Photo 1. Overview of the site showing dry conditions during the survey. 1/31/2019.

Photo 2. Typical Koa Haole Scrub vegetation dominated by koa haole trees and Guinea grass. 1/31/2019.

Photo 3. Native *Abutilon incanum* in the foreground. 1/31/2019.

Photo 4. Waiahole Ditch pipe and former concrete ditch crossing over a gulch in the northern section of the Project Area. 1/31/2019.

Photo 5. Eroded right bank and bed of Kalio Gulch within the Project Area. 1/31/2019.

APPENDIX B

LIST OF PLANT SPECIES OBSERVED DURING SURVEYS

The table below provides a list of plant species observed in the Project Area by Tetra Tech on January 31 and February 5, 2019. The plant names are arranged alphabetically by family and then by species into two groups: monocots and dicots. The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999), Wagner and Herbst (2003), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012).

Status:

- E = endemic = native only to the Hawaiian Islands
- I = indigenous = native to the Hawaiian Islands and elsewhere
- P = Polynesian = introduced by Polynesians
- X = introduced/ non-native = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact (Cook's arrival in the islands in 1778)

List of Plant Species Observed During Surveys for the West O'ahu Solar Project

Scientific Name and Authorship	Hawaiian/Common Name	Status
MONOCOTS		
Poaceae		
Cenchrus ciliaris L.	buffelgrass	X
Melinis repens (Willd.) Zizka	Natal redtop, Natal grass	X
Urochloa maxima (Jacq.) R.D.Webster	Guinea grass	X
DICOTS		
Apocynaceae		
Stapelia gigantea (N.E. Brown)	zulu giant	X
Asteraceae		
Pluchea carolinensis (Jacq.) G.Don	sourbush, marsh fleabane	X
Chenopodiaceae		
Salsola tragus L.	tumbleweed	X
Convolvulaceae		
Ipomoea obscura (L.) Ker Gawl.	morning glory	X
Euphorbiaceae		
Ricinus communis L.	castor bean	X
Fabaceae		
Acacia confusa Merr.	Formosa koa	X
Acacia farnesiana (L.) Wild.	klu	X
Crotalaria pallida Aiton	smooth rattlepod, pikakani	X
Indigofera spicata Forssk.	creeping indigo	X

List of Plant Species Observed During Surveys for the West O'ahu Solar Project

Scientific Name and Authorship	Hawaiian/Common Name	Status
Chamaecrista nictitans (L.) Moench	partridge pea	X
Leucaena leucocephala (Lam.) de Wit	koa haole	X
Macroptilium atropurpureum (DC.) Urb.	–	X
Mimosa pudica var. *unijuga* (Duchass. & Walp.) Griseb.	sensitive plant, sleeping grass, pua hilahila	X
Pithecellobium dulce (Roxb.) Benth.	Manila tamarind, opiuma	X
Prosopis pallida Kunth	kiawe	X
Lamiaceae		
Hyptis pectinata (L.) Poit.	comb hyptis	X
Leonotis nepetifolia (L.) R.Br.	lion's ear	X
Malvaceae		
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	X
Abutilon incanum (Link.) Sweet	hoary abutilon	I
Sida ciliaris L.	–	X
Sida fallax L.	'ilima	I
Sida sp.	–	X
Polygonaceae		
Antigonon leptopus Hook. & Arn.	Mexican creeper	X
Sterculiaceae		
Waltheria indica L.	'uhaloa	I?
Verbenaceae		
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain, oī	X

Pueo Surveys for the West O'ahu Solar Plus Storage Project

To:	AES Distributed Energy
From:	Tetra Tech, Inc.
Date:	January 2020
Subject:	West O'ahu Solar Plus Storage Project Pueo Surveys

Introduction

AES Distributed Energy, Inc. (AES) is proposing the West O'ahu Solar Plus Storage Project (Project), a 12.5-megawatt ground-mounted solar photovoltaic (PV) and battery energy storage system (BESS) facility located approximately 3 miles northeast of Kapolei on the island of O'ahu. The Project area encompasses approximately 95.5 acres in an area commonly referred to as the University of Hawai'i (UH) West O'ahu Mauka Lands property and is within tax map key 9-2-002:007.

As part of the due diligence efforts for the Project, Tetra Tech conducted general biological surveys within the Project area in January and February 2019. The results of the surveys indicate that the Project area has been heavily modified over time by agricultural practices and the introduction of invasive species. The vegetation in the Project area is primarily Koa Haole Scrub. This vegetation type is characterized by open to dense stands of non-native koa haole trees (*Leucaena leucocephala*), ranging from 4 to 8 feet in height, with guinea grass (*Urochloa maxima*) as the most abundant plant in the understory.

As part of the general biological surveys, Tetra Tech conducted a survey specifically to detect the pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) in the morning on February 5, 2019. The Hawaiian short-eared owl or pueo is listed as endangered by the State of Hawai'i only on the island of O'ahu; it is not a federally listed species. Although not detected within the Project area during the biological surveys, this species been previously reported from the surrounding areas; the nearest known observation to the Project area is near the southern edge of the UH West Oahu campus (Price and Cotín, 2018, Pueo Project, 2019). Based on the habitat that is present, Tetra Tech's biologists determined it was possible that pueo may fly through or nest within the Project Area. Because pueo is listed by the State and has the potential to be impacted by construction activities, Tetra Tech recommended at least two (preferably three) additional pueo surveys be conducted in the Project area according to the Pueo Project survey protocol (Price and Cotín 2018). This technical memorandum documents the methodology and results of the additional pueo survey efforts in the Project area.

Methodology

Tetra Tech conducted pueo surveys on the evenings of September 26, November 14, and December 19, 2019, following the protocol outlined for the Pueo Project (Price and Cotín 2018). Because most pueo detections have occurred in the evenings (M. Price/ UH Mānoa, pers. comm., September 2019; Cotin et.

al. 2018), twilight pueo surveys were conducted. Surveys began 60 – 75 minutes before sunset and finished at civil twilight. Two survey points were established in the Project area to ensure that the entire Project area was visible (see Attachments 1 and 2). A biologist was present at each survey point for the duration of each of the three surveys to increase detectability. The ground and sky within the viewshed of each survey point were scanned with binoculars and the naked eye throughout the survey period.

The following general information was collected during each survey: date, observer, GPS coordinates, start time, and end time. Environmental information was recorded, including: cloud cover, wind speed, temperature, precipitation, extent of surveyed area (maximum length of viewshed surveyed in cardinal directions), and habitat classification. For any pueo observations, the following information would be collected: detection start time, detection end time, detection type, owl behavior classification, owl vocalization description, distance from observer, direction from observer, habitat where owl observed, and courtship behavior description. All surveys were conducted in good weather with light winds, few clouds, and no precipitation.

Results and Recommendations

No pueo were documented during the three surveys within the Project area (see Attachment 3). Although pueo were not observed or heard during the surveys, this species has been reported to use the surrounding areas (Price and Cotín 2018, Pueo Project 2019). Given the habitat present, pueo could potentially forage or nest in and around the Project area. However, based on consultation with DOFAW biologists and Pueo Project researchers regarding the survey results and previous pueo detections in the vicinity, it is understood that pueo are not likely to use the Project area on a regular basis as they were not detected during any of the pueo-specific surveys (A. Siddiqui/ DOFAW, pers. comm., October 2019).

Based on the survey results, Tetra Tech recommends the following avoidance and minimization measures, which are consistent with the protocols established by UH for their West Oʻahu property as well as input from DOFAW:

- A wildlife education and observation program should be implemented for all construction and regular on-site staff. Staff should be trained to identify pueo (and other listed species) and to take appropriate steps if a pueo is detected in the Project area.
- Prior to clearing vegetation within the Project area, pre-construction pueo surveys should be conducted by a qualified biologist (following the Pueo Project survey protocol) to confirm no pueo are nesting in the area. Nests are constructed by females and are comprised of simple scrapes in the ground lined with grasses and feather down (Holt 1993).
- If a ground nest or an owl nesting on the ground is observed at any time (prior to construction, during construction, or during operation), an approximately 50-foot buffer should be established and marked in the field. In accordance with existing protocol for UH West Oʻahu, a designated UH West Oʻahu representative should be contacted immediately, and that representative should provide notification to DOFAW. No vegetation clearing should occur until pueo nesting ceases.
- If a live pueo is observed on-site by Project staff all activities within 50 feet of the bird should cease, and the bird should not be approached.

Literature Cited

Cotín, J., K.E. Davis, A. Siddiqi, and M. Price. 2018. The Pueo Project Annual Report 2018. Breeding phenology and daily activity of the Hawaiian Short-eared Owl (*Asio flammeus sandwichensis*) on O'ahu.

Holt, D.W. and S.M. Leasure. 1993. Short-eared owl (*Asio flammeus*). In The Birds of North America, No. 62 (Poole A, Gill F, editors). Philadelphia, (PA): The Academy of Natural Sciences; and Washington DC: The American Ornithologists' Union.

