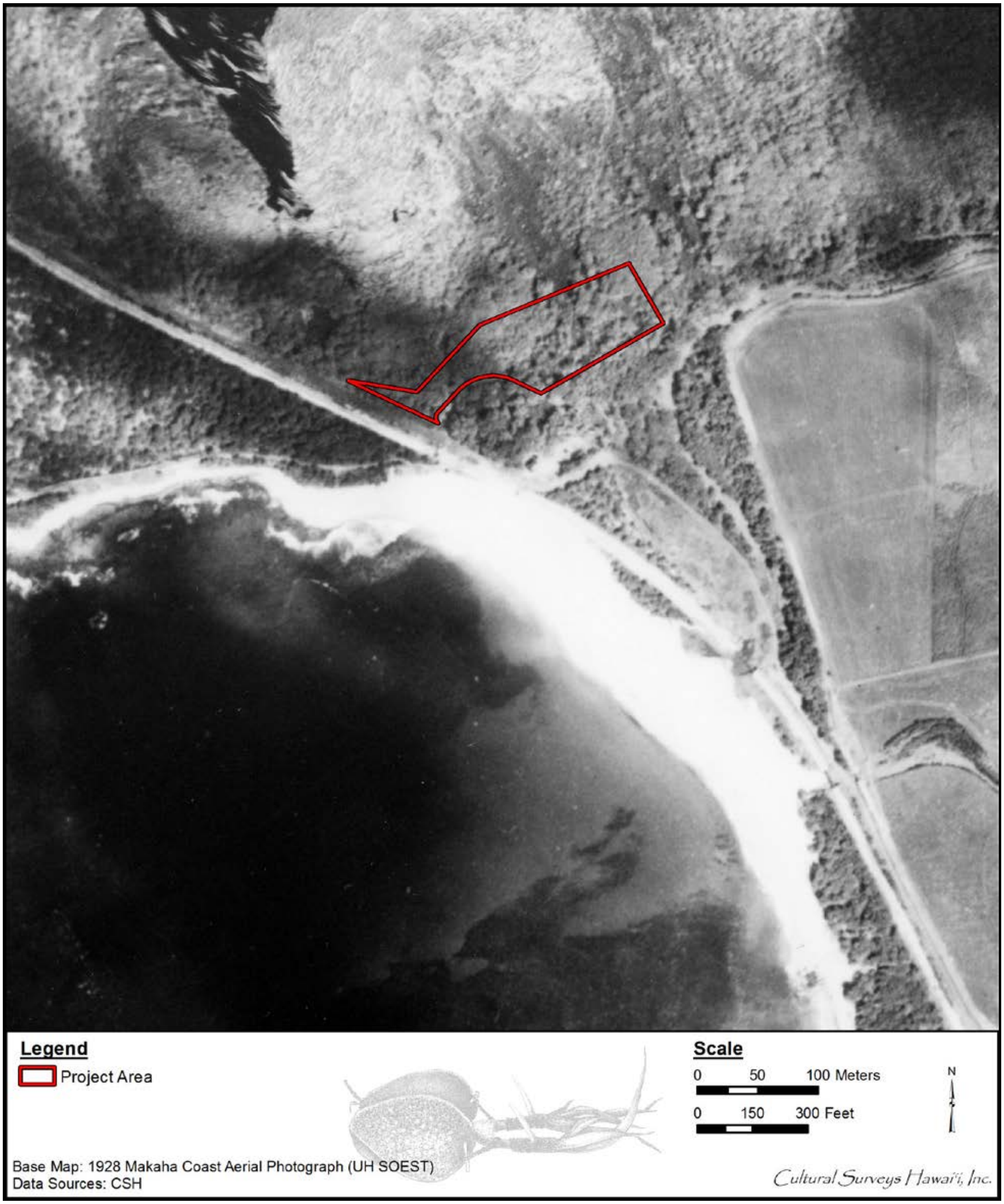

Figure 12. 1928 Makaha Coast aerial photograph (UH SOEST) with project area

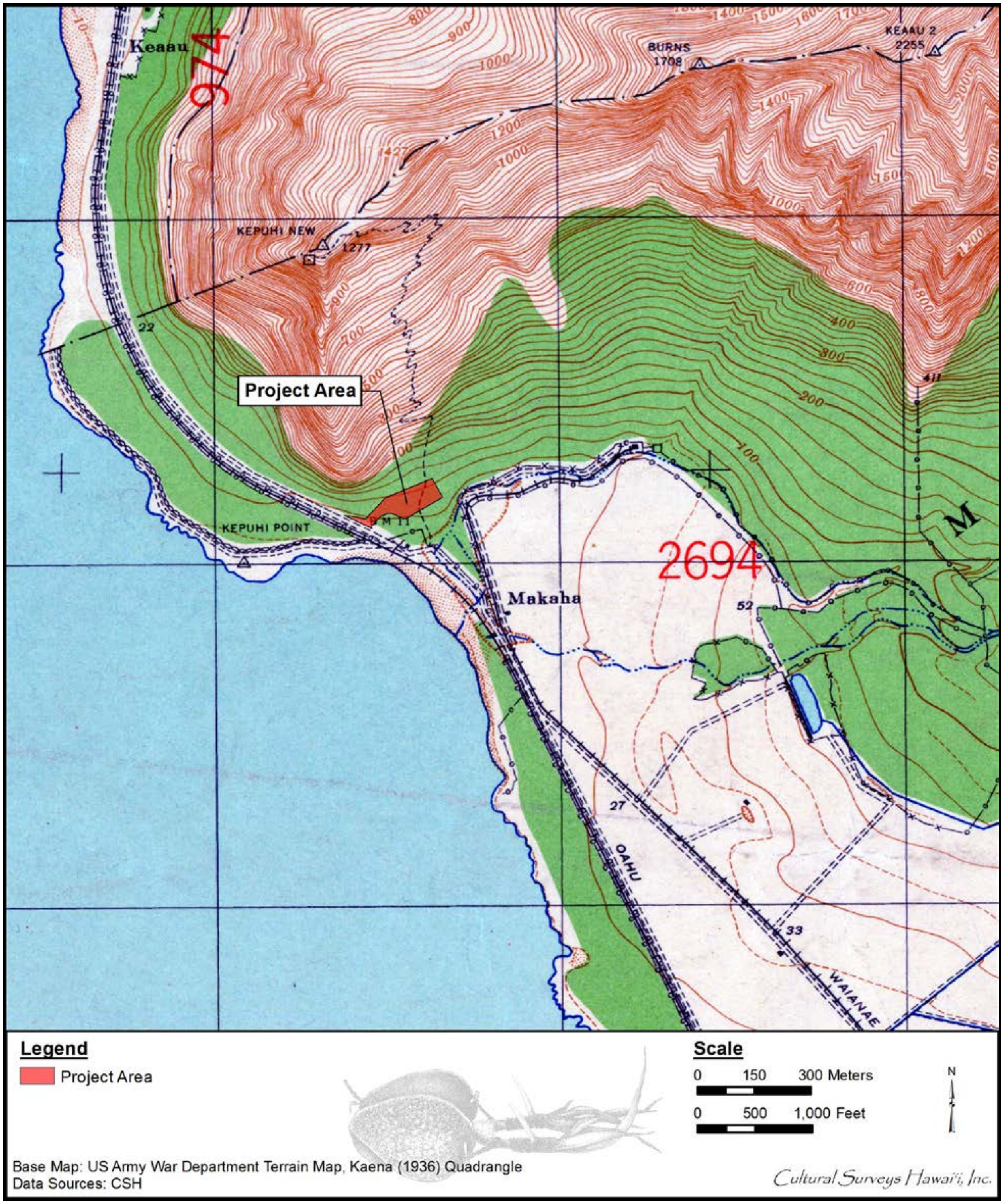

Figure 13. 1936 U.S. Army War Department Terrain map, Kaena Quadrangle with project area; note the trail way is still present throughout the Waiʻanae Coast with segments traveling into Mākaha Valley

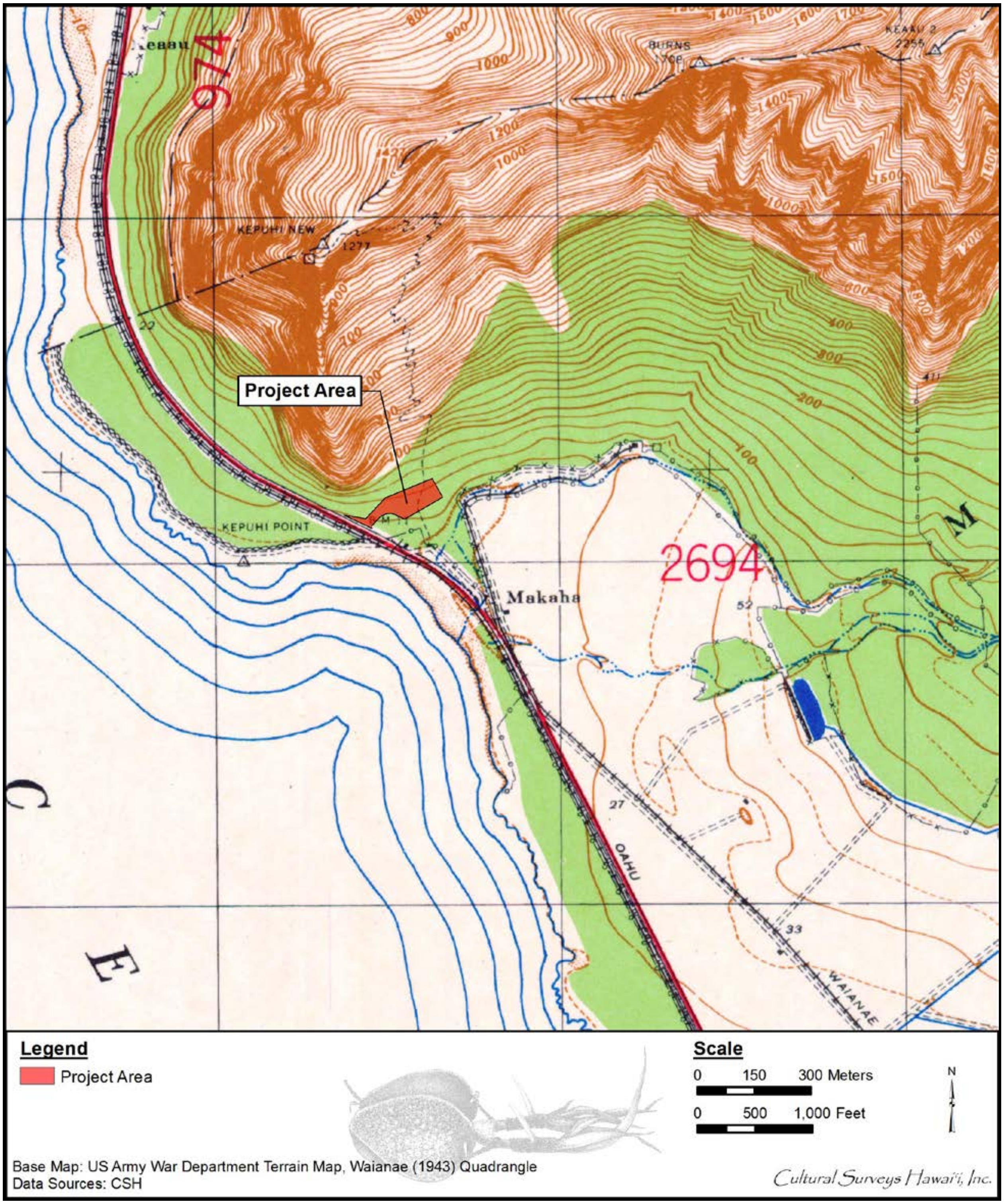

Figure 14. 1943 U.S. Army War Department Terrain map, Waianae Quadrangle with project area

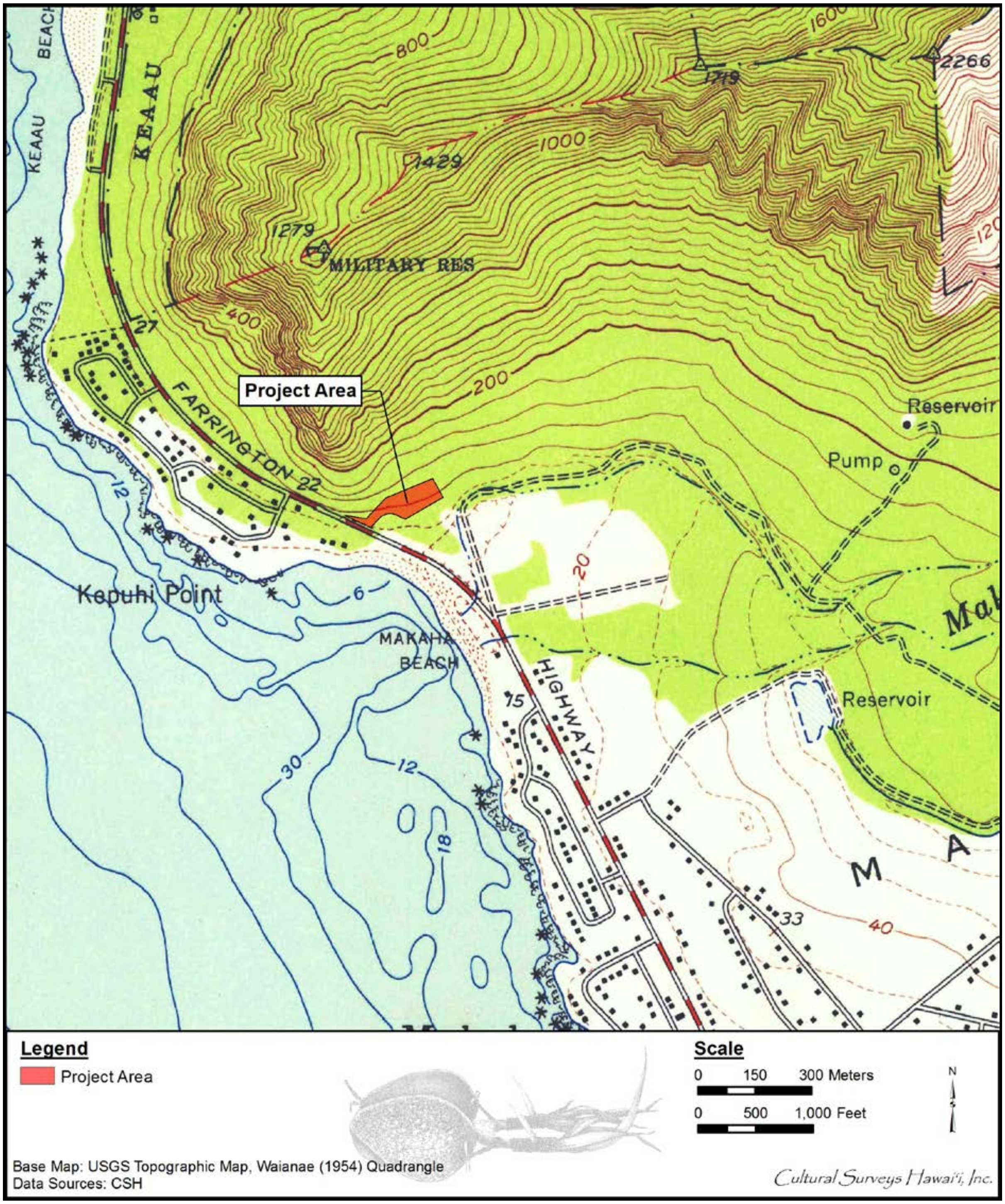

Figure 15. Portion of 1954 Waianae USGS topographic quadrangle with project area; note Farrington Highway runs *makai* of the project area and homes can be found along the coastline and in Mākaha Valley (as depicted with black squares); the railway has been removed from the map as well

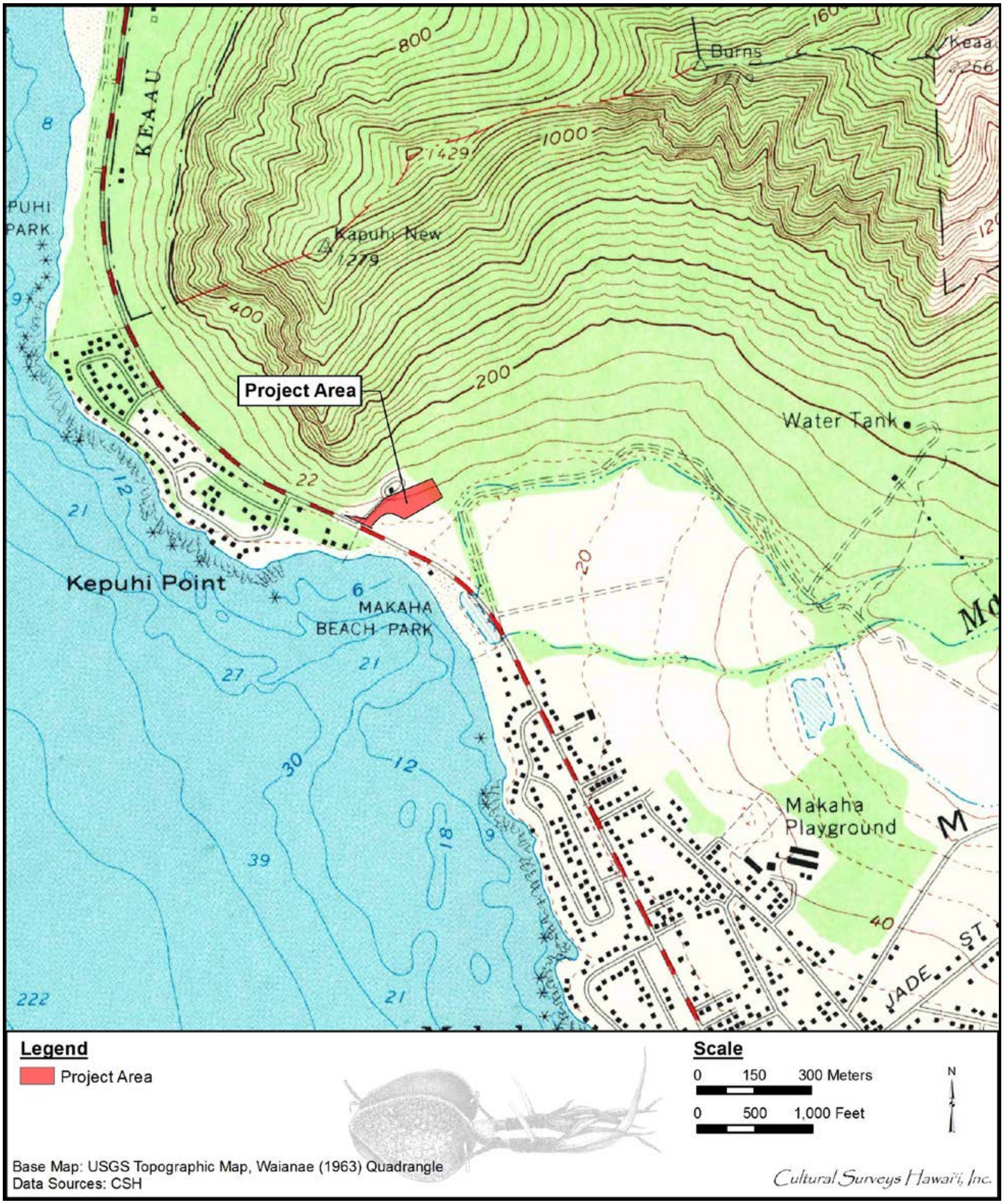

Figure 16. Portion of 1963 USGS Waianae topographic quadrangle, with project area; note more homes can be found *makai* of the project area and within Mākaha Valley

4.3 Previous Archaeological Research

A number of archaeological studies have been carried out in Mākaha Ahupua‘a. Below are brief summaries of archaeological studies conducted within the *ahupua‘a*. Table 2 lists these studies, location, type of study, and any findings made during the study. Figure 17 illustrates the previous archaeological study project limits. Figure 18 depicts locations of historic properties found within Mākaha Ahupua‘a.

In 1930, McAllister (1933) conducted an island-wide survey of sites on O‘ahu. These sites were designated with site numbers and later given historic property designations using the site number as the discrete site number. State Inventory of Historic Places (SIHP) # 50-80-07-173 (Site 173) is described as the probable location of a large rock reported in 1839 by E.O. Hall as “two or three miles distance” past the settlement at Pukahea (Pu‘u Kahea) that was once an object of worship. This sacrificial stone was reported by Hall as “in no peculiar sense striking” and “as undignified as any other hump or inanimate matter along the road” (McAllister 1933:121).

SIHP # -174 (Site 174), Laukīnui Heiau, was described as “the important one [*heiau*; pre-Christian place of worship] in Mākaha Valley,” and said to be so old as to have been built by the *menehune* (small mythical people). McAllister places this site in the vicinity of Kepuhi Point and his description of the *heiau* incorporating a “coral outcrop” and “an amazing amount of coral” fits that locale (McAllister 1933:121).

SIHP # -175 (Site 175) known as Mololokai is located at the base of the ridge between Kea‘au and Mākaha on the sea side of the road. This site was described as two pits where early cannibals had come to wash the defleshed bodies of their victims at high tide. Associated with this site were said to be two prominent stones, Pōhaku O Kāne on the Mākaha side and Pōhaku O Kanaloa on the Kea‘au side (McAllister 1933:121–122).

The Mākaha Valley Historical Project (Green 1969, 1970, 1980; Ladd and Yen 1972; Ladd 1973) was a major study done on Mākaha Valley between 1968 and 1970. Neller (1984) noted that sites were lumped into large geographical districts and most of the valley was only surveyed at the reconnaissance level. The Mākaha Valley Historical Project research was unique in that it was funded by private enterprise without legal compulsion and the investigations covered parts of the valley beyond those due for development. More than 600 archaeological features were recorded in the upper valley and 1,131 features were recorded in the lower valley. The area was designated the Mākaha Valley Historical Project Site Complex (SIHP # -776).

The coastal strip and the central lower valley were not included because of previous development. Excavations were undertaken at 30 separate structural features, including ten field shelters, four stone mounds, three stepped-stone platforms, three house enclosures, two storage pits, a clearing, a possible shrine, a *heiau*, a pond field terrace system, a habitation feature, two historic house platforms, and a modern curbed foundation. Carbon dating indicated settlement as early as the thirteenth century. Settlements were focused near Mākaha Stream. Subsequently, settlements expanded into *kula* lands. By the sixteenth century, subsistence practices changed when irrigated taro farms appeared in the upper valley (Green 1980:75).

Table 2. Previous Archaeological Studies Conducted in Mākaha Ahupuaʻa

Study	Location	Type of Study	Results (SIHP # 50-80-07)
McAllister 1933	Island-wide	Island-wide survey	Described McAllister site number and SIHP #s -173, a legendary stone; -174, Laukīnui Heiau; and -175, Mololokai pits
Green 1969, 1970, 1980; Ladd and Yen 1972; and Ladd 1973	Mākaha Valley	Mākaha Valley historical project	Documented over 600 archaeological features in the upper valley and 1,131 features in the lower valley; provided evidence of permanent pre-Contact inland settlements in Mākaha Valley; the area designated the Mākaha Valley Historical Project Site Complex SIHP # -776
Kennedy 1986	Mauna Lahilahi	Archaeological inventory survey	Identified five sites (later designated features of SIHP # -3704 by Komori 1987), including a possible shrine, a *koʻa* (fishing shrine), linear mound, and enclosure
Komori 1987	Mauna Lahilahi	Archaeological survey and testing	Confirmed five sites identified by Kennedy (1986) and identified additional features including petroglyphs, enclosures, terraces, rock shelters, midden scatters, and lithic scatters; all sites associated with Mauna Lahilahi designated features of SIHP # -3704; subsurface testing yielded eight radiocarbon dates, clustered tightly between AD 1300 to 1650 period
Kawachi 1990	Mauna Lahilahi	Burial report	Described remains of at least two individuals, artifacts and sites associated with SIHP # -3704
Hammatt and Robins 1991	Water St/ Kili Dr area	Archaeological inventory survey	Identified a linear earthen berm associated with commercial sugarcane cultivation (SIHP # -4363)

Study	Location	Type of Study	Results (SIHP # 50-80-07)
Kawachi 1992	84-325 Makau St, Kepuhi Point	Burial report	Documented human remains eroding from a sand bank following Hurricane ʻIniki (SIHP # -4527); the burial reported to have included staghorn coral at major joints and a possible shell *niho palaoa* (pendant worn by the *aliʻi*)
Moore and Kennedy 1994	Northwest side of Mākaha Valley	Archaeological inventory survey	No historic properties observed
Cleghorn 1997	*Mauka* of Farrington Hwy and north of Kili Dr	Archaeological inventory survey	Identified remains of OR&L railroad infrastructure (SIHP # 50-80-12-9714); subsurface testing revealed a cultural layer and a pond/wetland area (SIHP # 50-80-07-6572); radiocarbon dating of the cultural layer yielded a date range of AD 1440-1690
Elmore et al. 2000	South side of Kili Dr	Archaeological inventory survey	Identified SIHP # -5793 comprised of three features including a bi-faced wall (Feature A), a pavement (Feature B), and a platform (Feature C); located within the Mākaha Valley Historical Project Site Complex (SIHP # -776); subsurface testing within the features yielded traditional Hawaiian artifacts; features interpreted to be related to dryland agriculture and habitation
Moore and Kennedy 2000	North side of Kili Dr	Archaeological inventory survey	Identified SIHP # -5792 comprised of two features, including a remnant wall (Feature A) and a stone mound/boulder alignment (Feature B); located within the Mākaha Valley Historical Project Site Complex (SIHP # -776); subsurface testing did not yield any cultural material; features interpreted to be related to dryland agriculture and habitation
Kailihiwa and Cleghorn 2003	Lower Mākaha	Archaeological monitoring	Identified three historic properties, comprised of five features including a pit (SIHP # -6521), concrete flume (SIHP # -3325), two fire pits (SIHP # -6522), and a charcoal deposit

Study	Location	Type of Study	Results (SIHP # 50-80-07)
Tulchin and Hammatt 2003	Kili Dr and Farrington Hwy	Archaeological inventory survey	No historic properties identified
McDermott and Tulchin 2006	Mākaha Bridges 3 and 3A	Archaeological inventory survey	Identified five historic properties: SIHP # -6822, Mākaha Bridge 3; SIHP # -6823, Mākaha Bridge 3A; SIHP # -6824, Farrington Hwy; SIHP # -6825, a culturally enriched A horizon, which contained a previously disturbed burial; and SIHP # 50-80-12-9714, the former OR&L railroad alignment
Hammatt 2006	Mākaha Bridges 3 and 3A	Archaeological monitoring	No historic properties identified
Hazlett and Hammatt 2007	Mākaha Bridge 3, Farrington Hwy, Mākaha	Archaeological monitoring	No historic properties identified
McElroy 2007	Makau St, Kepuni Point	Archaeological monitoring	No historic properties identified
Hunkin and Hammmatt 2008	Farrington Hwy between Jade St and Lawaiʻa St	Archaeological monitoring	No historic properties identified
McElroy 2008a	Farrington Hwy between Kili Dr and 200 m north of Hakimo Rd	Archaeological monitoring	No historic properties identified
McElroy 2008b	Kili Dr and Farrington Hwy	Archaeological monitoring	Identified SIHP # -7031, a subsurface cultural layer containing charcoal, marine shell, sea urchin, animal bone, a basalt flake, basalt shatter, and a possible seed; one volcanic glass core collected
McElroy and Nishioka 2008	Private residence at Kepuhi Point	Emergency archaeological monitoring	No historic properties identified
O’Hare et al. 2010	Board of Water Supply Fire Dip Tank	Archaeological assessment	No historic properties identified