Price, M. and J. Cotín. 2018. The Pueo Project. Final Report. April 2017-March 2018. Population size, distribution and habitat use of the Hawaiian Short-eared Owl (*Asio flammeus sandwichensis*) on O'ahu.

Pueo Project. 2019. Pueo Distribution and Sightings Map. https://www.pueoproject.com/distribution-map

Attachment 1. Location of Pueo Survey Points within Project Area

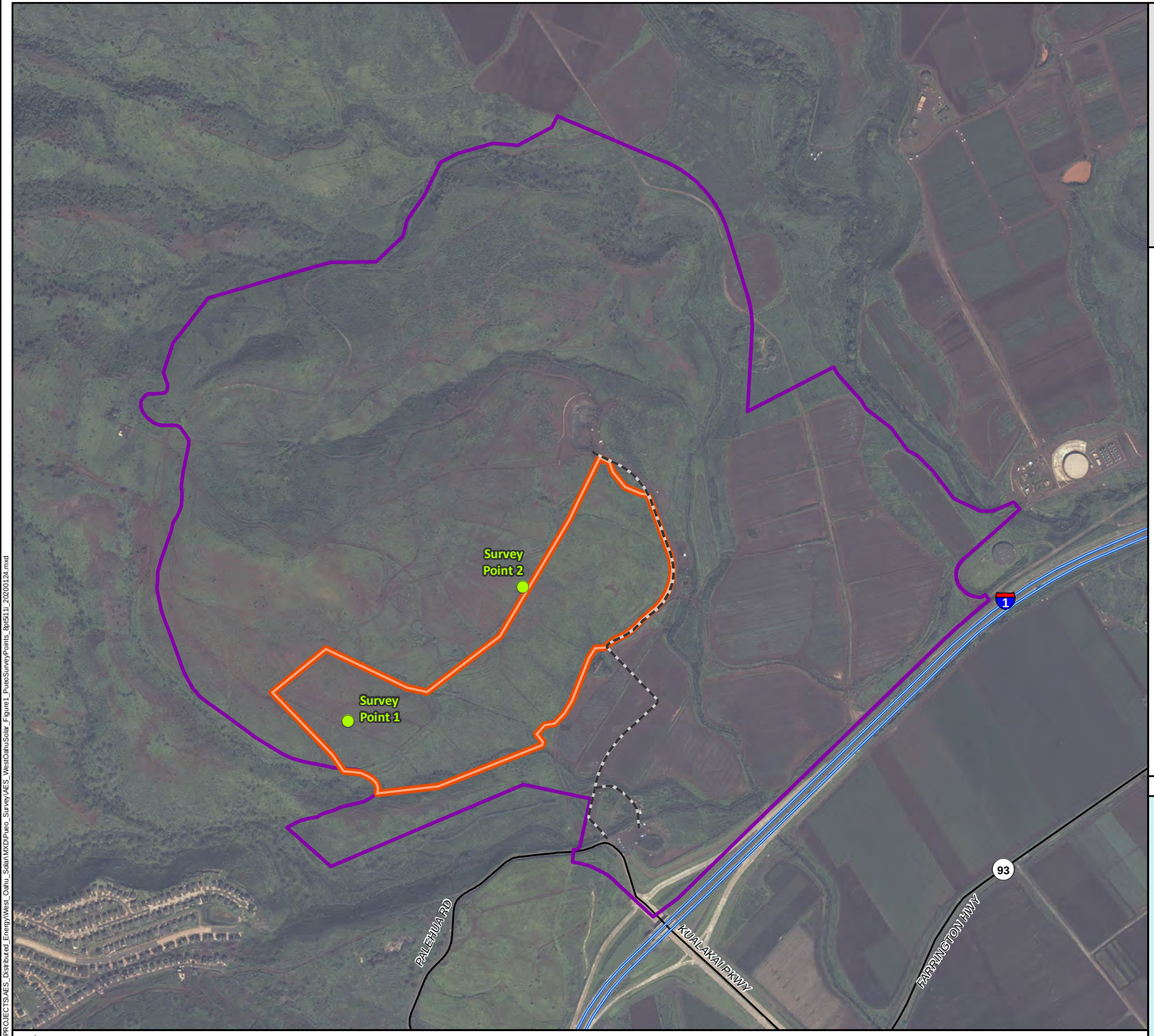


Figure 1

West Oahu Solar Plus Storage Project

AES Distributed Energy

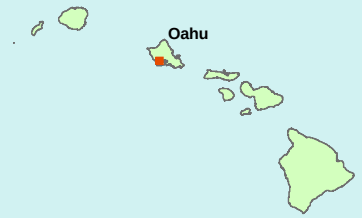
Pueo Survey Points

HONOLULU COUNTY, HI

- Project Area
- Property Boundary
- Existing Access Road
- Interstate Highway
- Roadway
- Survey Point

TETRA TECH

Reference Map



1:15,000 WGS 1984 UTM Zone 4N

0 0.25 0.5 1 Miles

NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\AES_Distributed_Energy\West_Oahu_Solar\MXD\Pueo_Survey\AES_WestOahuSolar_Figure1_PueoSurveyPoints_8in511i_20200124.mxd

Attachment 2. Photographs from the Pueo Survey Points

Photo 1. View from pueo survey point 1 looking to the southeast over the Project area. Notice the steam plant in the middle left of the photo for reference between photos of survey points 1 and 2.

Photo 2. View from pueo survey point 2 looking to the southeast over the Project area.

Attachment 3. Pueo Survey Datasheets

Pueo Project Survey Datasheet 2017

Site: UH West Solar GPS point: 286 (Western Corner) GPS coordinates: (D.dddddd, -D.dddddd) 576517 2363571

Date: 9/26/19 Visit # (1, 2 or 3): 1 Survey Start Time: 5:35 Survey Stop Time: 6:50 Observers: JD

Temperature: 80 Cloud cover (Clear, PC, MC, Cloudy): PC Rain: None Wind (0-7): 0-1

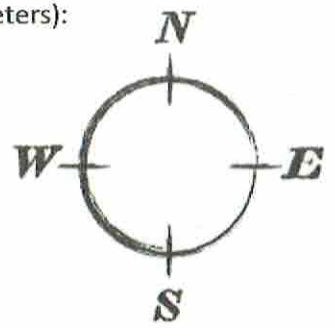
Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat
—	—	—	—	—	—	—	—
No	detections						

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grasslshort Grazed	Grasslshort Golf	Grasslshort Mowed
Grassland Fallow	Grasslands Tall >75cm	Shrublands	Non Native Forest	Native Forest	Other	Total
100%						

Surveyed area (max visible meters):

N: 400 S: 800
NE: 1600+ SW: 800
E: 1000+ W: 1000+
SE: 1000+ NW 400



Observations: Lots of cattle and cyclists onsite

Pueo Project Survey Datasheet 2017

Site: UH West Solar GPS point: survey point GPS coordinates: (D.dddddd, -D.dddddd) 0597019, 2363956 ±4m

Date: 9-26-19 Visit # (1, 2 or 3): ___ Survey Start Time: 5:15 pm Survey Stop Time: 6:50pm Observers: Philip Taylor

Temperature: 82°F Cloud cover (Clear, PC, MC, Cloudy): PC Rain: 0 Wind (0-7): 1

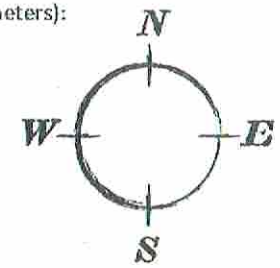
Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grassl/short Grazed	Grassl/short Golf	Grassl/short Mowed
Grassland Fallow	**Grasslands Tall >75cm**	**Shrublands**	**Non Native Forest**	**Native Forest**	**Other**	**Total**
100%						

Surveyed area (max visible meters):

N: 250 S: 1000
NE: 600 SW: 500
E: 1000 W: 150
SE: 1000 NW 200



Observations: other species observed: Cattle egret, zebra dove, red-vented bulbul, red avadavat

Limited visibility after 6:40pm.

Pueo Project Survey Datasheet 2017

Western Point

~~596557 2363566 (299) Meta~~ ?

Site: UH West Solar GPS point: (286) GPS coordinates: (D.dddddd, -D.dddddd) 596517 2363571 (256)

Date: 11/14/17 Visit # (1, 2 or 3): 2 Survey Start Time: 4:30 pm Survey Stop Time: 6:17 Observers: JD

Temperature: 78 Cloud cover (Clear, PC, MC, Cloudy): PC Rain: None Wind (0-7): 2 From South

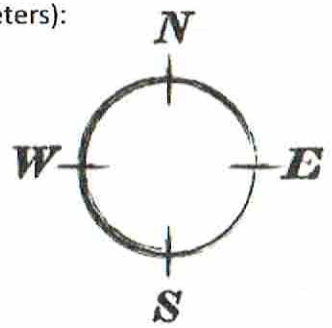
Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat
—	—	—	—	—	—	—	—

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grasslshort Grazed	Grasslshort Golf	Grasslshort Mowed
Grassland Fallow	Grasslands Tall >75cm	Shrublands	Non Native Forest	Native Forest	Other	Total
100%						

Surveyed area (max visible meters):

N: 400 S: 800
NE: 1000+ SW: 800
E: 1000+ W: 1000+
SE: 1000+ NW 400



Observations: Good conditions, no detections

Pueo Project Survey Datasheet 2017

Site: UH West GPS point: _____ GPS coordinates: (D.dddddd, -D.dddddd) 0597016, 2363956 ±3M

Date: 11-14-19 Visit # (1, 2 or 3): 2 Survey Start Time: 4:45p Survey Stop Time: 6:20p Observers: Philip Taylor

Temperature: 75°F Cloud cover (Clear, PC, MC, Cloudy): PC Rain: 0 Wind (0-7): 3

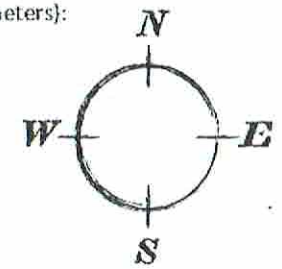
Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grasslshort Grazed	Grasslshort Golf	Grasslshort Mowed
Grassland Fallow	Grasslands Tall >75cm	Shrublands	Non Native Forest	Native Forest	Other	Total

Surveyed area (max visible meters):

N: 300 S: 500+
NE: 500+ SW: 100
E: 500+ W: 200
SE: 500+ NW 250



Observations: No pueo observed. Barn owl heard inside structure at bottom of survey area.

Pueo Project Survey Datasheet 2017

Site: VH West Solar GPS point: (Western Corner 282) GPS coordinates: (D.dddddd, -D.dddddd) 596517 2363571

Date: 12/19/19 Visit # (1, 2 or 3): 3 Survey Start Time: 4:35 PM Survey Stop Time: 6:21 PM Observers: JD

Temperature: 80 Cloud cover (Clear, PC, MC, Cloudy): PC Rain: None Wind (0-7): 2-3

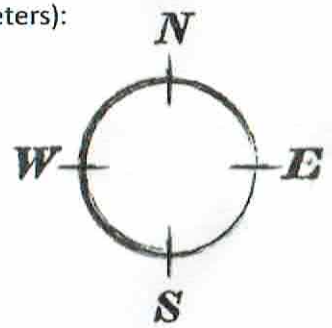
Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat
—	—	—	—	—	—	—	—

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grasslshort Grazed	Grasslshort Golf	Grasslshort Mowed
Grassland Fallow	Grasslands Tall >75cm	Shrublands	Non Native Forest	Native Forest	Other	Total

Surveyed area (max visible meters):

N: 400 S: 500+
NE: 500+ SW: 500+
E: 500+ W: 500+
SE: 500+ NW 400



Observations: A little breezy but overall good survey conditions

Pueo Project Survey Datasheet 2017

Site : UH West GPS point: East GPS coordinates: (D.dddddd, -D.dddddd) 0597019, 2363956 ± 4m

Date: 12/19/19 Visit # (1, 2 or 3): 3 Survey Start Time: 4:30p Survey Stop Time: 6:20p Observers: Phil Taylor

Temperature: 78°F Cloud cover (Clear, PC, MC, Cloudy): _____ Rain: 0 Wind (0-7): 4

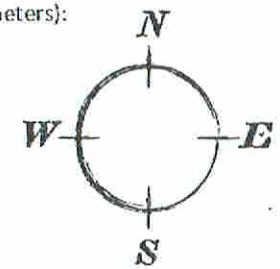
Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grasslshort Grazed	Grasslshort Golf	Grasslshort Mowed
Grassland Fallow	Grasslands Tall >75cm	Shrublands	Non Native Forest	Native Forest	Other	Total
100%						

Surveyed area (max visible meters):

N: 200 S: 500
NE: 500+ SW: 100
E: 500+ W: 100
SE: 500+ NW 100



Observations: No pueo observed.

Attachment F
Archaeological Inventory Survey Report

Draft
Archaeological Inventory Survey Report for the AES West Oʻahu Solar Project, Honouliuli Ahupuaʻa, ʻEwa District, Oʻahu TMK: [1] 9-2-002:007 (por.)

Prepared for
Tetra Tech, Inc.
on behalf of
AES Distributed Energy

Prepared by
Alison Welser, M.A.,
Scott Belluomini, B.A.,
Tyler Turran, B.A.,
David W. Shideler, M.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawaiʻi, Inc.
Kailua, Hawaiʻi
(Job Code: HONOULIULI 171)

February 2020

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Management Summary

Reference	Archaeological Inventory Survey Report for the AES West O‘ahu Solar Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-2-002:007 (por.) (Welser et al. 2020)
Date	February 2020
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: HONOULIULI 171
Investigation Permit Number	CSH completed the archaeological inventory survey (AIS) fieldwork under archaeological fieldwork permit number 19-07, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) §13-13-282.
Agencies	SHPD; Department of Planning and Permitting (DPP); Land Use Commission (LUC)
Land Jurisdiction	State of Hawai‘i
Project Proponent	AES Distributed Energy
Project Funding	AES Distributed Energy
Project Location	The project area is on undeveloped lands located in the southeastern foothills of the Wai‘anae Range, northeast of Pu‘u Makakilo and the Makakilo subdivision and about 600 m northwest of the intersection of the H-1 freeway and the Kualaka‘i Parkway. The project area is depicted on a portion of the Ewa and Schofield Barracks 2013 U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.
Project Description	The proposed AES West O‘ahu Solar project consists of construction and operation of an approximately 12.5 MW ground-mounted solar photovoltaic system, coupled with a 50 MWh battery energy storage system and related interconnection and ancillary facilities. Specifically, it includes the following major components: (1) solar photovoltaic system, (2) battery energy storage system, (3) substation and interconnection equipment, (4) a network of electrical wiring and collector lines, and (5) access roads and fencing. In addition to these facilities, the Project area would be made available for compatible agricultural activities. The solar photovoltaic system would consist of a series of solar modules mounted on a fixed-tilt racking system. The racking system would hold the modules at a fixed angle of 15 degrees facing toward the south and would be supported by steel posts, spaced approximately every 19 feet (5.8m) (varies). The posts would be installed using a hydraulic pile driver and/or augur for pre-drilling, with approximate depths of 6 feet (1.8m) (depending on soil conditions). In the event it is determined that the desired depth cannot be achieved, foundations would be pre-drilled and supported with concrete. Once mounted on the racking system, the highest point of the modules is expected to extend

	approximately 8.5 feet (2.6m) above the ground surface, with an average of approximately 3 feet (0.9m) of ground clearance below the modules. Electrical equipment (including inverters and transformers) and the battery units (housed in containers) would be installed on concrete equipment pads distributed throughout the Project area. A total of five concrete pads would be installed; each approximately 2,800 square feet (260.1 m^2) in area. The Project would also include a substation and associated electrical equipment to facilitate interconnection with the Hawaiian Electric grid. These facilities would be constructed immediately adjacent to the existing Hawaiian Electric ‘Ewa Nui #42 46kV sub-transmission line and would occupy a total of approximately 7,800 square feet (724.6m^2). A short overhead electrical connection (approximately 300 feet or 91.4m in length), supported by approximately three 60-foot or 18.3m tall wood poles, would also be installed. Electrical wiring and collector lines connecting the solar modules with the equipment pads and the substation would be installed underground; approximately 14,000 linear feet (4.267 km) of trenching would be required, with widths ranging between 5-10 feet (1.5m to 3.0m) and depths up to 4 feet (1.2m). Perimeter fencing and new access roads would also be installed within the Project area. Equipment to support compatible agricultural activities would include four beekeeping stations (each approximately 40 square feet or 3.7m^2) and two cattle pens (each with a small concrete slab for a water trough). In addition to construction of the facilities described above, grading would also occur in localized areas as needed to smooth the ground surface and for other civil engineering purposes (e.g., stormwater retention and management).
Project Acreage	The project area is approximately 101.62 acres (41.12 hectares).
Historic Preservation Regulatory Context	This AIS investigation fulfills the requirements of HAR §13-276. The AIS was conducted to identify, document, and assess the significance of historic properties within the project area, assess the potential for the project to adversely affect significant historic properties, and to provide agreed upon mitigation commitments to address any adverse impacts. This document is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-42 and HAR §13-284, as well as the project’s environmental review under HRS §343. It is also intended to support any project-related historic preservation consultation with stakeholders such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. The AIS investigation was designed in consultation with the SHPD. An *Archaeological Inventory Survey of the University of Hawai‘i West O‘ahu Campus, District of ‘Ewa, Island of O‘ahu, Hawai‘i (TMKs: 9-2-02:01, 03, and 05)* (Dega et al. 1998) that included the entirety of the