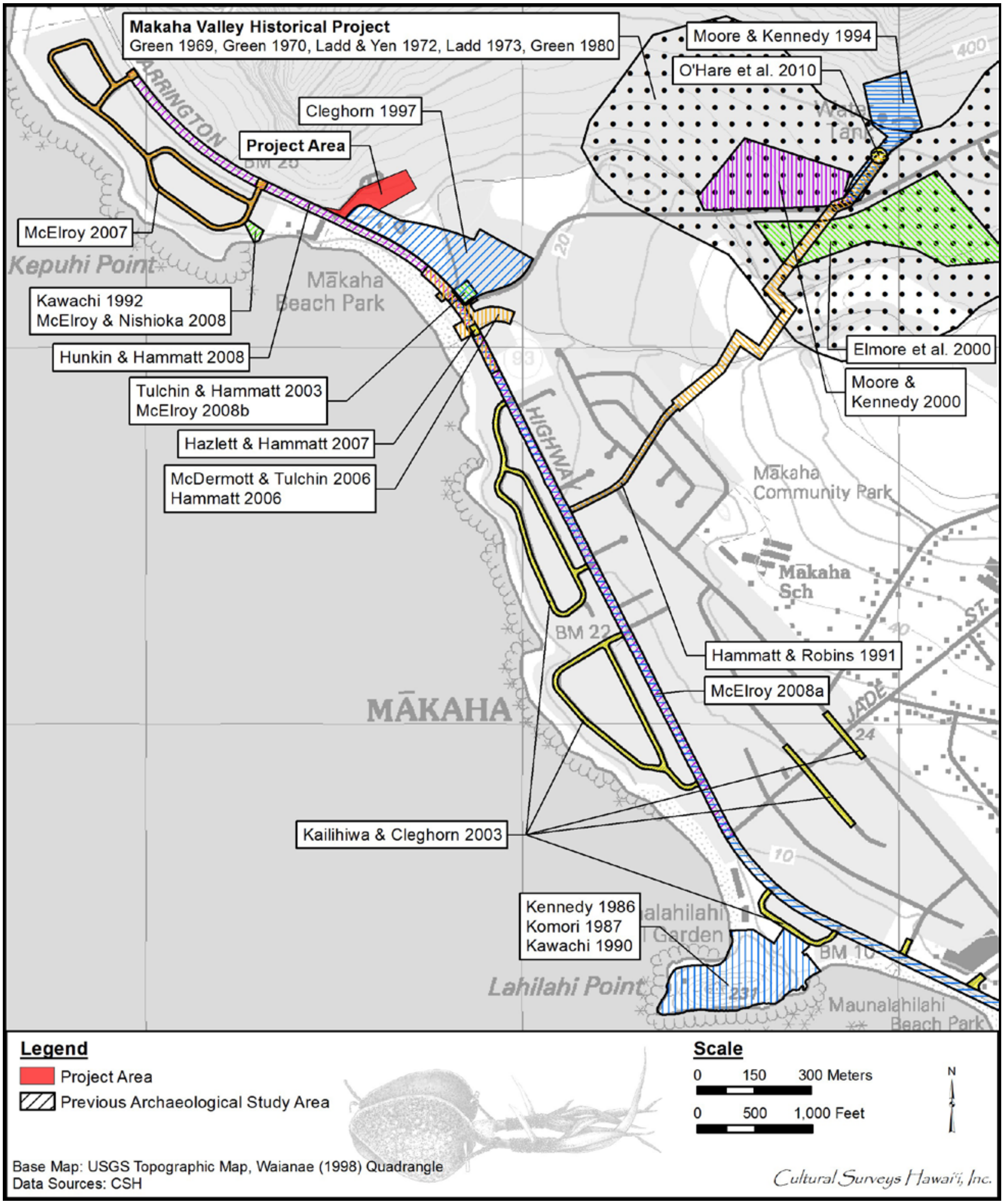

Figure 17. Portion of 1998 Waianae USGS topographic quadrangle depicting previous archaeological studies conducted within the vicinity of the current project area

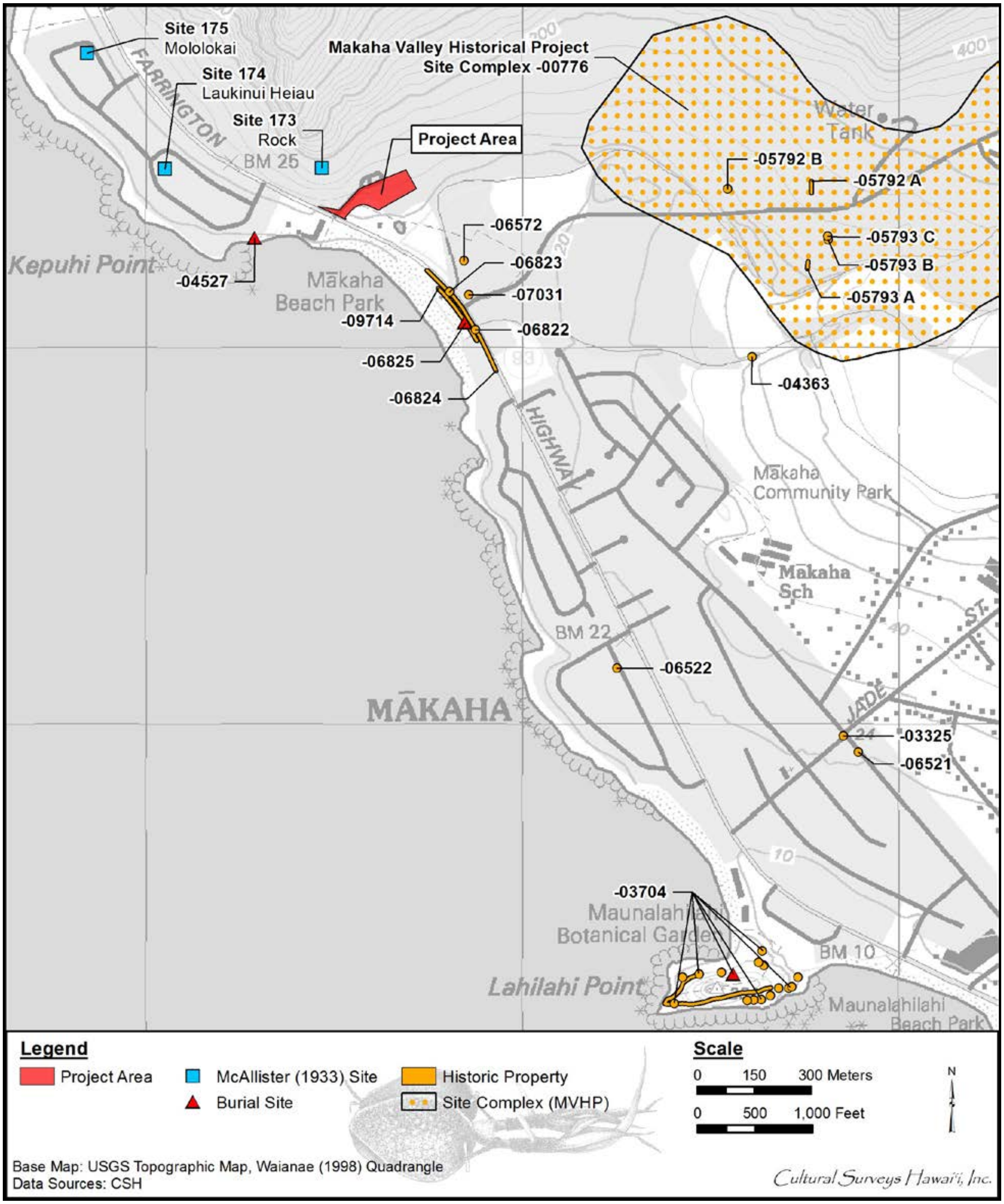

Figure 18. Portion of the 1998 Waianae USGS topographic quadrangle depicting previously identified historic properties in the vicinity of the project area

Green’s (1980) archival research, as part of the Mākaha Valley Historical Project, identified a number of small residences thought to correspond to late pre-Contact and early historic habitation in the vicinity of the current project area. This area, and presumably the associated settlement, is termed Kahaloko based on information provided by Clark (1977:91). This Kahaloko (see Figure 8) is depicted on Green’s reconstructed map of Mākaha Valley settlement and land use for the period between 1855 and 1884 (Green 1980:22–23).

This settlement was at least generally geographically associated with a fishpond:

> It is highly probable that there was a brackish-water fishpond in the low area behind the beach where Mākaha Stream would have constantly been imponded . . . A pond appears in this position on the preliminary field map for the O‘ahu Railway and Land Company (Dillingham Files, n.d.). The use of the name Kahaloko (place of the fishpond) for Mākaha Beach strongly suggests its presence, and Clark (1977:92) gives Mākāhā [sluice gate of a traditional Hawaiian fishpond] as the name of a large as the name of a large fishpond here. [Green 1980:20]

Kennedy (1986) carried out archaeological investigations focused on the north (Mākaha) side of Mauna Lahilahi, and identified five sites including a possible shrine, a *ko‘a*, a linear pile, and an enclosure. These sites were later designated features of SIHP # -3704, Mauna Lahilahi, by Komori (1987). Komori (1987) carried out archaeological survey and testing at Mauna Lahilahi, confirming Kennedy’s (1986) five sites. An additional 11 sites including petroglyphs, enclosures, terraces, rock shelters, midden, and lithic scatters were identified. Komori (1987) reported eight radiocarbon dates within the AD 1300-1650 period. The sites associated with Mauna Lahilahi were designated SIHP # -3704. Kawachi (1990) documented remains of at least two individuals recovered from a crevice in Mauna Lahilahi (SIHP # -3704). The remains had been placed in a small hole with two large cobbles placed in the hole to seal it. These human remains are documented as features of SIHP # -3704, Mauna Lahilahi.

Hammatt and Robins (1991) carried out an archaeological inventory survey of an approximately 4,600-ft long route of a proposed 20-inch water main extending northeast from Farrington Highway, up Water Street, and then continuing northeast across Kili Drive. They documented a single historic property SIHP # -4363 described as “a linear earthen berm . . . buttressed along its stream side with cobbles and boulders” (Hammatt and Robins 1991:18). The berm was interpreted as “associated with the historic sugarcane cultivation” (Hammatt and Robins 1991:18). Based on historic maps, the berm likely represents an old ditch alignment, which was an altered area during construction of the adjacent golf courses. It functions currently as a flood control structure, protecting housing downslope. Subsurface testing within the corridor encountered no materials of archaeological significance.

Carol Kawachi (1992) documented a burial(s) (SIHP # -4527) eroding out of the sand at 84-325 Makau Street. This find was a pit burial, approximately 50 cm below the surface, extending 1.5 m long in a sand bank exposed by Hurricane ‘Iniki. The burial included staghorn coral at major joints and a possible shell *niho palaoa*.

Moore and Kennedy (1994) carried out archaeological investigations on the northwest side of Mākaha Valley for a proposed reservoir at 242 ft elevation. The access corridor and reservoir site covered approximately 11 acres. No historic properties were observed.

In 1997, Cleghorn conducted test excavations associated with an archaeological inventory survey conducted for the new Mākaha Beach Park comfort station and parking area located east of Farrington Highway. The survey was conducted in two stages: the first being west of the AT&T Easement and the second east of the AT&T Easement. Stage one, west of the AT&T encompasses our current project area. Within this area, 14 test bores and two test pits were excavated (Figure 19). While no cultural material was observed, stratigraphic profiles were collected for the two test trenches. The soils in the units were extremely hard to excavate due to their extremely rocky nature. The coral bedrock was encountered at approximately 1.25 m below surface. Test unit 2 only reached about 30 cm below surface due to the difficult nature of the soils. As a result, excavation was terminated.

While not within the current project area, Cleghorn also excavated four test units east of the AT&T Easement that revealed cultural material. Cleghorn identified a subsurface pre-Contact cultural layer (SIHP # -6572) present in an area approximately 80 m *mauka* of Farrington Highway near its intersection with Kili Drive. Radiocarbon analysis indicated an age range of AD 1440-1690. The deposit contained “evidence of a small encampment near the coast” (Cleghorn 1997:32). Cleghorn also indicated the possible importance of a pond/wetland area just *mauka* of the highway at Mākaha Beach Park: “This pond and wetland may have offered rich resources for the Hawaiians of the area, and the pond may have been used as an inland fishpond during the prehistoric and early historic eras” (Cleghorn 1997:33).

This pond/wetland area is likely the area Green (1980) identified as “Kahaloko.” Also present in the area are remains of infrastructure associated with the OR&L railroad (SIHP # 50-80-12-9714). Cleghorn noted the presence of a bridge foundation located in an unnamed stream just north of Kili Drive, *makai* of the highway and within the current Mākaha Bridges project area (Cleghorn 1997:11).

Elmore et al. (2000) conducted an archaeological inventory survey of an approximately 19.6- acre parcel located on the south side of Kili Drive and just west of the condominiums in a portion of previously identified SIHP # -776. A total of eight features were identified. Of these, five were determined to be modern disturbances, while the other three were thought to be possible traditional Hawaiian dryland agricultural and/or habitation features. These features, although in the boundaries of SIHP # -776, were designated SIHP # -5793A (bi-faced wall), SIHP # -5793B (pavement), and SIHP # -5793C (platform).