	present project area was previously accepted by SHPD on 3 February 1999 (LOG NO. 22959, DOC. NO. 9901EJ28; Appendix A). Due to the passage of time and given that the present project is different than that addressed by the 1998 report, it was agreed in consultation with Dr. Susan Lebo on 12 February 2019 that it would be appropriate to move forward with an AIS specific to this project.
Fieldwork Effort	CSH archaeologists Scott Belluomini, B.A., Alison Welser, M.A., Tyler Turran, B.A., Chris Konen, B.A., and David W. Shideler, M.A., conducted fieldwork between 4 and 6 February 2019 under the general supervision of Hallett H. Hammatt, Ph.D., Principal Investigator. This work required approximately 11 person-days to complete. Following the initial pedestrian inspection, the project area boundaries were altered slightly, extending to the north and the west, as well as south to encompass the existing access roads to be used for the project. Additional pedestrian inspection was conducted for these areas on 12 December 2019.
Historic Properties Identified and Historic Property Significance	The AIS further documented two previously identified historic properties within the project area: State Inventory of Historic Places (SIHP) # 50-80-08-5593 consists of an historic irrigation system and plantation infrastructure, including a mill building and pump station (“Pump Station 12”), bridges, troughs, transport ditches, culvert, pipes, culvert and sluice gate, and various other features related to water retention and movement. SIHP # 50-80-08-5593 was previously assessed by Dega et al. (1998) as significant under Hawai‘i State historic property significance Criteria a (be associated with events that have made an important contribution to the broad patterns of our history) and d (has yielded, or may be likely to yield, information important for research on prehistory or history). The current study assesses SIHP # 50-80-08-5593 as significant under only HAR §13-284-6 Criterion d. This historic property has yielded information on land utilization and agricultural history of the ‘Ewa Plain. However, it is not associated with specific impactful events in the area, unlike the Waiahole Ditch, which immeasurably altered the entirety of the landscape. The historic property retains integrity of location, design, materials, and workmanship. SIHP # 50-80-09-2268 consists of the Waiahole Ditch System, previously assessed by various studies. The historic property is assessed as significant pursuant to HAR §13-284-6 under Criteria a (be associated with events that have made an important contribution to the broad patterns of our history), c (embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value), and d (has yielded, or is likely to yield, information important for research on prehistory or history). The

	historic property has yielded information on agricultural history of the area and contributed greatly to the development and evolution of the ‘Ewa Plain throughout its history. The historic property retains integrity of location, design, materials, and workmanship. However, within the project area, the historic property only retains sufficient integrity of location, which is also diminished in portions of the project area due to erosion and neglect. While there are some portions that retain some integrity of design, materials, and workmanship within the project area, this integrity is diminished. The overall ditch is significant, however, the remnant portion of SIHP # 50-80-09-2268 within the project area does not retain sufficient integrity to be considered significant.
Effect Recommendations	The portion of SIHP # 50-80-09-2268 within the project area does not retain sufficient integrity to be considered significant, and therefore no further work is recommended for the historic property. Sufficient information regarding the location, extent, function, and age of the portion of SIHP # 50-80-08-5593 within the project area have been generated by the current archaeological inventory survey investigation to mitigate any adverse effect caused by the proposed project. Pursuant to HAR §13-284-7, the project-specific effect determination is “no historic properties affected.”
Mitigation Recommendations	The proposed project will have no effect on significant historic properties within the project area, therefore no mitigation is required.

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Section 1 Introduction

1.1 Project Background

At the request of Tetra Tech, Inc., and on behalf of AES Distributed Energy, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this archaeological inventory survey report (AISR) for the AES West O‘ahu Solar project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-2-002:007 (por). The project area is 101.62 acres (41.12 hectares) of undeveloped lands in the southeastern foothills of the Wai‘anae Range, northeast of Pu‘u Makakilo and the Makakilo subdivision, and 600 m northwest of the intersection of the H-1 Freeway and the Kualaka‘i Parkway. The project area is depicted on a portion of the 2013 Ewa and Schofield Barracks U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2018 aerial photograph (Figure 3).

1.2 Proposed Project Description

The proposed AES West O‘ahu Solar project consists of construction and operation of an approximately 12.5 MW ground-mounted solar photovoltaic system, coupled with a 50 MWh battery energy storage system and related interconnection and ancillary facilities (see Overall Site Plan, Figure 4). Specifically, it includes the following major components: (1) solar photovoltaic system, (2) battery energy storage system, (3) substation and interconnection equipment, (4) a network of electrical wiring and collector lines, and (5) access roads and fencing. In addition to these facilities, the Project area would be made available for compatible agricultural activities.

The solar photovoltaic system would consist of a series of solar modules mounted on a fixed-tilt racking system. The racking system would hold the modules at a fixed angle of 15 degrees facing toward the south and would be supported by steel posts, spaced approximately every 19 feet (5.8m) (varies). The posts would be installed using a hydraulic pile driver and/or augur for pre-drilling, with approximate depths of 6 feet (1.8m) (depending on soil conditions). In the event it is determined that the desired depth cannot be achieved, foundations would be pre-drilled and supported with concrete. Once mounted on the racking system, the highest point of the modules is expected to extend approximately 8.5 feet (2.6m) above the ground surface, with an average of approximately 3 feet (0.9m) of ground clearance below the modules. Electrical equipment (including inverters and transformers) and the battery units (housed in containers) would be installed on concrete equipment pads distributed throughout the Project area. A total of five concrete pads would be installed; each approximately 2,800 square feet (260.1 m^2) in area. The Project would also include a substation and associated electrical equipment to facilitate interconnection with the Hawaiian Electric grid. These facilities would be constructed immediately adjacent to the existing Hawaiian Electric ‘Ewa Nui #42 46kV sub-transmission line and would occupy a total of approximately 7,800 square feet (724.6m^2). A short overhead electrical connection (approximately 300 feet or 91.4m in length), supported by approximately three 60-foot or 18.3m tall wood poles, would also be installed. Electrical wiring and collector lines connecting the solar modules with the equipment pads and the substation would be installed underground; approximately 14,000 linear feet (4.267 km) of trenching would be required, with widths ranging between 5-10 feet (1.5m to 3.0m) and depths up to 4 feet (1.2m). Perimeter fencing and new access roads would also be installed within the Project area. Equipment to support compatible agricultural