Moore and Kennedy (2000) conducted an archaeological inventory survey of an approximately 20-acre parcel located on the north side of Kili Drive in a portion of previously identified SIHP # -776. A total of 12 features were identified; ten of these were determined to be modern disturbances, while the other two were thought to be possible traditional Hawaiian dryland agricultural features. These features, although in the boundaries of SIHP # -776, were designated SIHP # -5792A (remnant wall) and SIHP # -5792B (mound/boulder alignment).

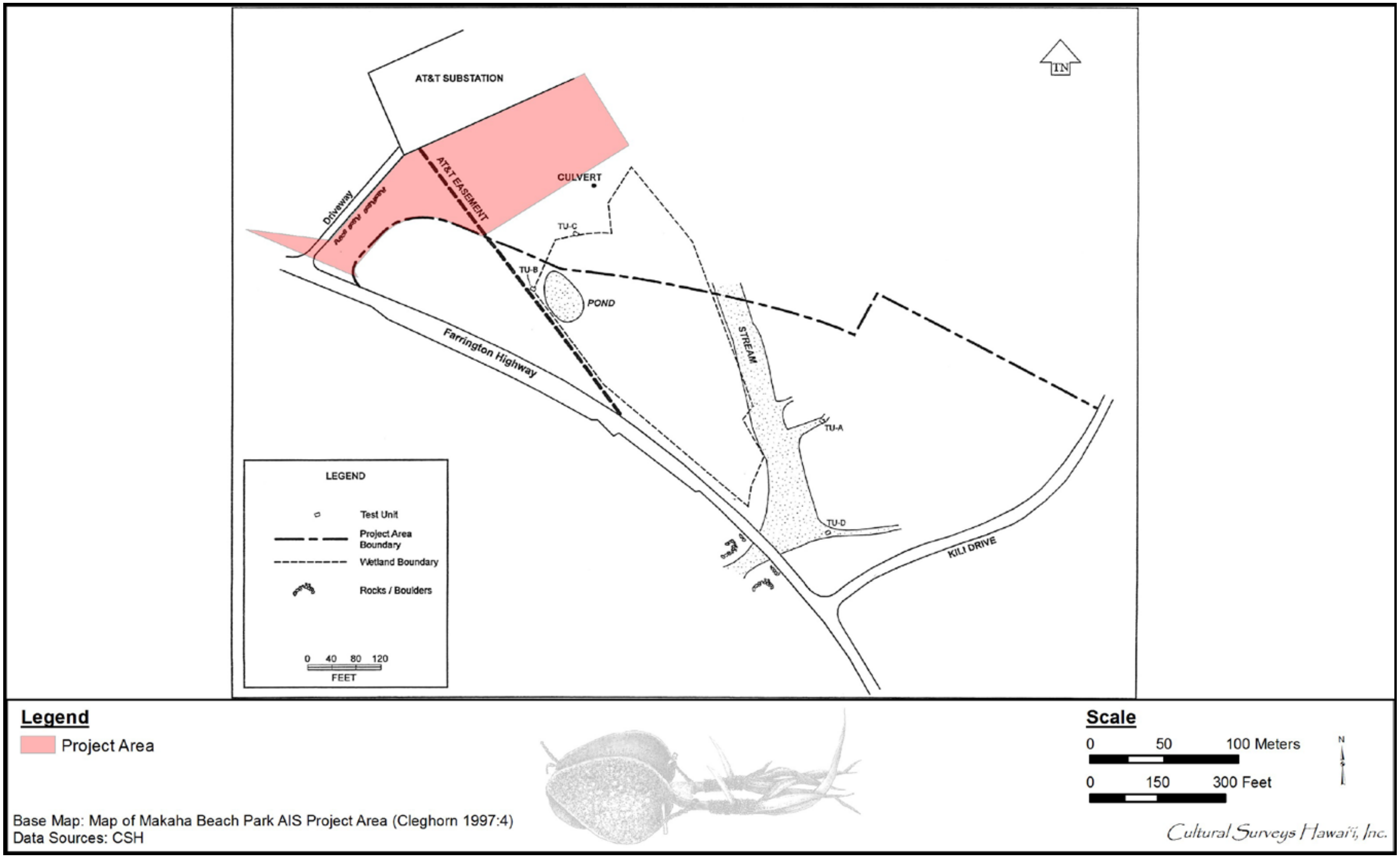

Figure 19. Map of Mākaha Beach Park AIS project conducted by Cleghorn (1997:4) with current project overlay in red

Kailihiwa and Cleghorn (2003) monitored the Mākaha Water System Improvements Phase II for ten streets in the *ahupuaʻa* of Mākaha and Waiʻanae. A total of three sites were documented, which consisted of five features. The sites included a pit feature (SIHP # -6521), a concrete flume (SIHP # -3325), two fire features (SIHP # -6522), and a charcoal deposit (no SIHP # designated). No artifacts or human remains were found during the course of the project.

Tulchin and Hammatt (2003) conducted an archaeological inventory survey located at the corner of Kili Drive and Farrington Highway, associated with a proposed fiber optic cable facility. No historic properties were observed.

In August 2005, CSH conducted an archaeological inventory survey for the Mākaha Bridge Replacement project (McDermott and Tulchin 2006). Five historic properties were documented including SIHP # -6822, Mākaha Bridge 3 (constructed in 1937); SIHP # -6823, Mākaha Bridge 3A (constructed in 1937); SIHP # -6824, Farrington Highway (originally constructed in the 1930s); SIHP # -6825, a culturally enriched A horizon, a former land surface from the pre-Contact and historic period, which contained a previously disturbed burial that is most likely Native Hawaiian; and SIHP # 50-80-12-9714, the former OR&L railroad alignment (constructed in the 1890s). All of these recorded cultural resources were documented within the *makai* portions of the project area. *Mauka* of Farrington Highway, the project area appeared to have been disturbed by grading or other land alterations, most likely associated with commercial agriculture.

In 2005, CSH monitored geotechnical test borings for the Mākaha Bridge Replacement project, carried out as part of the design phase for the project (Hammatt 2006). Geotechnical testing consisted of nine test cores (7.5 cm diameter) near the footing of the existing bridges and along the route of the proposed temporary detour road as well as at the temporary bridge structures on the seaward (southwestern) side of Farrington Highway. The surface sediments of Borings 1–5 excavated within the existing Farrington Highway consisted of imported fill materials associated with the Farrington Highway and bridge construction overlying natural sand sediments and the limestone shelf. Subsurface sediments of Borings 6–9 generally consisted of varying thicknesses of imported fill material overlying natural silty sand sediments and the limestone shelf. No new historic properties were identified.

In 2006, CSH conducted additional archaeological monitoring for emergency repairs to Mākaha Bridge 3 (Hazlett and Hammatt 2007). Repair work included repairs to the wooden structure of Mākaha Bridge 3 and the removal of accumulated sediments from the drainage channel beneath the bridge and around the bridge footings. No new historic properties were identified.

McElroy (2007) conducted archaeological monitoring for the Board of Water Supply Makau Street project, which installed water main lines along the Kepuni Point community roadways. Sixty-three stratigraphic profiles were drawn during the course of project excavations. The coral shelf was uncovered from 18 to 116 cm below surface. No historic properties were observed.

Hunkin and Hammatt (2008) completed archaeological monitoring for the Farrington Highway Part IV project, which extended along Farrington Highway between Jade Street and Lawaiʻa Street. No significant subsurface cultural deposits were encountered. In general the observed and documented stratigraphy consisted of varying layers of imported fill, as well as backfilled natural sediment associated with subsurface utilities and road construction; a discontinuous buried A horizon (former land surface) disturbed by previous subsurface excavations; and naturally deposited marine sand and coral bedrock. No historic properties were observed.

McElroy and Nishioka (2008) conducted emergency archaeological monitoring at a private residence located at TMK: [1] 8-4-009:005 northwest of Mākaha Beach Park. No historic properties were observed.

McElroy (2008a) conducted archaeological monitoring for the Department of Hawaiian Homelands Fiber Optic Cable Installation project along Farrington Highway beginning northwest of Kili Drive (Mākaha) and ending 200 m north of Hakimo Road in Lualualei. Stratigraphy generally consisted of modern asphalt roadway overlying multiple fill layers and either natural sand or coral shelf. No historic properties were observed.

McElroy (2008b) conducted archaeological monitoring at the corner of Farrington Highway and Kili Drive for the construction of a fiber optic cable landing site. A subsurface cultural layer, SIHP # -7031, was identified very near the corner of Farrington Highway and Kili Drive, i.e., just *mauka* of the current project area. SIHP # -7031 consisted of a buried cultural layer containing abundant charcoal, marine shell, sea urchin, animal bone, a basalt flake, basalt shatter, and a possible seed. In addition, a possible isolated volcanic glass core was found on the ground surface during light grading of the area.

In 2010, CSH completed an archaeological assessment for the development of a fire dip tank facility, comprised of less than 1 acre (O’Hare et al. 2010). No historic properties were observed.

Section 5 Previous Oral History Research

This section draws from previous oral history research from the Waiʻanae Coast Culture and Arts Society titled *Ka Poʻe Kahiko o Waiʻanae* (1986) highlighting the voices of several dozen people who had deep knowledge of the culture and history of the *ahupuaʻa* of Waiʻanae and its surrounding areas. Their *moʻolelo* color the cultural and historical background with nuanced recollections and add depth to the information provided by *kūpuna* and *kamaʻāina* interviewed for this CIA (see Section 6).

5.1 *Mauka* Resources

Rita Analika Kauikawekiu Akana's family settled into Nānākuli Ahupuaʻa. Ms. Akana said her father would get people to gather coconuts from the old Waiʻanae church to make *haupia* (pudding formerly made of arrowroot and coconut cream) and *kūlolo* (pudding made of baked or steamed grated taro and coconut cream). Coconuts were also provided by Mr, Fricke, the Waianae Plantation manager (Waiʻanae Coast Cultural and Arts 1986:3).

Ruby Duncan Aki and her husband moved to Nānākuli in 1949. The couple raised cows and pigs and sold their animals to the Filipino residents of Waipahu (Waiʻanae Coast Cultural and Arts Society 1986:13).

Albert Dung was born in Waiʻanae Valley. He was one of 11 children. He shares his memories of his home life in Waiʻanae Valley:

> My father . . . would . . . plant taro on our land at home for our use. There was lots of water from the Waiʻanae Valley streams for us to use for our taro patch. . . . Some of the lands that the oldtimers lived on were gotten through grants from the *aliʻi*, while others bought their land and still others have a ninety-nine-year lease similar to the Hawaiian Home Lands . . . growing up, my brothers and sisters and I, . . . became acquainted with and used most of the Hawaiian medicines like *pōpolo* [the black nightshade; *Solanum nigrum*], used for colds; *ʻuha-loa* [*Waltheria indica var. americana*], used as a tea or chewed to relieve sore throat; *kukui* [candlenut; *Aleurites moluccana*], used to clean the tongue of *ʻea* [general term for infections and infectious diseases], *maiʻa-pōpō-ʻulu* [a Hawaiian variety of bananas; root of young plants used medicinally], used medicinally to clean out; and *kaliko* [*Euphorbia heterophylla var. cyathorphora*], also used medicinally as a laxative. When I was a young boy I worked for the plantation as a mule driver. My job was to harness the mules and guide the mules into plowing the field. I started work between five and six in the morning and ended about two or three in the afternoon. [Waiʻanae Coast Cultural and Arts Society 1986:16–17]

John Dominis Holt, author and major contributor for the oral history of the Waiʻanae Coast, describes a signature plant of Mākaha; the *maile-lau-liʻi*. When people would return to town on the train wearing the *lei* of *mailelauliʻi*, those in town knew the *lei* wearers had been in Mākaha for the weekend or holiday.

5.2 *Makai* Resources

Elizabeth Palilo Ahia mentions the pond at Zablan (Nānākuli) used to be so clean "you could just scoop your net to catch *ʻōpae* [shrimp]" (Waiʻanae Coast Cultural and Arts Society 1986:7). Ms. Ahia recalls having to drink brackish water growing up. She remembers her *hānai* (foster child, adopted child) father making a charcoal stove to *pūlehu* (to broil) fish. She loved picking *limu* (seaweed) as a little girl.

Harvey Cornwell was born in Waikapū, Maui. He later worked for the police department and relocated to Waiʻanae. He often fished with his neighbors including the Cordez, Kekahio, and Hulama families (Waiʻanae Coast Cultural and Arts Society 1986:23). *Limu* was plentiful on the beaches of the Waiʻanae Coast. Varieties found include *limu-kohu* and *līpeʻepeʻe.*

Charles Hanohano, moved from Kauaʻi to Waiʻanae to work for Grace Brothers.

> [M]y fellow workers at Grace Brothers would show me places in the Waiʻanae Coast that were considered to be the best fishing spots. While I went fishing, my wife would pick up *ʻopihi* and *limu*; everything was plentiful . . . then after December 7, 1941, would couldn't go to the beach like before. The military had strung out barbed wire coils and angle irons all along the beach. We had to keep away. [Waiʻanae Coast Cultural and Arts Society 1986:34]

5.3 Cultural Sites

Andrew Kalinchak was one of the few who talked about burial caves:

> There was an ancient burial cave in the mountains behind the Holt home. Mrs. Holt took us up there one day—that was when we were younger and could walk a little better. The height of the cave was above six feet. I remember seeing a few caskets in there, the handles were all copper but they were all tarnished by then. Later, somehow the secret of the burial cave leaked out and the place became desecrated. [Waiʻanae Coast Cultural and Arts Society 1986:43]

James Robinson Holt III recalls that before his "family became the owners of Mākaha Valley, there were a lot of thieves that lived up here in the valley. Then my great-grandfather bought the valley and all the thieves were chased out" (Waiʻanae Coast Cultural and Arts Society 1986:37). His grandfather built a large seven-bedroom home and often entertained guests including the Castle and Cooke families.

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 (NHO), agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise and/or knowledge of the *ahupuaʻa* of Mākaha. CSH initiated its outreach effort in October 2015 through letters, email, telephone calls, and in-person contact. CSH completed the community consultation in December 2015.

6.2 Community Contact Letter

In the majority of cases, letters along with a map and an aerial photograph of the project area were mailed with the following text:

> At the request of R. M. Towill Corporation, Cultural Surveys Hawaiʻi Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Southeast Asia – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupuaʻa, Waiʻanae Moku, Oʻahu Island, Tax Map Key (TMK) [1] 8-4-002: 059. The project area is approximately 2.823 acres.
>
> The proposed project involves the installation of a submarine fiber optic (F/O) telecommunications cable in offshore waters approximately ¼ to ½ miles seaward of Mākaha Beach, Oʻahu, Hawaiʻi. Installation of the F/O cable will involve use of horizontal directional drilling (HDD) equipment positioned on land owned by Hawaiian Telcom. HDD will be used to create a borehole and will continue beneath the ground until it is ready to daylight in sandy ocean bottom at a depth of approximately 15 to 20 meters. There is no specific timeframe for the period of drilling but it is expected to last several months. Conduit will be placed into the borehole as the drill progresses. Following HDD, the remaining conduit will be used to pull the F/O cable to a specially prepared manhole at the Hawaiian Telcom property. The F/O cable will then be connected to a newly constructed Cable Landing Station at the project site.
>
> The land owned by Hawaiian Telcom and site for the proposed project is north of the existing Mākaha Beach parking lot on the *mauka* (towards the mountain) side of the Farrington Highway. The location for the daylighting of the borehole and conduit in off-shore coastal waters was selected to minimize disturbance to the environment, disruption to users of Mākaha Beach, interference with existing cables, and to secure long-term protection of the SEA-US Cable System.
>
> Landing and positioning the cable within the extensive sand deposits off-shore of the Mākaha Beach will reduce cable exposure to ocean forces, eventually allowing it to be buried beneath the sand. This is expected to allow for the protection of corals and other marine species that depend on the area for food, foraging, and habitat. Once completed, the location of the cable in 15 to 20 meters

of water depth is not expected to affect beach users including surfers, divers, boaters, swimmers, or fishermen.

Ultimately, the final build-out of the SEA-US project will result in telecommunications connectivity between Southeast Asia, Hawai‘i, Guam, and the U. S. West Coast. The project will further benefit Hawai‘i with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided.

The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assists us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project.

We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites- for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends 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**

Samples of the letters are shown in Figure 20and Figure 21.

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) 262-4950

Job code: MAKAHA 16 **nishihara@culturalsurveys.com** www.culturalsurveys.com

October 2015

Aloha mai e kāua,

At the request of R. M. Towill Corporation, Cultural Surveys Hawai‘i Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Southeast Asia – United States (SEA-US) Cable System, Mākaha Beach Landing Project, Mākaha Ahupua‘a, Wai‘anae Moku, O‘ahu Island, Tax Map Key (TMK) [1] 8-4-002: 059. The project area is approximately 2.823 acres.

The proposed project involves the installation of a submarine fiber optic (F/O) telecommunications cable in offshore waters approximately ¼ to ½ miles seaward of Mākaha Beach, O‘ahu, Hawai‘i. Installation of the F/O cable will involve use of horizontal directional drilling (HDD) equipment positioned on land owned by Hawaiian Telcom. HDD will be used to create a borehole and will continue beneath the ground until it is ready to daylight in sandy ocean bottom at a depth of approximately 15 to 20 meters. There is no specific timeframe for the period of drilling but it is expected to last several months. Conduit will be placed into the borehole as the drill progresses. Following HDD, the remaining conduit will be used to pull the F/O cable to a specially prepared manhole at the Hawaiian Telcom property. The F/O cable will then be connected to a newly constructed Cable Landing Station at the project site.

The land owned by Hawaiian Telcom and site for the proposed project is north of the existing Mākaha Beach parking lot on the *mauka* (towards the mountain) side of the Farrington Highway. The location for the daylighting of the borehole and conduit in off-shore coastal waters was selected to minimize disturbance to the environment, disruption to users of Mākaha Beach, interference with existing cables, and to secure long-term protection of the SEA-US Cable System.

Landing and positioning the cable within the extensive sand deposits off-shore of the Mākaha Beach will reduce cable exposure to ocean forces, eventually allowing it to be buried beneath the sand. This is expected to allow for the protection of corals and other marine species that depend on the area for food, foraging, and habitat. Once completed, the location of the cable in 15 to 20 meters of water depth is not expected to affect beach users including surfers, divers, boaters, swimmers, or fishermen.

Ultimately, the final build-out of the SEA-US project will result in telecommunications connectivity between Southeast Asia, Hawai‘i, Guam, and the U. S. West Coast. The project will further benefit Hawai‘i with increased telecommunications speed and reliability due to the advanced capacity and backup that would be provided.

The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assists us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project.

Figure 20. Community consultation letter, page one

MAKAHA 16 CIA for Southeast Asia US Project

Page 2

We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites- for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kamaʻāina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupuaʻa* 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 Nicole Ishihara (nishihara@culturalsurveys.com) by email or phone at (808) 262-9972 no later than November 13, 2015.**

Me ka haʻahaʻa,

Nicole Ishihara
CSH Cultural Researcher

Figure 21. Community consultation letter, page two

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.

Table 3. Results of Community Consultation

Name	Affiliation	Comments
Aila, Bill and Melva	*Kamaʻāina*, longtime residents of Waiʻanae	Letter and figures sent out via U.S. Postal Service (USPS) 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Becket, Jan	Author, photographer, knowledgeable in cultural sites island-wide Kona Representative, Committee on the Preservation of Historic Sites and Cultural Properties	Letter and figure sent via email 5 October 2015 Mr. Becket responded via email on 5 October 2015 with the following: *Iʻll look forward to getting out there to those mauka heiau we spoke about. Happy to supply photos.* CSH emailed Mr. Becket 11 November 2015 asking if he had anywhere in particular in Mākaha that he'd like to visit Mr. Becket emailed CSH on 18 November 2015 with tentative dates for 23 and 24 November as well as the first week of December CSH emailed Mr. Becket on 20 November 2015 with a tentative date of 30 November 2015 to meet and interview Mr. Becket responded to CSH via email 23 November 2015 confirming site visit and interview for 30 November 2015 Site visit and interview conducted on 30 November 2015; authorization form signed

Name	Affiliation	Comments
		CSH sent Mr. Becket his draft summary for review via email 29 December 2015 Mr. Becket responded to CSH via email 1 January 2016 with edits to his interview summary
Burns, Genevieve	*Kamaʻāina*, referred by SHPD for a previous project in Waiʻanae Moku	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Cachola, Fred	Historian, former resident of Waiʻanae Moku	Letter and figures sent out via email 5 October 2015
Cope, Aunty Aggie	Founder, Waiʻanae Coast Culture and Arts	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Crabbe, Dr. Kamanaʻopono	Ka Pouhana, OHA	Letter and figures sent out via USPS 5 October 2015
DeSoto, John and Patty	*Kamaʻāina*, residents of Mākaha Mākaha Hawaiian Civic Club	Letter and figures sent out via email 5 October 2015; also requested if they could pass information along to the Keaulana ʻOhana
Dodge, Fred	Retired doctor from Waiʻanae Coast Comprehensive Center; long-time resident of Waiʻanae	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Enos, Eric	Cultural practitioner, Kaʻala Farms	Letter and figures sent via email 5 October 2015 Mr. Enos responded to CSH via email on 8 October 2015 with the following: *I have no special concerns unless something develops needing attention. I assume this area is already heavily impacted with prior work.* *Let me know what develops.*
Fujikane, Candace	Associate Professor, English Department at the Univeristy of Hawaiʻi at Mānoa	Letter and figure sent via email 5 October 2015

Name	Affiliation	Comments
	KAHEA – The Hawaiian Environmental Alliance, Environmental Justice Working Group focusing on Waiʻanae Moku	
Gay, Lucy	LCC – Waiʻanae, KAHEA – The Hawaiian Environmental Alliance, Concerned Elders of Waiʻanae	Letter and figures sent via email 5 October 2015
Gomes, Domingo	*Kamaʻāina* and fisherman; previously referred to CSH by KAHEA – Environmental Justice Working Group	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Greenwood, Aunty Alice	Nani o Waiʻanae, Concerned Elders of Waiʻanae Waiʻanae Representative, Committee on the Preservation of Historic Sites and Cultural Properties	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Hawaiian Railway Society		Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Hoa ʻĀina o Mākaha	Farm in Mākaha Valley	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Hoʻohuli, Josiah "Black"	Cultural practitioner	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Kaleikini, Paulette Kaʻanohi	Descendant, cultural monitor, cultural practitioner, resident of Nānākuli	Letter and figures sent out via email 5 October 2015 Ms. Kaleikini responded via email 10 October 2015 with the following: *These are my concerns regarding this project:* *How deep will they need to drill for the submarine F/O beneath the ground before it moves seaward into the sandy ocean bottom* *How far inland on the Hawaiian Telcom property will*

Name	Affiliation	Comments
		the drilling will begin *Will there be a control station on the property; if yes, how large will it be and where on the property will it be located* *Will the cable run under Makaha Beach Park or north of it* *Will there be an Environmental Impact Assessment* *Will there be an Archaeological Inventory Survey for the area where drilling will take place* *Makaha was among of the first settlement areas of ancient Hawaiians coming from the Northwestern Hawaiian islands. Anywhere excavations are planned in this sensitive area could impact a cultural layer.* *The project could last several months. Hopefully, there will be minimal disturbance to the environment and Makaha beach users or I would totally object to this project. There needs to be more discussion with the community; to let them know the plans before it happens.* *o wau iho* *kaanohi kaleikini* CSH responded via email to Ms. Kaleikini on 19 October 2015 stating we have contacted the client and forwarded her questions and concerns
Kamealoha, Thomas	Cultural monitor, NHO registered	Letter and figures sent via email 5 October 2015
Kāne, Shad	Member, Oʻahu Island Burial Council ʻEwa Moku and Chair, Committee on	Letter and figures sent via email 5 October 2015

Name	Affiliation	Comments
	the Preservation of Historic Sites and Cultural Properties Founder, Kalaeloa Heritage & Legacy Foundation	Mr. Kāne replied via email on 5 October 2015 with the following: *Although I appreciate the invitation to comment and I do have a broad knowledge of the cultural landscape of Makaha I think it is much more culturally appropriate for me to defer to friends of mine who possess generational, place based knowledge to that parcel. As a suggestion you might want to consider speaking to Eric Enos, Bill Aila, Landis Ornellas, Vince Dodge, Albert Silva or even Representative Jo Jordan. You may even say I suggested you speak to them.* *Mahalo for the invitation.............shad*
Keaulana ʻOhana	*Kamaʻāina*, surfing family, frequents Mākaha Beach, first lifeguard of Mākaha Beach (Buffalo Keaulana)	Passed on information to John and Patty DeSoto to give to the Keaulana ʻOhana on 5 October 2015
Kila, Glen	Cultural practitioner	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
LaFrance, Donna K.	Associa Hawaiʻi, property management company for Mauna Olu Estates	Referred to CSH by guard shack at Mauna Olu Estates CSH called and left a message for Ms. LaFrance on 25 November 2015 CSH called and left a message for Ms. LaFrance on 29 November 2015 CSH called and left a message for Ms. LaFrance on 30 November 2015 CSH emailed Ms. LaFrance requesting access to Kāneaki Heiau; sent letter and figures

Name	Affiliation	Comments
		2 December 2015 CSH called and left a message for Ms. LaFrance on 2 December 2015 Ms. LaFrance responded to CSH via email on 2 December 2015 stating she would forward request to the Board for review Ms. LaFrance emailed CSH on 3 December 2015 stating that the Board responded “the heiau has been closed due to safety issues in relation to a recent rock slide.”
Mahoe, Harriet	Waiʻanae Valley Homestead Association	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Mākaha Cultural Learning Center	Restoration and reforestation of Mākaha	Letter and figures sent via email 5 October 2015
Mākaha Hawaiian Civic Club		Letter and figures sent via email 5 October 2015
Manansala, Sophie Flores	Mikilua Valley Community Association	Letter and figures sent via email 5 October 2015
Nahulu, Eli	*Kamaʻāina*, cultural practitioner	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Oliveira, Chris	Cultural practitioner	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Ornellas, Landis	*Kamaʻāina* and fisherman	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Silva, Albert	*Kamaʻāina*	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Solis, Kaʻahiki	Cultural Historian – Oʻahu, State	Letter and figures sent via

Name	Affiliation	Comments
	Historic Preservation Division (SHPD)	email 5 October 2015 Ms. Solis replied to CSH via email 6 October 2015 with the following: *I have two people in Makaha that may be interested. I will get back to you today on this or as soon as they respond. I was out sick yesterday sorry for the delayed response.*
Taylor, Vernon	*Kama‘āina*	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Teruya, Patty Kahanamoku	*Kama‘āina*	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015
Tiffany, Nettie	*Kahu* (guardian) for Lanikuhonua Cultural Institute	Letter and figures sent via email 5 October 2015
Wong-Kalu, Hinaleimoana	Chair, O‘ahu Island Burial Council (OIBC)	Letter and figures sent via email 5 October 2015
Worthington, Mele	President, Wai‘anae Hawaiian Civic Club	Letter and figures sent out via USPS 5 October 2015 Second letter and figures sent out via USPS 30 October 2015

6.4 *Kama‘āina* Interviews

The authors and researchers of this report extend our deep appreciation to everyone who took the time to speak and share their *mana‘o* and *‘ike* with CSH whether in 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 Jan Becket

Jan Becket is a retired teacher with Kamehameha Schools who is well-recognized for his black-and-white photographic documentation of sacred sites. He has conducted extensive archival research on sites of cultural significance, learned from *kūpuna*, and photographed many undocumented sites on O‘ahu, which resulted in a co-written book, *Pana O‘ahu* (Becket and Singer 1999). He is a member of the Committee for the Preservation of Cultural Sites and Properties under the O‘ahu Council of Hawaiian Civic Clubs, and reports back to the chair of the committee (Shad Kāne) on issues concerning cultural sites in the Kona district of Oʻahu. CSH has attended *huakaʻi* (trip, voyage) and conducted interviews with Mr. Becket since 2011 spanning the island of Oʻahu.