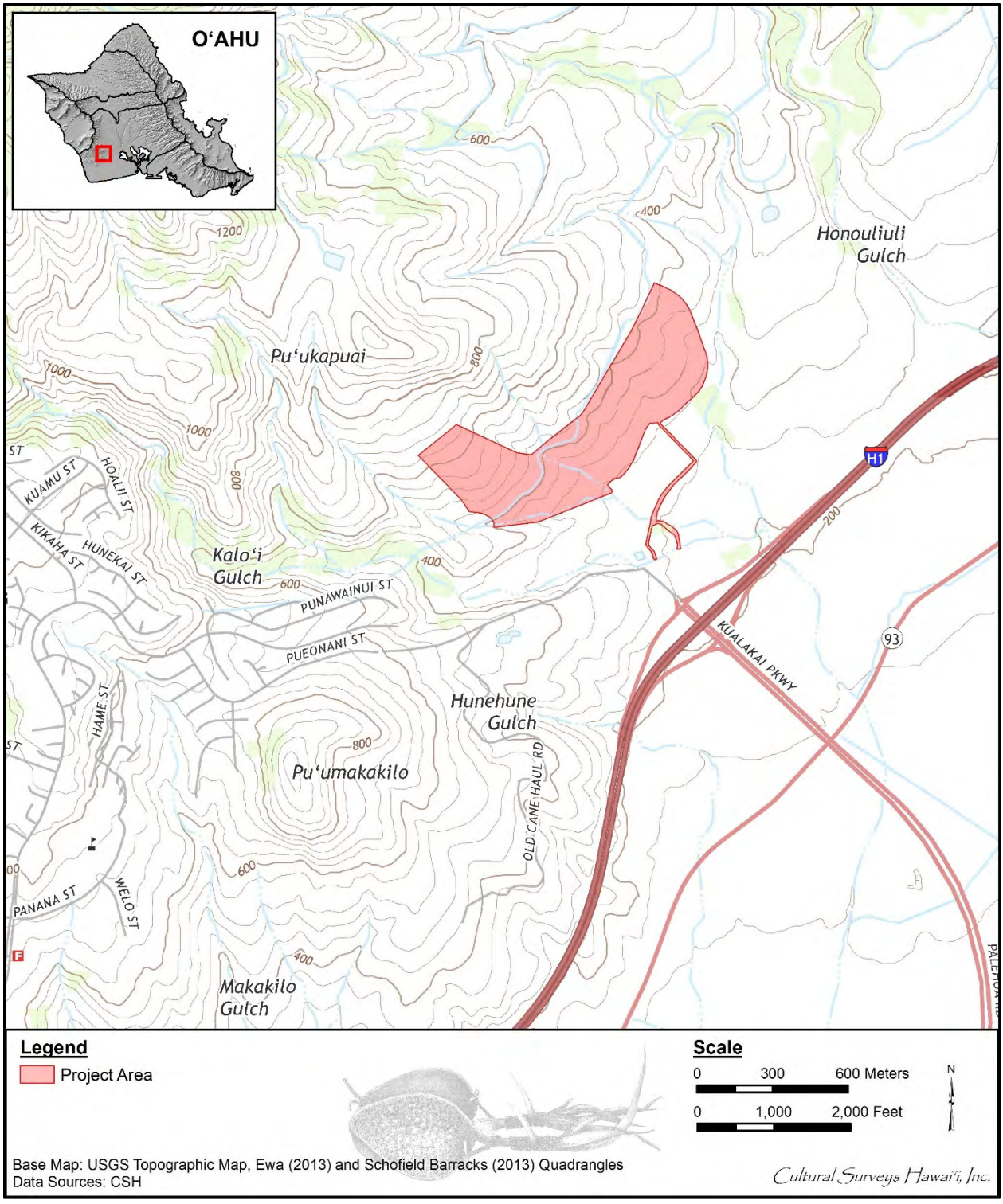

Figure 1. Portion of the 2013 Ewa and Schofield Barracks USGS 7.5-minute topographic quadrangles showing the location of the project area

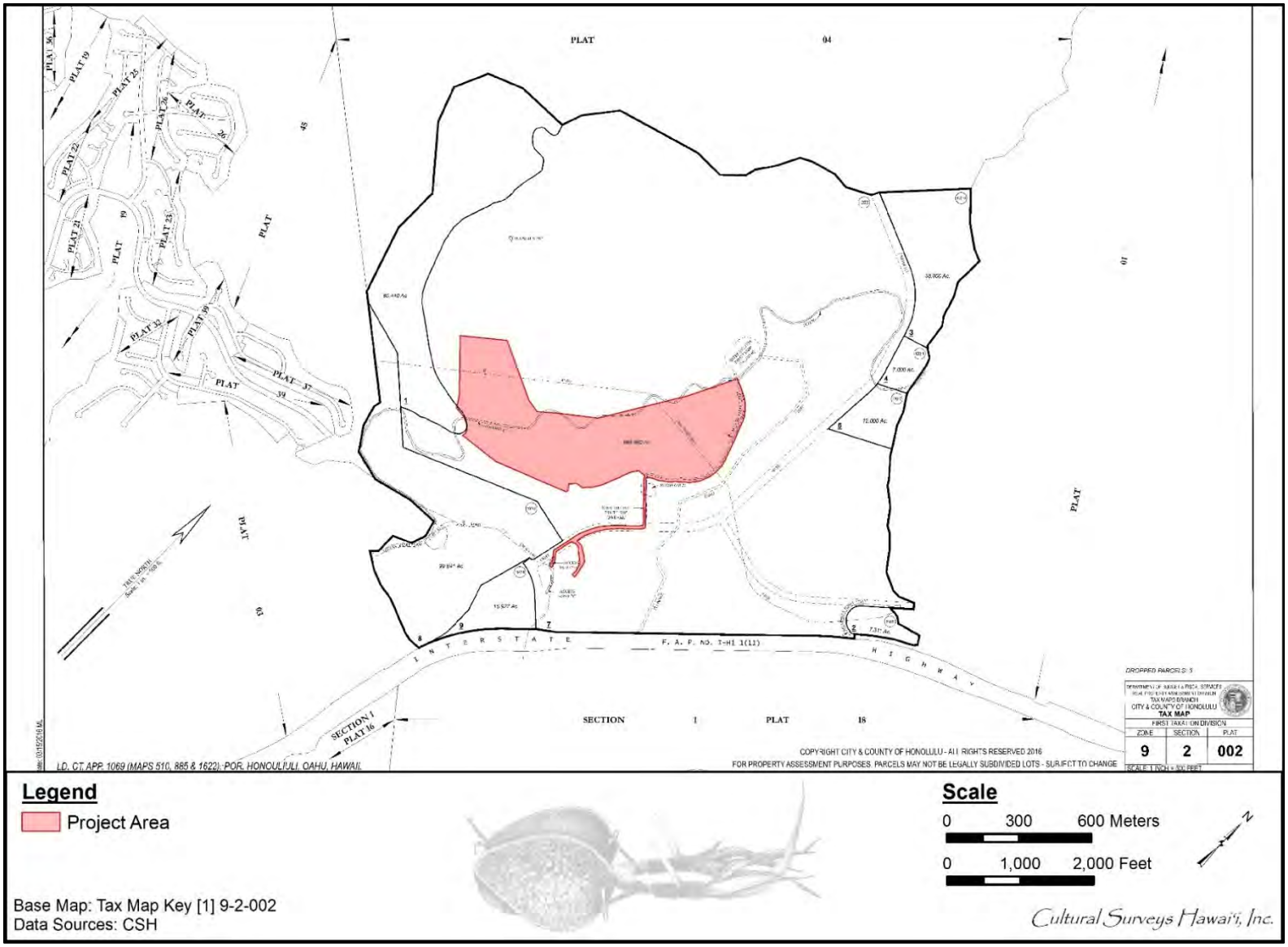

Figure 2. Tax Map Key (TMK) [1] 9-2-002 showing the location of the project area (Hawai‘i TMK Service 2014)

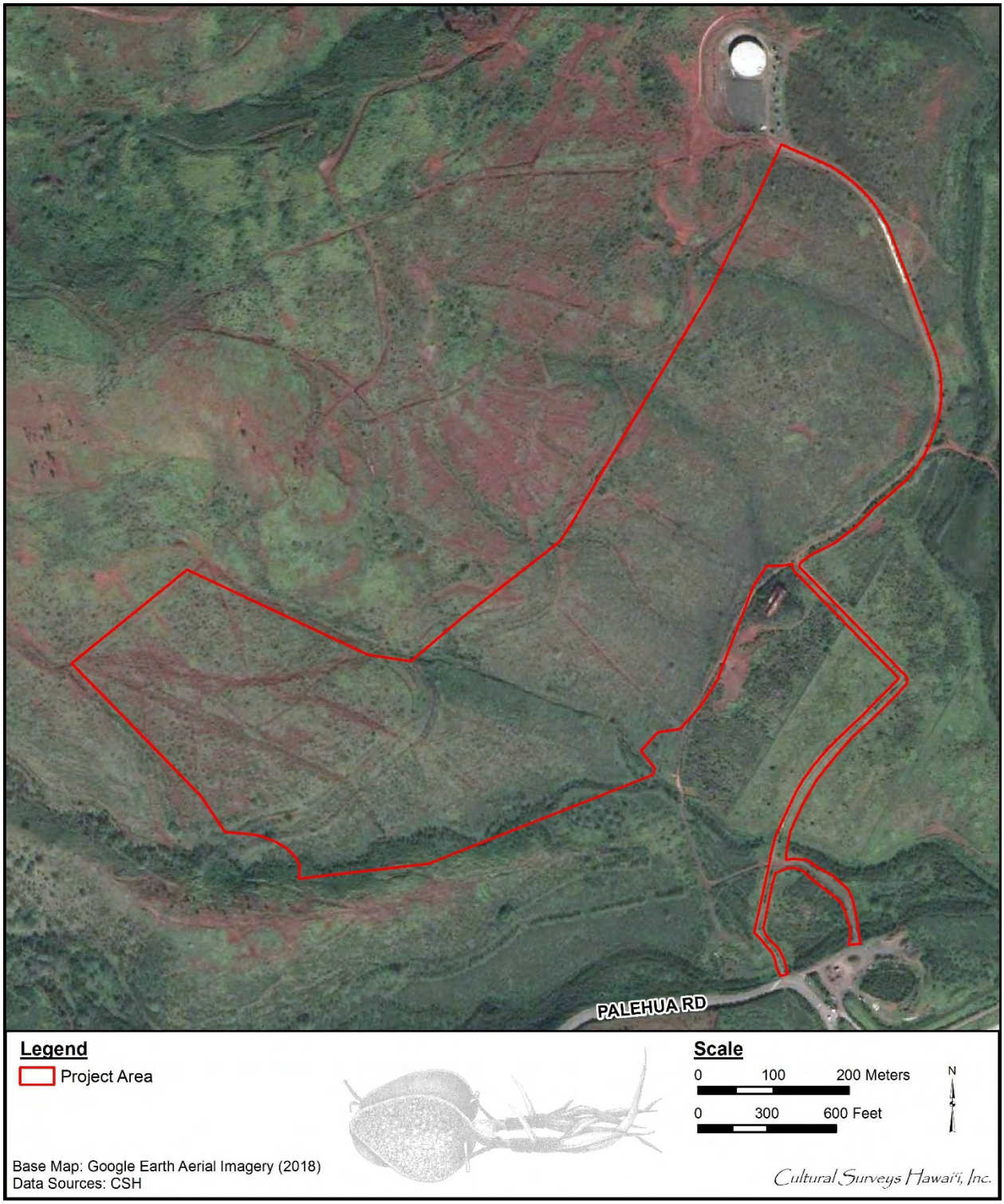

Figure 3. Aerial photograph of the project area (Google Earth 2018)