CSH interviewed Mr. Becket for the current project on 30 November 2015. The first stop was at Mauna Lahilahi located south of the project area. The *puʻu* (peak) consists of several sites including petroglyphs and a *koʻa*. He first learned of the sites in a book by Dennis Kawaharada, an English professor at Kapiʻolani Community College who also has an interest in Hawaiian history. Mr. Becket visited Mauna Lahilahi with Joseph Singer in the 1990s and photographed the sites. Mr. Becket mentions that he has not been back to the *mauna* (mountain) or the sites since then.

We parked along Lahilahi Street and walked into the park. The park walls are constructed of basalt stones, most likely of modern construction. Several trails branch out either leading to the east or west of Mauna Lahilahi. The park is overgrown with grass approximately 3 ft in height. *Kiawe* was also observed throughout the park.

Passing through the grass to access the petroglyphs, CSH observed a wall constructed of *pōhaku*. We stopped to observe the wall and noticed it ran east to west. Upon further observation, there were three additional walls that created a square. Mr. Becket mentioned he had never seen the enclosure before during his visit in the 1990s. He walked over the wall and examined the interior of the enclosure noting that the bottom was created of complete limestone and the walls were constructed of basalt and coral. There were two breaks in the walls, one located to the east and another to the north. Several stones to the northeastern corner and the eastern wall had potential to be possible upright stones. The function of the site was undetermined. Mr. Becket recalls being told by cultural practitioners that branch coral at a structure might indicate a ceremonial function or a burial. Due to the fact that the enclosure is adjacent to the ocean, it is difficult to determine if coral was used for construction purposes or was purposely placed at the site to indicate a function or purpose.

We exited the structure and headed *makai* toward Lahilahi Point. After scaling the shoreline, we found a modified path. Once on the path, the area opened up to various-size rocks ranging from boulders to *ʻiliʻili* (pebble) in basalt, limestone, and coral. Mr. Becket recognized the area and pointed to a rock wall facing *makai* stating that's where the petroglyphs are located. Mr. Becket traversed the rocky cliffside where he set up his camera and photographed two large *kiʻi pōhaku* (petroglyph) that resembled dogs (Figure 22). Mr. Becket mentioned that the *kiʻi pōhaku* were once defaced, as there was one area above the smaller dog petroglyph that was indecipherable. CSH inspected the area northeast of the dog petroglyphs and observed more etchings including a portion of the wall that resembled *niho* (tooth). On a past visit to Kawailoa Ahupuaʻa, Mr. Becket had pointed out several boulders with chipping that resembled *niho*. He indicated the chipped boulders were once the site of an adze quarry. Etchings could be found to the left of the *niho* chips that also resembled small dogs. To the right of the *niho* on higher boulders were petroglyphs of dogs and human figures.

Heading toward Lahilahi Point, Mr. Becket shared that the *koʻa* was actually a large *pōhaku* that ʻAiʻai, son of Ku-ula the fish god, brought from Kahiki (Figure 23). He indicated that behind the *koʻa* are two adjacent enclosures. Mr. Becket recalls that when he last visited Lahilahi Point, someone had brought a large coral head as a *hoʻokupu* (ceremonial gift) and it was placed on the

Figure 22. Photo of dog petroglyphs at Mauna Lahilahi (courtesy of Jan Becket 2015)

Figure 23. Photo of *koʻa* at Mauna Lahilahi with Waiʻanae Coast in background (courtesy of Jan Becket 2015)

wall between the two enclosures. As we approached the *koʻa*, it was evident that a homeless camp now inhabited the two enclosures and had modified the walls using part of the stones as a pathway making it difficult to determine the original construction, context, and provenance (Figure 24 and Figure 25). The *koʻa* faces the coastline, boasting a commanding view of the Waiʻanae Mountain Range including the many *puʻu* in the forefront spanning from Waiʻanae to Kahe Point. Lahilahi Point is clearly a vantage point that illustrates the cultural landscape of Waiʻanae without having to leave the shoreline.

Kamaile Heiau sits on the ridgeline dividing Mākaha from Waiʻanae. Mr. Becket recalls an archaeological survey being conducted within Mākaha Valley by Roger C. Green. Mr. Green stated in his report that there was no *heiau* below Kamaile Heiau in the *makai* portion of Mākaha Valley now occupied by a golf course and houses. According to Buddy Neller, former State Historic Preservation Division Oʻahu Archaeologist and personal friend of Mr. Becket, there were an additional five structures in the valley. The sites were later dozed. Although Kamaile Heiau still exists, the structures in the *makai* area of Mākaha Valley are now gone.

CSH and Mr. Becket headed *mauka* of Kamaile Heiau within Mākaha Valley to the Mauna Olu Estates where Kāneaki Heiau stands. Mr. Becket mentioned via email that he had not visited the *heiau* in approximately 20 years. It is one of the best preserved *heiau* on the island of Oʻahu. Unfortunately, CSH was unable to gain access to the *heiau* at the guard shack or via email through the property manager and the Mauna Olu Estates Board. Due to rock slides, the *heiau* has been closed for safety reasons.

Mr. Becket has no concerns or recommendations regarding the project. He did point out that he recalls the project area having enclosures years ago when he was a young child in the 1960s. He remembers driving to Kaʻena with his brother and seeing large site complexes within the HECO property, which are no longer there today.

6.5 Summary of *Kamaʻāina* Interviews

Mr. Becket pointed out several significant cultural sites within Mākaha Ahupuaʻa including Mauna Lahilahi, Kamaile Heiau, and Kāneaki Heiau. Mauna Lahilahi consists of several sites including an enclosure, petroglyphs, and a *koʻa*. A stone wall creating a square with several breaks in the wall sits at the bottom of the northern side of the *mauna*. The walls are constructed of basalt and coral, while the floor is completely made up of limestone. The function of the enclosure is undetermined. Mr. Becket recalls being told by cultural practitioners that branch coral at a structure might indicate a ceremonial function or a burial. However, due to the fact that the enclosure is in close proximity to the ocean, it is difficult to determine if the coral used was for construction purposes or placed to indicate a function or purpose.

To the east of the *mauna* is a pathway made of *pōhaku*. Looking to the rock wall facing Waiʻanae and Nānākuli are several petroglyphs or *kiʻi pōhaku*. Petroglyphs of dogs and possible *niho* chippings were observed on the wall. On a previous site visit to Kawailoa Ahupuaʻa, Mr. Becket stated *niho* chippings indicated the site of a possible adze quarry.

Farther past the petroglyphs were several homeless camps. Toward the point of Mauna Lahialahi was the site of a *koʻa*. The large *pōhaku* was said to be brought from Kahiki by ʻAiʻai, son of Ku-ula the fish god. Mr. Becket pointed out that behind the *koʻa* are two adjacent

Figure 24. Photo of homeless camp in back of fishing shrine at Mauna Lahilahi (courtesy of Jan Becket 2015)

Figure 25. Photo of enclosure in back of fishing shrine at Mauna Lahilahi (courtesy of Jan Becket 2015)

enclosures. However, a homeless camp now occupies the entire area behind the *ko‘a* and the walls were modified to create a pathway toward the shoreline making it difficult to determine the original construction, context, and provenance. The *ko‘a* faces the Wai‘anae coastline, boasting a commanding view of the Wai‘anae Mountain Range, which includes the many *pu‘u* in the forefront spanning from Wai‘anae to Kahe Point.

Section 7 Traditional Cultural Practices

7.1 Gathering of Plant and Food Resources

In 1793, Captain George Vancouver, the first explorer to document his observations of the leeward side of Oʻahu, described the Waiʻanae coast as barren and rocky and "nearly destitute of verdure, cultivation or inhabitants" (Vancouver 1798:217). However, he did describe a village south of Mauna Lahilahi situated in a coconut grove (Vancouver 1798:219). The beach and deep sea fishery is adjacent to Kamaile providing a diverse aquacultural resource. A fresh water spring and taro lands behind the village (Green 1980:8) provided water and *mauka* resources. LCA documentation illustrates that inhabitants settled inland near Mākaha Stream rather than on the shoreline. LCA information states that *moʻo ʻāina*, *loʻi*, *kula* (most likely to grow dryland agriculture such as sweet potatoes), and *kahawai* were present in the valley.

A previous oral history conducted by the Waiʻanae Coast Culture and Arts Society titled, *Ka Poʻe Kahiko o Waiʻanae* (1986), highlight the voices of Waiʻanae coast residents who shared their knowledge and experiences of the *moku*. Elizabeth Palilo Ahia caught *ʻōpae* and loved to pick *limu* as a child. Harvey Cornwell recalls *limu* being plentiful along the Waiʻanae coast. Varieties found include *limu-kohu* and *līpeʻepeʻe*. Charles Hanohano often fished on the Waiʻanae coast. His wife picked *ʻopihi* and *limu*. After World War II, the military erected barbed wire fencing along the beach, which affected Mr. Hanohano's gathering practices. Rita Akana's father would get people to gather coconuts from the old Waiʻanae church to make *haupia* and *kūlolo*. Coconuts were also provided by Waianae Sugar Plantation manager, Mr. Fricke. Albert Dung who was born in Waiʻanae Valley was one of eleven children. He recalls his father planting taro on their land at home. Water from Waiʻanae Valley ran through their taro patch. Mr. Dung and his siblings became acquainted with *lāʻau lapaʻau* (Hawaiian healing medicine). *Pōpolo* was used for colds; *ʻuhaloa* was used as a tea or chewed to relieve sore throat; *kukui* was used to clean the tongue of *ʻea*; *maiʻa-pōpō-ʻulu* was also used to clean out medicinally; *kaliko* was used as a laxative. John Dominis Holt, author and major contributor to the oral history project, describes the signature plant of Mākaha: the *maile-lau-liʻi*.

7.2 Burials

In 1990, at least two individuals were recovered from a crevice in Mauna Lahilahi (SIHP # -3704) (Kawachi 1990). The remains had been placed in a small hole with two large cobbles to seal it. In addition to the burials, several other sites were identified under SIHP # -3704 including a possible shrine, *koʻa*, a linear pile, an enclosure, petroglyphs, terraces, rock shelters, midden, and lithic scatters (Kennedy 1986 and Komori 1987).

In 1992, after Hurricane ʻIniki, a pit burial was exposed (Kawachi 1992). The burial included a staghorn coral at major joints and a possible *niho palaoa*.

In August 2005, CSH conducted an archaeological inventory survey for the Mākaha Bridge Replacement project (McDermott and Tulchin 2006). SIHP # -6825 yielded a cultural enriched A-horizon, a former land surface from the pre-Contact and historic period, which contained a previously disturbed burial that is most likely Native Hawaiian.

Andrew Kalinchak, a participant of the Waiʻanae coast oral history project, discussed burial caves in the mountains behind the Holt home in Mākaha Valley.

7.3 Cultural Sites

Several *heiau* stood in Mākaha Ahupuaʻa including Kamaile Heiau, Kāneʻaki Heiau, and Laukīnui Heiau. Other important *wahi pana* include Mauna Lahilahi; Malolokai Cave; Pōhaku o Kāne ("stone of the god Kāne"); the *pōhaku* known as Pāpale o Kāne ("hat of Kāne"); Pōhaku o Kīkēkē ("clapping" or "knocking" rock), which produces a sound when you clap four to five feet away from it (Clark 1977:94); and a talking stone at Malolokai.

Oral history participant, Andrew Kalinchak, recalls his grandfather chasing out thieves who once inhabited Mākaha Valley. It wasn't until the Holt family bought the valley and built their family home when the thieves were evicted. The correlation between the name Mākaha meaning "fierce" by Pukui (et al. 1974:139) and Alexander's interpreting the definition as "robbery" (1902, in Sterling and Summers 1978:60), both translations offer insight to the valley and its inhabitants.

Interviewee Jan Becket escorted CSH to several cultural sites within Mākaha Ahupuaʻa. Mauna Lahilahi located south of the project area consists of several sites including petroglyphs, an enclosure, and a *koʻa*. Mr. Becket had not been to the sites at Mauna Lahilahi since the 1990s. Petroglyphs that resemble dogs can be found on the eastern portion of Mauna Lahilahi that faces Waiʻanae and Nānākuli. Mr. Becket mentioned that the petroglyphs were once defaced. Northeast of the dog petroglyphs are more etchings including *niho* or chipped boulders that resemble teeth, which could be the possible site of an adze quarry. The etchings to the left of the *niho* resembled small dogs and human figures. The *koʻa* stands at the point of Mauna Lahilahi. The large *pōhaku* is said to have been brought to Oʻahu from Kahiki by ʻAiʻai, son of Ku-ula, the fish god. Behind the *koʻa* are two enclosures. The last time Mr. Becket was at the *koʻa*, he recalls someone had brought a large coral head as a *hoʻokupu* and placed it between the two enclosures. Since then, a homeless camp now inhabits the two enclosures and modified the walls using someof the stones to create a pathway to the shoreline making it difficult to determine the original construction, context, and provenance. The *koʻa* faces the coastline, boasting a commanding view of the Waiʻanae Mountain Range including the many *puʻu* in the forefront spanning from Waiʻanae to Kahe Point.

Mr. Becket also pointed out Kamaile Heiau, which sits on the ridgeline that divides Waiʻanae from Mākaha Ahupuaʻa. According to Buddy Neller, former SHPD Oʻahu Archaeologist and personal friend of Mr. Becket, there were an additional five structures in the valley below Kamaile Heiau. Contract archaeologist, Roger C. Green, stated in his archaeological survey of Mākaha Valley that there were no *heiau* below Kamaile Heiau. The sites were later dozed. Although Kamaile Heiau still exists, the structures in the *makai* area of Mākaha Valley are now gone.

Another *heiau* in Mākaha Valley that still exists in Kāneaki Heiau. The *heiau* is within the Mauna Olu Estates, a gated neighborhood, and is one of the best preserved cultural sites. Unfortunately due to rock slides, the *heiau* has been closed for safety reasons.

Section 8 Summary and Recommendations

CSH undertook this CIA at the request of R.M. Towill. The research and community consultation broadly covered the entire *ahupuaʻa* of Mākaha, including the current project area.

8.1 Results of Background Research

Background research for this study yielded the following results:

1. Mary Kawena Pukui translates Mākaha as "fierce" in reference to the inhabitants of the land (Pukui et al. 1974:139). Alexander (1902 in Sterling and Summers 1978:60) interprets Mākaha as "robbery" in reference to a well-known *moʻolelo* (story) regarding cannibal robbers who threatened travelers on the coastal trail through Waiʻanae Moku.
2. Older families from Waiʻanae Moku believe these negative interpretations of the meaning of the place name Mākaha and the inhabitants of the area being robbers and/or cannibal robbers are propaganda intended to discredit Native Hawaiians who continue to have a stronghold of residency on the coast (Monahan and Silva 2007).
3. The demi-god Māui is said to have spent a great deal of time on the Waiʻanae coast. Two *kaʻao* (legend) are associated with the demi-god. The first is Māui's mother, Hina, encourages him to find the birds who have the power to make fire. Māui captures the *alae ʻula* (Hawaiian gallinule or mudhen; *Gallinula chloropus sandvicensis*) and obtains the secret from it. The mudhen explains "that fire is in the water" and shows Māui how to obtain it (Beckwith 1970:229–230). The second *kaʻao* is of how Māui slowed the sun for Hina. Māui and Hina lived at Kāne-ana (Kāne's cave) at Puʻu-o-hulu. Hina was skilled in tapa making. To dry Hina's tapa, Māui found a way to slow the sun (Westervelt 1910:199).
4. Several *heiau* (pre-Christian place of worship) stood in Mākaha Ahupuaʻa including Kamaile Heiau, Kāneʻaki Heiau, and Laukīnui Heiau. Other important *wahi pana* (storied places) include Mauna Lahilahi; Malolokai Cave; Pōhaku o Kāne ("stone of the god Kāne"); the *pōhaku* (rock, stone) known as Pāpale o Kāne ("hat of Kāne"); Pōhaku o Kīkēkē ("clapping" or "knocking" rock), which produces a sound when you clap 4 to 5 ft away from it (Clark 1977:94); and a talking stone at Malolokai.
5. Early foreign accounts describe Waiʻanae Moku as rocky and barren (Vancouver 1798:217). Captain George Vancouver places a village south of Mauna Lahilahi situated in a coconut grove. The village is most likely Kamaile, as the beach and off-shore fishery were adjacent to the area. Behind the village was a freshwater spring where extensive taro lands existed.
6. According to Māhele documentation, Land Commission Awards (LCAs) were awarded in the *mauka* (toward the mountain) sections and along Mākaha Stream. No LCAs were found in the vicinity of the project area.
7. Chief Abner Pāki, father of Bernice Pauahi, was given the entire *ahupuaʻa* of Mākaha by Liliha after her husband, Boki, disappeared in 1829 (Green 1980). Pāki died in 1855 and the administrators of his estate sold his Mākaha lands to James Robinson and Company. Later, one of the partners, Owen Jones Holt, bought out the shares of the others (Ladd and Yen 1972). The Holt family dominated the economic and social scene in Mākaha

until the end of the nineteeth century. From 1997 to 1899, Holt Ranch raised horses, cattle, pigs, goats, cattle, and peacocks (Ladd and Yen 1972:4).

8. In 1880, the Waianae Sugar Company cultivated cane in three valleys: Mākaha, Waiʻanae, and Lualualei. During this time they also altered the Waiʻanae coastline by constructing a railroad. The railroad impacted the natural features of the area such as sand dunes and man-made features such as fishponds and salt ponds.
9. Holt Ranch began selling off its land in the early 1900s (Ladd and Yen 1972). The Waianae Sugar Company moved their operations to Mākaha and by 1923, the lower portion of Mākaha Valley was under sugarcane cultivation. For half a century, Mākaha was predominantly sugarcane fields until 1946 a manager's report announced plans to liquidate due to increased wages making operations no longer profitable (Condé and Best 1973:358).
10. Lack of water played a role in Waianae Sugar Company's liquidation. In the 1930s the plantation sold out to American Factors Ltd. (Amfac, Inc.). Amfac initiated a geologic study of the ground water in the mountain ridges in the back of Mākaha and Waiʻanae valleys. In 1945, James W. Golver, Ltd. was contracted to create a tunnel into the ridge in back of Mākaha Valley. Approximately 700,000 gallons of water was pumped daily for the irrigation of sugar. The following year the plantation liquidated all of its acres of land to the Honolulu Stock Exchange. Parts of the property were sold off as beach lots, shopping centers, and house lots.
11. Previous archaeological studies locate several cultural sites northwest of the project area (Site 173, *pōhaku*; Site 174, Laukinui Heiau; Site 175, Mololokai; McAllister 1933) and human remains (State Inventory of Historic Properties [SIHP] # 50-80-07-4527) with staghorn coral at major joints and a possible *niho palaoa* (whale tooth pendant worn by *aliʻi* [chief]) (Kawachi 1992). Southeast of the project area includes a pre-Contact cultural layer (SIHP # -6572); the Mākaha Bridge 3A constructed in 1937 (-6823); a subsurface cultural layer (-7031); Mākaha Bridge 3 (-6822); remains of the OR&L railroad infrastructure (-9714); a culturally enriched A horizon with a previously disturbed burial (-6825); and Farrington Highway (-6824) (McDermott and Tulchin 2006). Two burials were found farther south at Mauna Lahilahi (-3704) in addition to artifacts and sites associated to the burials (Kawachi 1990).

8.2 Results of Community Consultations

CSH attempted to contact NHOs, agencies, and community members. Below is a list of individuals who shared their *manaʻo* and *ʻike* about the project area and Mākaha Ahupuaʻa.

1. Jan Becket, retired Kamehameha Schools teacher, author, photographer, knowledgeable in cultural sites, Kona Moku Representative for the Committee on the Preservation of Historic Sites and Cultural Properties
2. Eric Enos, cultural practitioner and operates Kaʻala Farms
3. Paulette Kaʻanohi Kaleikini, descendant, cultural monitor, cultural practitioner, and resident of Nānākuli
4. Shad Kāne, OIBC, ʻEwa moku and Chair for the Committee on the Preservation of Historic Sites and Cultural Properties, founder of the Kalaeloa Heritage & Legacy Foundation

5. Donna LaFrance, Associa Hawaiʻi – property management for Mauna Olu Estates
6. Kaʻahiki Solis, Cultural Historian – Oʻahu SHPD

8.3 Impacts and Recommendations

Based on information gathered from the background and community consultation, the proposed project may potentially impact undetected *iwi kūpuna*. CSH identifies potential impcts and makes the following recommendations.

1. Previous archaeology conducted in the vicinity of the project area has yielded *iwi kūpuna* (SIHP #s 50-80-07-4527 and -6825). In addition, no archaeology has been conducted within the project area. There is also a community concern regarding impact to a possible cultural layer, which may include burials (such as SIHP # -6825). Based on these findings, there is a possibility *iwi kūpuna* may be present within the project area and that land disturbing activities during construction may uncover presently undetected burials or other cultural finds. Should burials (or other cultural finds) be encountered during ground disturbance or via construction activities, all work should cease immediately and the appropriate agencies should be notified pursuant to applicable law, HRS §6E.
2. Another community concern was minimal disturbance to the environment and Mākaha Beach users (which may include cultural practitioners such as surfers and fishermen). The community's recommendation was to have more discussion with the community and to discuss plans prior to construction.

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Appendix A LCA

No. 877, Kaana, Waianae, October 14, 1847

N.R. 497-498v2

To the Honorable Land Commissioners of the Hawaiian Islands Greetings:

I hereby tell you of my claim for land and house. This land is at Kamaile, Waianae, Island of Oahu.It is bounded on the north by the land of Kalama, on the east by the land of Paaluhi, on the south by the land of Nakai, on the west by the land of Kaakomae. I have a claim at Kamaile 2. It is bounded on the north by the land of Nakike, on the east by the land of Kahue, on the south by the land of Pio and on the west by the land of Kealoha.

The third of my land claims is bounded on the north by the land of Mahi and of Lalawalu, on the east by the land of Holi, on the south by Holi, and on the west by kula. The fourth of my land claims is at Makaha, Island of Oahu, and is bounded on all sides by the land of Alapai. My house claim is at Halana in Waianae. It is bounded on the north by Kaapuiki, on the east by the kula of Keikenui, on the south by the kula of Keikenui and the govenrment road, on the west by the lot of Kaapuiki. The fifth of my land claims is at Honolulu, Island of Oahu. On the north is the land of Maunalei, on the east the land of Makana, on the south the land of Makahopu, on the west the land of Makahopu. The second of my house lot claims is bounded on the north by the government road, on the east by the lot of Kamikana, on the south by the lot of Amala, on the west by the lot of Kuapanio.

KAANA

F.T. 293-294v9

No. 486B, Kaana, claimant, Correct Number 877

Claimant appeared & made oath that his claim was duly made out & presented by Maakuia, the name is therefore admitted to a hearing. Pahupu, sworn says, the place of claimant is a pahale called Pepeiaopili in the ili of Halona in Waianae, Oahu,

Bounded:

Mauka by the paaina

Ewa by the hau of Kanepuniu

Waialua by the land & pahale of Kaapuiki.

Claimant received his land from Pahupu in the year 1841. There has been no counter claimant from the first. At this time Keikeanu (See No. 4974, on a preceding page, Kaikeanu, claimant) claims a half of the place & has given it to Lauhulu. My opinion is Keikeanu has no just claim to any part of the place. Kaana puts in his protest to Keikeanu's claim. The place did not belong to Kaaupuiki but to Pa [sic] Pahupu from when he, Kaana, received it.

Kaana appeals to the land Commission for the whole house lot. Keikenui has long been a [illegible] resident at Waianae.

Kahelehili, sworn says, my testimony agrees with that of Pohupu above.

The other claim of Kaana is for a house lot and 4 lois in Honolulu.

His witnesses are Ii & Kaaili.

Honolulu claim of two parts remaining.

N.T. 413v9

No. 9486B, Kaana (court action)

[awarded under 877]

Claimant, sworn, Maakuia wrote his claim and has probably filed it in Honolulu, but no receipt has been returned here and approval has been granted.

Pahupu, sworn, he has seen his house lot Pepeiaopili in the ili of Halona of Waianae, Oahu.

Mauka, land enclosure

Ewa, Kanepuni hau trees

Makai, Government road

Waianae, Kaapuiki's house lot.

House lot from Pahupu in 1841, no objections, earlier, recently Keikinui had filed for a place and had bequested it to Lauhulu. Pahupu feels Keikinui had no interest there, Kaana is appealing for the place. The place is not for Kaapuiki, it had been for Pahupu and then it was given to Kaana and he is now appealing to the land officers, Keihnui has no claim there.

Kahalehili, sworn, he has known in the same way as Pahupu.

N.T. 80v10

No. 877, Apana 3, Kaana, 23 December 1851

John Ii, sworn, I have seen his house lot in Honolulu here, Kona, Oahu.

Mauka, Hotel Street

Waikiki, Thompson's lot

Makai. Booth's lot

Ewa, Kuapanio's lot.

This place had been from Poomano, Kaana's wife at the time of Liholiho before 1823 and upon his death, it was willed to Poomano, his wife. She has lived there in peace to this time.

Sarai H. Ii, sworn, I have seen this place of Kaana which was the interest of Poomano just as Ii has testified here.

[Award 877; R.P. 655; Hotel St. Honolulu Kona; 1 ap.; .07 Ac.; R.P. 465; Kapuaa Makaha Waianae; 1 ap.; 1.587 Acs; Halona Waianae; 1 ap.; .945 Ac.; Kaana for Poomano]

No. 8228, Inoaole

N.R. 517v5

To the Honorable Land Commissioners of the Hawaiian Islands, Greetings: I hereby state /my claim for/ my land and house. This land is at Laukinui in Makaha, Island of Oahu and is bounded on the north by the land of Kaawahia and the stream, on the east by the land of Hookae and the land of Kaawahia, on the south by the ko`ele, on the west by the land of Keohi and the stream.