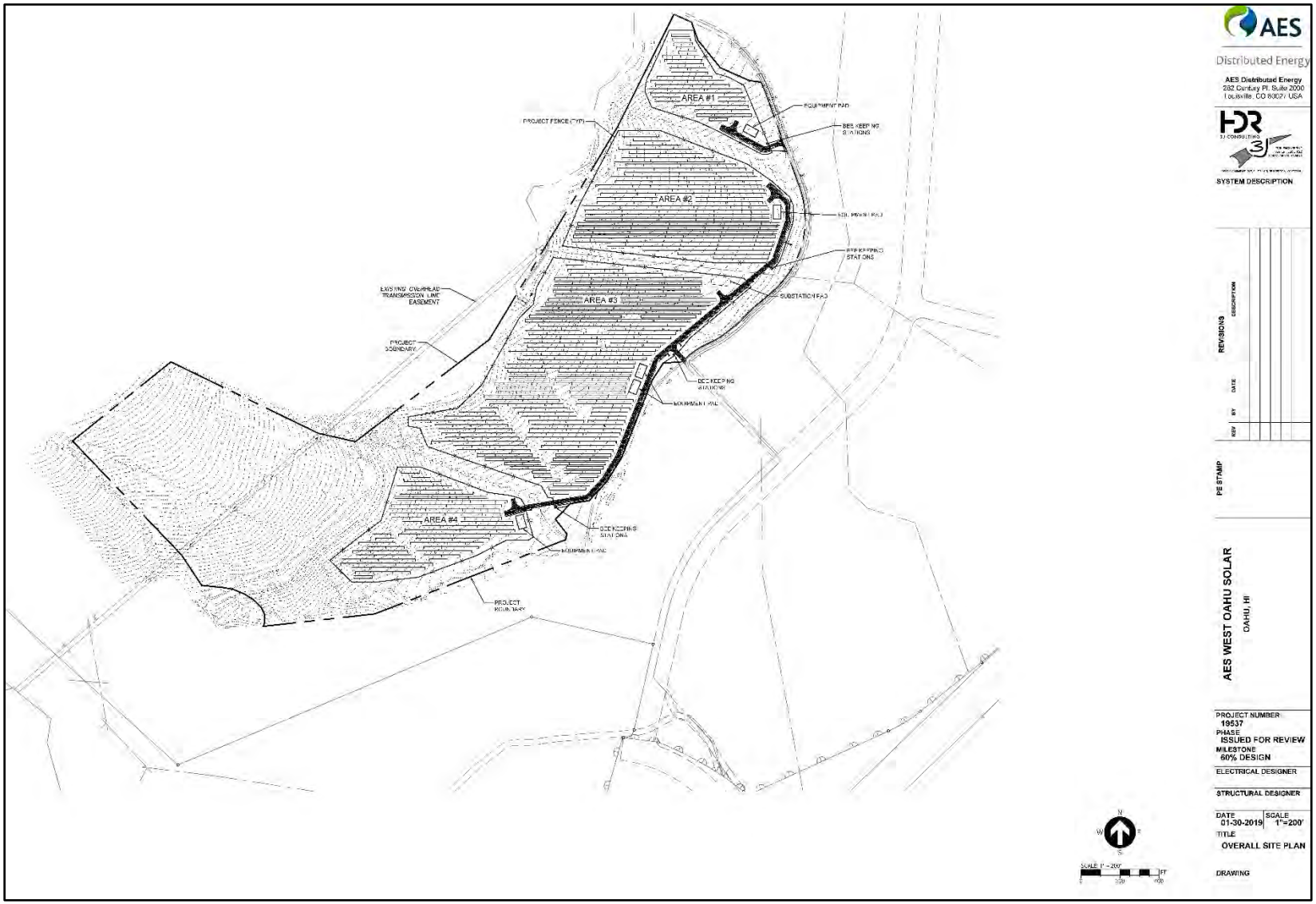

Figure 4 AES West Oahu Overall Site Plan (supplied by client, dated 1/30/2019)

activities would include four beekeeping stations (each approximately 40 square feet or 3.7m^2) and two cattle pens (each with a small concrete slab for a water trough). In addition to construction of the facilities described above, grading would also occur in localized areas as needed to smooth the ground surface and for other civil engineering purposes (e.g., stormwater retention and management).

1.1 Historic Preservation Regulatory Context and Document Purpose

The entire AES West O‘ahu Solar project area was previously addressed within an *Archaeological Inventory Survey of the University of Hawai‘i West O‘ahu Campus, District of ‘Ewa, Island of O‘ahu, Hawai‘i (TMK 9-2-02:01, 9-2-02:03, 9-2-02:05)* (Dega et al. 1998), which was accepted by the State Historic Preservation Division (SHPD) on 3 February 1999 (LOG NO. 22959, DOC. NO. 9901EJ28; Appendix A). Due to the passage of time and given that the present project is different than that addressed by the 1998 report, it was agreed in consultation with Dr. Susan Lebo on 12 February 2019 that it would be appropriate to move forward with an AIS specific to this project.

This AIS investigation fulfills the requirements of Hawai‘i Administrative Rules (HAR) §13-13-276. The AIS was conducted to identify, document, and assess the significance of historic properties within the project area, assess the potential for the project to adversely affect significant historic properties, and to provide agreed upon mitigation commitments to address any adverse impacts. This document is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-42 and HAR §13-284, as well as the project’s environmental review under HRS §343. It is also intended to support any project-related historic preservation consultation with stakeholders such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. The AIS investigation was designed in consultation with the SHPD.

1.2 Environmental Setting

1.2.1 Natural Environment

The project area is in the southeast Wai‘anae Range at an elevation of approximately 280 to 640 feet (ft) above mean sea level. The Wai‘anae Range comprises the eroded remnant of a great shield volcano, dating back in origin to approximately 2.2 to 3.8 million years ago, now in the form of a long narrow ridge shaped by erosion (Macdonald et al. 1983:420, 303). Pu‘u Kapua‘i is 0.5 km to the northwest and Pu‘u Makakilo is 1.2 km to the southwest. These are understood as “very late cones [of the Wai‘anae volcano] […] composed of a varied mixture of cinder, spatter and lava flows” (Macdonald et al. 1983:429).

Topography of the area is moderately sloping. In terms of hydrology, the area is drained by two deeply dissected gulches, Kalo‘i Gulch 300 m to the southwest and Honouliuli Gulch 700 m to the northeast. These gulches at a comparable elevation are believed to rarely run with water. Historic maps indicate a spring located approximately 2.2 km to the north. Such infrequent springs may have been key to the early human activity on the southeast Wai‘anae slope. The project area is relatively dry with a mean annual rainfall at the neighboring Station Field 105 of 703 mm or 27.7 inches (Giambelluca et al. 2013). This rainfall would be marginal for non-irrigated agriculture. Average annual temperatures range from 38° to 75° Fahrenheit (Giambelluca et al. 2014).

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 Kawaihapai clay loam (KIB), 2 to 6% slopes (KIaB), Mahana silt clay loam, 6 to 12% slopes, eroded (McC2), Mahana silt clay loam, 12 to 20% slopes, eroded (McD2), Mahana silt clay loam, 20 to 35% slopes, eroded (McE2), Molokai silty clay loam, 7 to 15% slopes (MUC) and Molokai silty clay loam, 15 to 25% slopes (MUD) soils (Figure 5).

Kawaihapai series soils are described as follows:

> This series consists of well-drained soils in drainageways and on alluvial fans on the coastal plains on the islands of Oahu and Molokai. These soils formed in alluvium derived from basic igneous rock in humid uplands. They are nearly level to moderately sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 30 to 50 inches. […] These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of kiawe, koa haole, lantana, and bermudagrass. [Foote et al. 1972:63–64]

Further, Kawaihapai clay loam, 2 to 6% slopes soils (KIB), are described as having slow runoff and a slight erosion hazard (Foote et al. 1972).

Kawaihapai stony clay loam, 2 to 6% slopes (KIaB) is described as similar to Kawaihapai clay loam, but with "enough stones to hinder, but not prevent cultivation. Runoff is slow, and the erosion hazard is slight" (Foote et al. 1972:64).