/Translator's note: the following is apparently a note by the scribe./

There are many words of explanation concerning the claims but it was set aside by L.P. Iasona because of the smearing and because of being scratched out; therefore it is believed it was deleted. But, see the letter which was given this number/

[No. 8228 not awarded]

No. 8763, Kanakaa

N.R. 384v4

I, Kanikaa, am a claimant for land in Makaha. I have an 'ili, Hoaole, for your information

KANIKAA

[No. 8763 not awarded]

No. 9689, Nahina

No. 9861, Nahina, Makaha, January 14, 1848

N.R. 482v4 [not awarded]

To the Honorable Land Commissioners of the Hawaiian Islands, Greetings: I hereby state my claim for land at Kekio, Makaha, Island of Oahu. It is bounded on the north by the house of Kuaana, on the east by the land of Kauahipaka, on the south by the land of Kaono, on the west by the land of Kaono.My house is in the Ahupua'a and it is bounded on the north by the house of Kalua, on the east by the kula, on the south by the kula, on the west by the muliwai.

I am, with thanks, your obedient servant.

NAHINA

F.T. 314v9

No. 9861, Nahina, claimant 9 [9869]

Kauwahipaka, sworn says, the land of claimant consists of 16 lois or more in the moo aina Laulauae, ili of Kekio, ahupuaa of Makaha, Waianae, Oahu in one piece, bounded:

Mauka by the moo aina Mooiki

Ewa by the loi of same moo aina

Makai by the loi of same moo aina

Waialua by the kahawai.

Claimant received his land from Kilau in the time of Kinau & has held quiet possession of the same until now.

Manaia, sworn says, the land of claimant is truly represented as above & his own testimony agrees with the same.

N.T. 429v9

No. 9861, Nahina (court action)

Kauwahipaka, sworn, he has seen 16 or more patches in the moo land of Laulanae in the ili of Kekio of the ahupuaa of Makaha, Waianae, Oahu - 1 section.

Mauka, Mooiki, a moo land

Ewa, Some of the patches of Mooiki – patches

Makai, Some of the patches of Mooiki – patches

Waianae- A stream.

Land from Kilau at the time of Kinau. No one objected.

Manaia, sworn, he has known in the same way as Kauwahipaka.

[Award 9689; R.P. 2338; Laulauwae Makaha Waianae; 1 ap.; .957 Ac.; no documents found for 9689; See 9861 not awarded]

No. 9859, Napoe, Makaha, November 16, 1847

N.R. 481v4

To the Honorable Land Commissioners of the Hawaiian Islands, Greetings: I hereby state my claim for land at Aheakai in Makaha, Island of Oahu. It is bounded on the north by the pali, on the east by the land of Kaahaumae, on the south by the stream, on the west by the land of Kaakaumoe.

My second land is in Mooiki, in Makaha, Island of Oahu and it is bounded on the north by the land of Maeala, on the south by the land of Maeala, on the east by the land of Maeala, on the west by the land of Maeala. My house is in the Ahupua'a and it is bounded on the north by the kula and the houses of Kalua ma, on the east by a kula and the stream, on the south by the stream, on the west by the muliwai.

I am, with thanks, your obedient servant.

NAPOE

F.T. 314v9

No. 9859, Napoe, claimant

Kauwahipaka, sworn says, the land of claimant is a moo aina called Kalawa in the ili Laukini of Makaha, Waianae, Oahu. It contains 17 lois & a kula in one apana and is bounded:

Mauka by the moo aina Paeaea

Ewa by the moo aina Laukini

Makai by the moo aina Pounui & Pohakupuupuu

Waialua by the kahawai.

Claimant received his land from Kaule in the time of Boki & has held it in quiet ever since.

Nahina, sworn, confirms the above testimony as true & says his own is like it.

N.T. 429-430v9

No. 9859 Napoe (court action)

Kanahiwaka, sworn, he has seen his land Kalawa, a moo land in the ili of Laukinui, Makaha ahupuaa in Waianae. Oahu - 17 Patches in 1 section.

Mauka, Paaeae a moo land

Ewa, Paaeae a moo land, Laukinui an ili

Makai, Pounui and Pohakupuupu moo lands

Waianae, A stream.

Land from Kaule at the time of Boki, no objections.

Nahina, sworn, he has known in the same way as Kanahipaka.

[No. 9859 not awarded]

No. 9860, Kalua, Makaha, January 14, 1848

N.R. 481-482v4

To the Honorable Land Commissioners of the Hawaiian Islands, Greetings: I hereby state my claim for land at Luulauwaa in Makaha, Island of Oahu. It is bounded on the north by the land of Kalua, on the east by the land of Maeala, on the south by the land of Kauwahipaka, on the west by land of Kala. My house is in the kahawai of Makaha /ln the stream valley/. It is bounded on the north by the hau /clump/, on the east by the kula, on the south by the house of Kalua, on the west by the muliwai.

I am, with thanks, your obedient servant.

KALUA

[No. 9860 not awarded]

No. 9861, Nahina, Makaha, January 14, 1848

N.R. 482v4

To the Honorable Land Commissioners of the Hawaiian Islands, Greetings: I hereby state my claim for land at Kekio, Makaha, Island of Oahu. It is bounded on the north by the house of Kuaana, on the east by the land of Kauahipaka, on the south by the land of Kaono, on the nest by the land of Kaono.My house is in the Ahupua'a and it is bounded on the north by the house of Kalua, on the east by the kula, on the south by the kula, on the west by the muliwai.

I am, with thanks, your obedient servant.

NAHINA

F.T. 314v9

No. 9861, Nahina, claimant 9 [9869]

Kauwahipaka, sworn says, the land of claimant consists of 16 lois or more in the moo aina Laulauae, ili of Kekio, ahupuaa of Makaha, Waianae, Oahu in one piece, bounded:

Mauka by the moo aina Mooiki

Ewa by the loi of same moo aina

Makai by the loi of same moo aina

Waialua by the kahawai.

Claimant received his land from Kilau in the time of Kinau & has held quiet possession of the same until now.

Manaia, sworn says, the land of claimant is truly represented as above & his own testimony agrees with the same.

N.T. 429v9

No. 9861, Nahina (court action)

Kauwahipaka, sworn, he has seen 16 or more patches in the moo land of Laulanae in the ili of Kekio of the ahupuaa of Makaha, Waianae, Oahu - 1 section.

Mauka, Mooiki, a moo land

Ewa, Some of the patches of Mooiki – patches

Makai, Some of the patches of Mooiki – patches

Waianae- A stream.

Land from Kilau at the time of Kinau. No one objected.

Manaia, sworn, he has known in the same way as Kauwahipaka.

[No. 9861 not awarded]

Appendix E Sea Engineering, Inc., 2016. Reference in Text: (Sea Engineering, 2016), *Memorandum: Mākaha Cable Landing – Seafloor Characteristics.* Prepared by Sea Engineering, Inc. Prepared for R. M. Towill Corporation.

Sea Engineering, Inc.
Makai Research Pier
41-305 Kalanianaole Hwy.
Waimanalo, Hawaii 96795-1820
Ph: (808) 259-7966 Fax: (808) 259-8143
Email: sei@seaengineering.com
Website: www.seaengineering.com

MEMORANDUM

DATE:	January 27, 2016
TO:	Walter Chong, R.M. Towill Corp.
FROM:	Marc Ericksen, Derek Linsley
SUBJECT:	Makaha Cable Landing – Seafloor Characteristics

Makaha Beach Park has been the site of many cable landings over the years. The near shore bathymetry is well known and there is a broad sand channel connecting an offshore sand cell to the sand beach. Cables have been landed through this channel and on the beach. In general these cables are buried in the sand but can be uncovered and re-buried by seasonal movement of sand.

The proposed alignment for the fiber optic cable at Makaha is shown in Figure 1. It is proposed to land the Makaha cable via a directional-bored conduit. The cable would exit the conduit on the north side of the sand channel at the 14 meter isobath.

Makaha Beach Park encompasses approximately 490 meters of a 600 meter arcuate sand beach which is bounded by Kepuhi Point to the north and a rocky emergent reef just north of Lahilahi Point to the south. The highway crosses two stream beds near the center of the beach. These are typically dry but will occasionally flood the backshore portion of the beach in this region and cross the beach to the ocean during times of heavy rain.

Both the beach width and slope vary considerably throughout the year due to the seasonally varying wave climate. The beach is composed of medium size, well-sorted calcareous sand, and the nearshore sea bottom is comprised of alternating patches of sand and coralline reef rock. A deep sand-filled channel bisects the nearshore bottom seaward of the stream mouth. This channel has been used for landing and burying numerous communication cables. Extensive coralline limestone fringing reef platforms border both the north and south sides of the sand channel. Coral communities are well developed along this hard substratum.

The bottom at the proposed cable exit points is anticipated to be a mix of rubble/cobble and sand. Sea Engineering Inc. (2001) measured the sand thickness in the Makaha sand channel using a subbottom profiler. The survey indicates that the cables daylight in an area with a sand thickness greater than 1 meter. Because of the shifting nature of this substratum, seasonal movement of sand and scouring that occurs with surf in this area, no corals or other slow-growing sessile species are expected at the two potential exit points.

The Pacific Island Ocean Observing System's (PacIOOS) mapping program, *Voyager*, presents the National Oceanographic and Atmospheric Administration's (NOAA) benthic maps. These maps show both the geomorphological structure and biological cover types for the Makaha area. The geomorphological structure type at the potential exit points is sand. The biological cover type at the proposed exit points is uncolonized, meaning the substrate is not covered with at least 10% biological cover. Uncolonized habitat is usually found on sand or mud bottoms.

Previous survey work conducted by Sea Engineering indicates that the sand channel widens offshore of the proposed exit points. At the 17 meter water depth, the sand channel spans a width of 300 meters. Further offshore it connects to a broad sand deposit that parallels the Waianae Coast. The NOAA benthic maps indicate that the area offshore the proposed exit points is uncolonized sand. This bottom type continues to the 40 meter isobaths, the offshore extent of the NOAA maps.

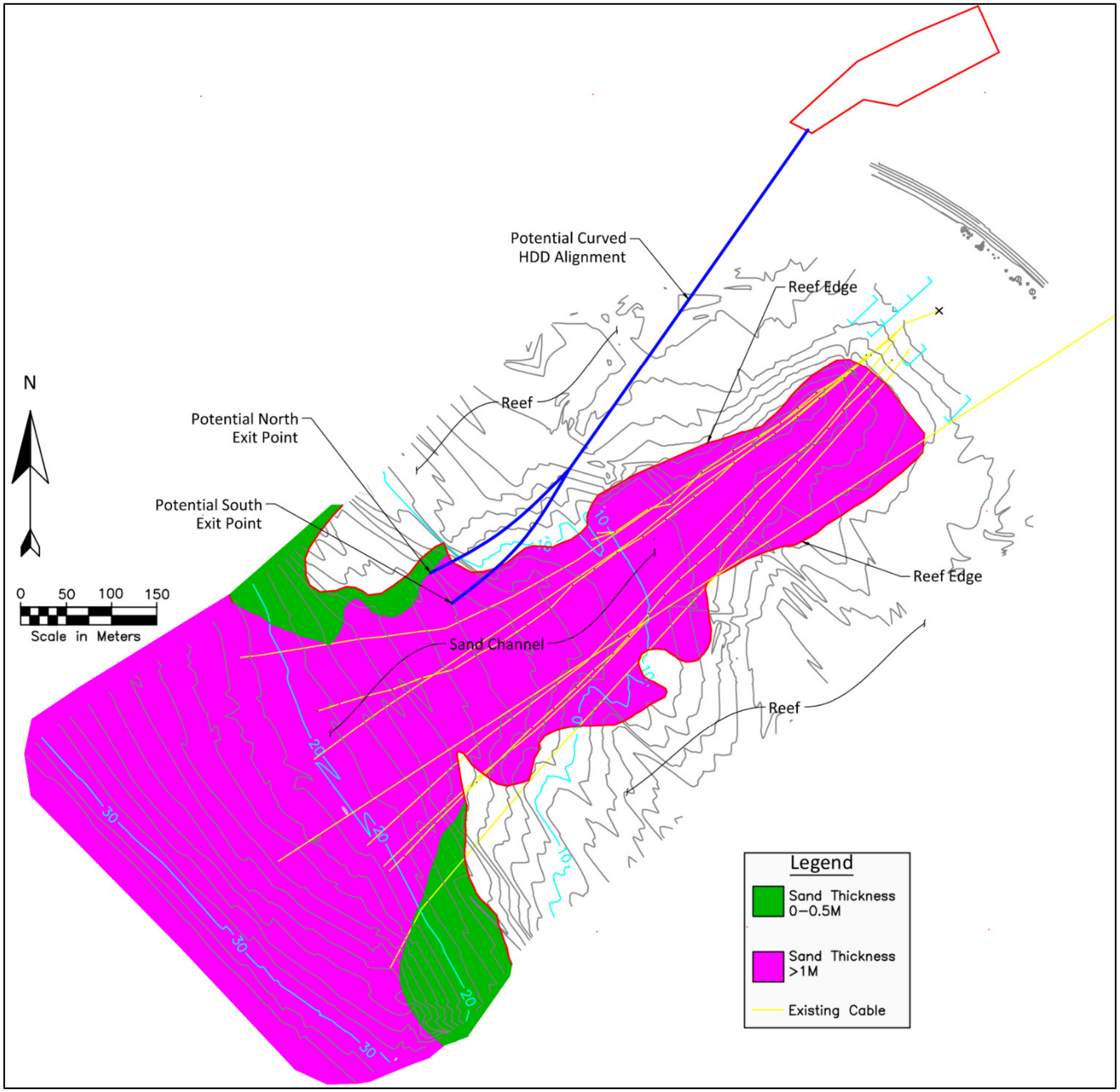

Figure 1 – Potential exit points for HDD fiber optic cable