Mahana series soils are described as follows:

> This series consists of well-drained soils on uplands on the islands of Kauai and Oahu. These soils developed in volcanic ash. They are gently sloping to very steep. Elevations range from 1,000 to 3,000 feet. The annual rainfall amounts to 30 to 45 inches. […] These soils are used for pasture, woodland, wildlife habitat, irrigated sugarcane, and water supply. The natural vegetation consists of puakeawe, aalii, ricegrass, molassesgrass, silver oak, yellow foxtail, lantana, joee, Japanese tea, passion flower, and associated plants. [Foote et al. 1972:85]

Mahana silt clay loam, 6 to 12% slopes, eroded (McC2) soils are described as follows:

> This soil occurs on ridgetops and moderately sloping uplands […] Permeability is moderately rapid. Runoff is slow, and the erosion hazard is slight. […] In places roots penetrate to a depth of 5 feet or more. […] This soil is used for pasture, woodland, wildlife habitat, pineapple, and sugarcane. [Foote et al. 1972:85–86]

Mahana silt clay loam, 12 to 20% slopes, eroded (McD2) soils, are described as having medium runoff and a moderate erosion hazard, used for pasture, woodland, wildlife habitat, and sugarcane (Foote et al. 1972).

Mahana silty clay loam, 20 to 35% slopes, eroded (McE2) soils are further described as follows:

> Most of the surface layer has been removed by erosion. Runoff is very rapid, and the erosion hazard is very severe. Included in mapping were areas where all of the surface layer and part of the subsoil have been removed by erosion. Also included were small, stony areas and reddish-colored upland soils that are underlain by a

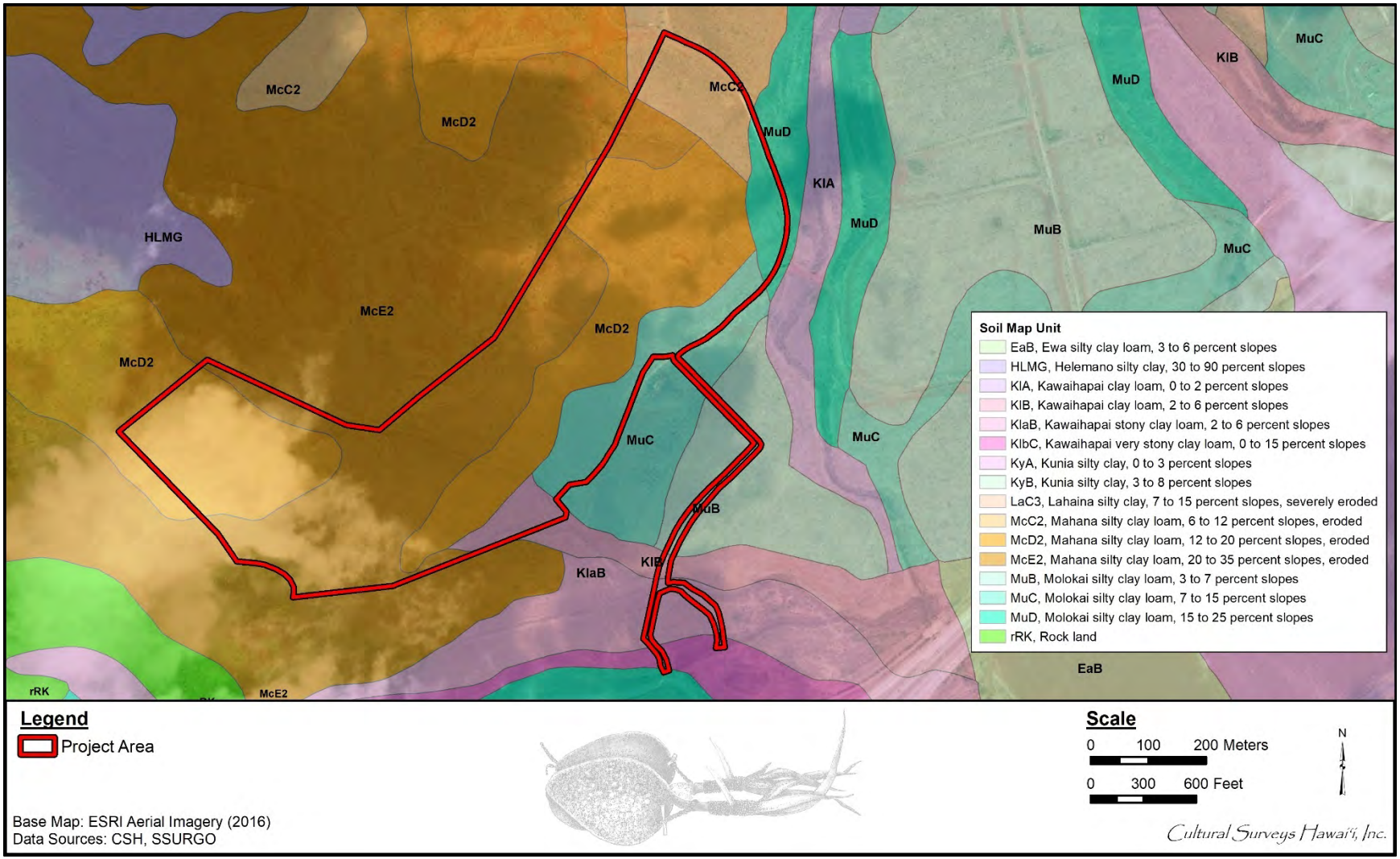

Figure 5. ESRI Aerial Imagery (2016) with overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972; USDA SSURGO 2001), indicating soil types within and surrounding the project area

> panlike layer at a depth of 15 to 50 inches. This soil is used for pasture, pineapple, and irrigated sugarcane. [Foote et al. 1972:86]

Molokai series soils are described as follows:

> This series consists of well-drained soils on uplands on the islands of Maui, Lanai, Molokai, and Oahu. These soils formed in material weathered from basic igneous rock. They are nearly level to moderately steep. Elevations range mainly from nearly sea level to 1,000 feet but are as much as 1,500 feet on Lanai. The annual rainfall amounts to 20 to 25 inches, most of which occurs between November and April […] These soils are used for sugarcane, pineapple, pasture, wildlife habitat, and homesites. The natural vegetation consists of kiawe, ilima, uhaloa, feather fingergrass, and buffelgrass. [Foote et al. 1972:96]

Molokai silty clay loam, 3 to 7% slopes (MuB) are further described as having slight to moderate erosion hazard with slow to medium runoff.

Molokai silty clay loam, 7 to 15% slopes (MUC) soils, are described as occurring on knoll slope breaks, with medium runoff and a moderate erosion hazard (Foote et al. 1972). This material is used for sugarcane, pineapple, pasture, wildlife habitat, and home sites (Foote et al. 1972).

Molokai silty clay loam, 15 to 25% slopes (MUD) soils are further described as follows:

> This soil occurs on Oahu. In most places the slope does not exceed 20 percent. Runoff is medium, and the erosion hazard is severe. Workability is slightly difficult because of the slope. Included in mapping were small areas where boulder cores are exposed. This soil is used for sugarcane and pineapple. [Foote et al. 1972:97]

Today the project area is largely covered with *haole koa* (*Leucaena leucocephala*) and exotic grasses. *Wiliwili* (*Erythrina sandwicensis*), sweet acacia or klu (*Acacia farnesiana*), and *kiawe* (*Prosopis pallida*) were also observed within the project area.

1.2.2 Built Environment

The project area was utilized for commercial sugarcane from the early twentieth century into the late 1970s. Some of the sugarcane plantation infrastructure in the vicinity was relatively elaborate, with the Waiahole Ditch transporting irrigation water from windward O‘ahu into the foothills of the southern Wai‘anae Range. The sugarcane fields have remained fallow for decades. Some plantation infrastructure is still present in the form of cane haul roads and remnant irrigation features (see Figure 3). The project area is otherwise undeveloped. The H-1 Freeway is approximately 800 m south of the project area.

Section 2 Methods

2.1 Field Methods

Fieldwork was completed under archaeological fieldwork permit number 19-07, issued by the SHPD pursuant to HAR §13-282. CSH archaeologists Scott Belluomini, B.A., Chris Konen, B.A., Tyler Turran, B.A., and Alison Welser, M.A., conducted fieldwork between 4 and 6 February 2019 under the direction of project manager David W. Shideler, M.A., and general supervision of Hallett H. Hammatt, Ph.D., Principal Investigator. Following the initial pedestrian inspection, the project area boundaries were extended slightly to the north and the west, as well as south to encompass the existing access roads to be used for the project. Additional pedestrian inspection was conducted for these areas on 12 December 2019. This work required approximately 12 person-days to complete.

2.1.1 Pedestrian Survey

Archaeologists undertook a 100%-coverage pedestrian inspection of the project area for the purpose of historic property identification and documentation. The pedestrian survey was accomplished through systematic sweeps of four CSH archaeologists spaced approximately 10 to 15 m apart based on ground visibility. Archaeologists walked transects beginning at the north end of the project area down to the southern border, oriented southwest (Figure 6). Additionally, archaeologists walked the length of the Waiahole Ditch within the project area. Archaeologists recorded the general characteristics of the project area, including vegetation, and took general photographs of the project area. Only minimal vegetation clearance was attempted for the purpose of feature documentation and photography.

When potential historic properties were identified, archaeologists documented their locations. This included GPS data collection of the historic property and associated features. All surface features visible within the project area were photographed with a scale and generally described, which often included descriptions of dimensions, shape, materials, method of construction, integrity, general condition, and evidence of age and function of the feature. Plan maps were completed for features, as well as profiles and cross-sections when appropriate. Additionally, archaeologists documented areas of the historic properties outside the project area boundaries and photographed and noted construction methods and components of the ditch for an overall description of the historic property. Note that historic property extents were defined by a 1-m radius surrounding the documented portions of all identified features.

2.1.2 GPS Data Collection

The locations of all documented components of historic properties 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 0.1 m. GPS location information was converted into GIS shape files using Trimble’s Pathfinder Office software, version 5.85, and graphically displayed using ESRI’s ArcGIS 10.6.1. CSH utilizes the NAD 83 HARN datum and UTM Zone 4N coordinate system.

In addition to feature locations, archaeologists recorded data points, which were also recorded on illustrated plan maps. For feature complexes, GPS points were taken at several data points, which were recorded on plan maps to assist in the accurate mapping of the horizontal extent of the

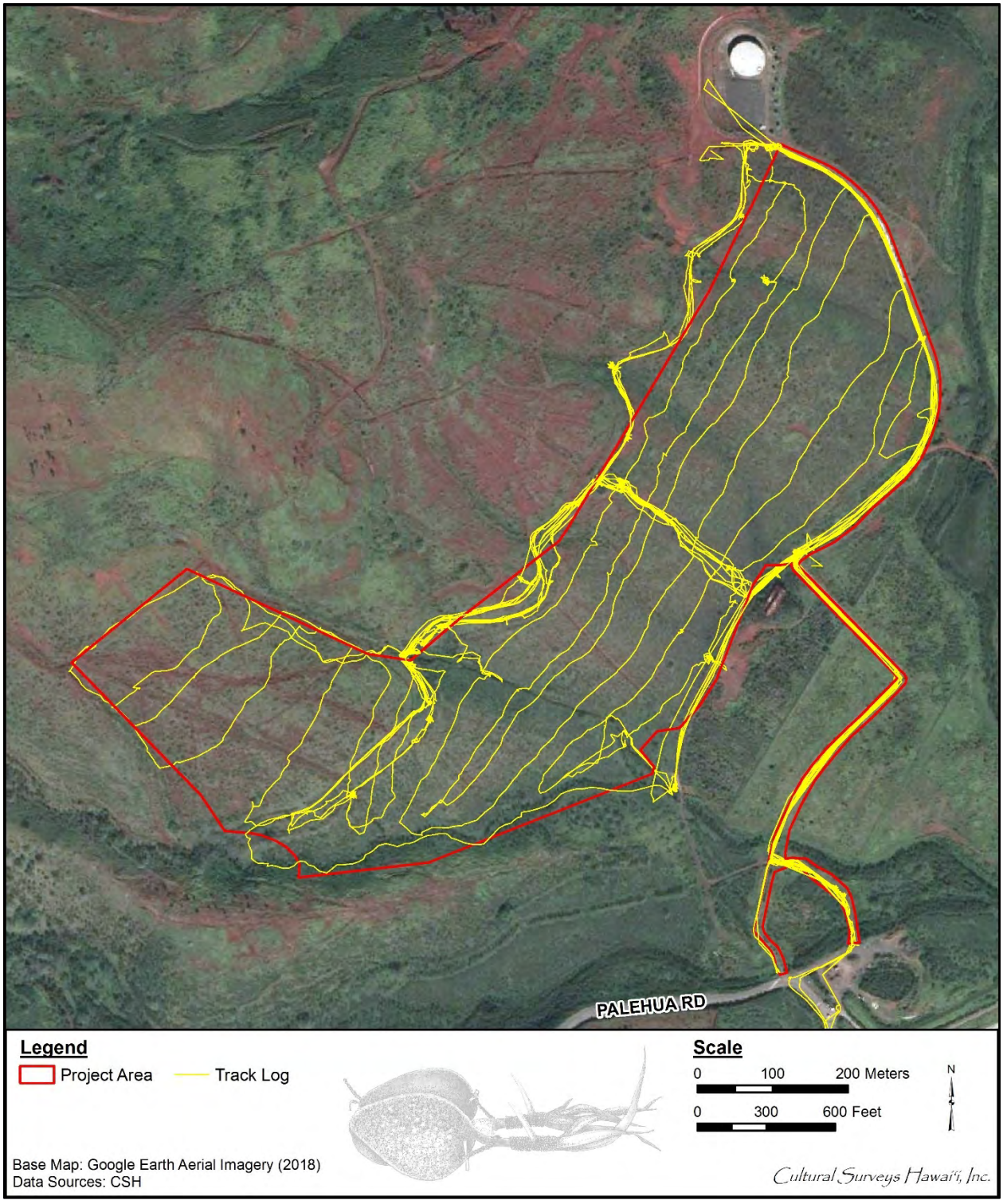

Figure 6. Aerial photograph showing the project area with overlay of two of four archaeologists' GPS track logs (Google Earth 2018)

historic property. The data points were used to geo-reference the historic properties' location using scaled illustrated maps and field notes.

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 Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (Waihona ‘Aina 2020). 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.

2.3 **Disposition of Materials**

No materials were collected during AIS fieldwork. All data generated during the course of the AIS are stored at the CSH office in Waimānalo, O‘ahu.

Section 3 Background Research

3.1 Traditional and Historical Background

The *ahupua‘a* (traditional land division) of Honouliuli is the largest, in total land area, *ahupua‘a* on the island of O‘ahu. It stretches across 16,446.4 hectares (40,640 acres) from the summit of the Wai‘anae Range in the northwest, to the west shore of Pearl Harbor in the east. It is separated from the Pearl Harbor entrance channel and the ocean by Pu‘uloa Ahupua‘a on its southeast side.

Honouliuli Ahupua‘a, as a traditional land unit, had tremendous and varied resources available for exploitation by early Hawaiians. Within Honouliuli Ahupua‘a, not only is there a long coastline fronting the normally calm waters of leeward O‘ahu, but there are also 4 miles of waterfront along the west side of the West Loch of Pearl Harbor. The “karstic desert” and marginal characterization of the limestone plain, which is the most readily visible terrain, does not do justice to the *ahupua‘a* as a whole. Although the *ahupua‘a* was rich in resources in many locations, the upper-middle portion of the Honouliuli Ahupua‘a, where the project area is located, has little recorded traditional use.

Traditional sources, the earliest maps, and early archaeological studies do not display much land use in this portion of Honouliuli Ahupua‘a. Kalo‘i Gulch, which courses just south of the project area, and Pu‘u Kapua‘i just to the northwest are the only Hawaiian-named land forms in the vicinity of the project area that have been documented (Figure 7). Pukui et al. (1974:77) translate the name “Ka-lo‘i” to mean “the taro patch” and Sterling and Summers (1978:35) relate a number of vignettes regarding the “Waihuna” or “Punahuna” hidden spring associated with Kalo‘i Gulch. Ida E.K. von Holt (in Sterling and Summers 1978:35) relates in the account of “two old Hawaiians” that the hidden spring “had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840.” “Pu‘u Kapua‘i” is translated as “footprint hill” (Pukui et al. 1974:199) but the association with that name is unclear.

The political and cultural center of the *ahupua‘a* is understood to have been the relatively dense settlement and rich lands for irrigated taro cultivation at the *‘ili* (land division smaller than an *ahupua‘a*) of Honouliuli, located where Honouliuli Stream empties into the north portion of West Loch (east of the current project area). The name of the *ahupua‘a*, translated as “dark bay” (Pukui et al. 1974:51), may refer to the nature of the waters of West Loch at the mouth of Honouliuli Stream. Early accounts and maps indicate a large settlement at the *‘ili* of Honouliuli. It is possible the political power of this village was so great it was able to extend its jurisdiction well to the northwest, into an area which might have been anticipated to fall under the dominion of the Wai‘anae ruling chiefs.

3.1.1 Mythological and Traditional Accounts

The traditions of Honouliuli Ahupua‘a have been compiled and summarized in studies by Sterling and Summers (1978), Hammatt and Folk (1981), Kelly (1991), Charvet-Pond and Davis (1992), and Maly and Rosendahl (1993). Some of the themes of these traditions include connections with Kahiki (the traditional homeland of Hawaiians, probably in reference to central Polynesia) and the special character and relationship of the places known as Pu‘u ‘o Kapolei and Kualaka‘i.

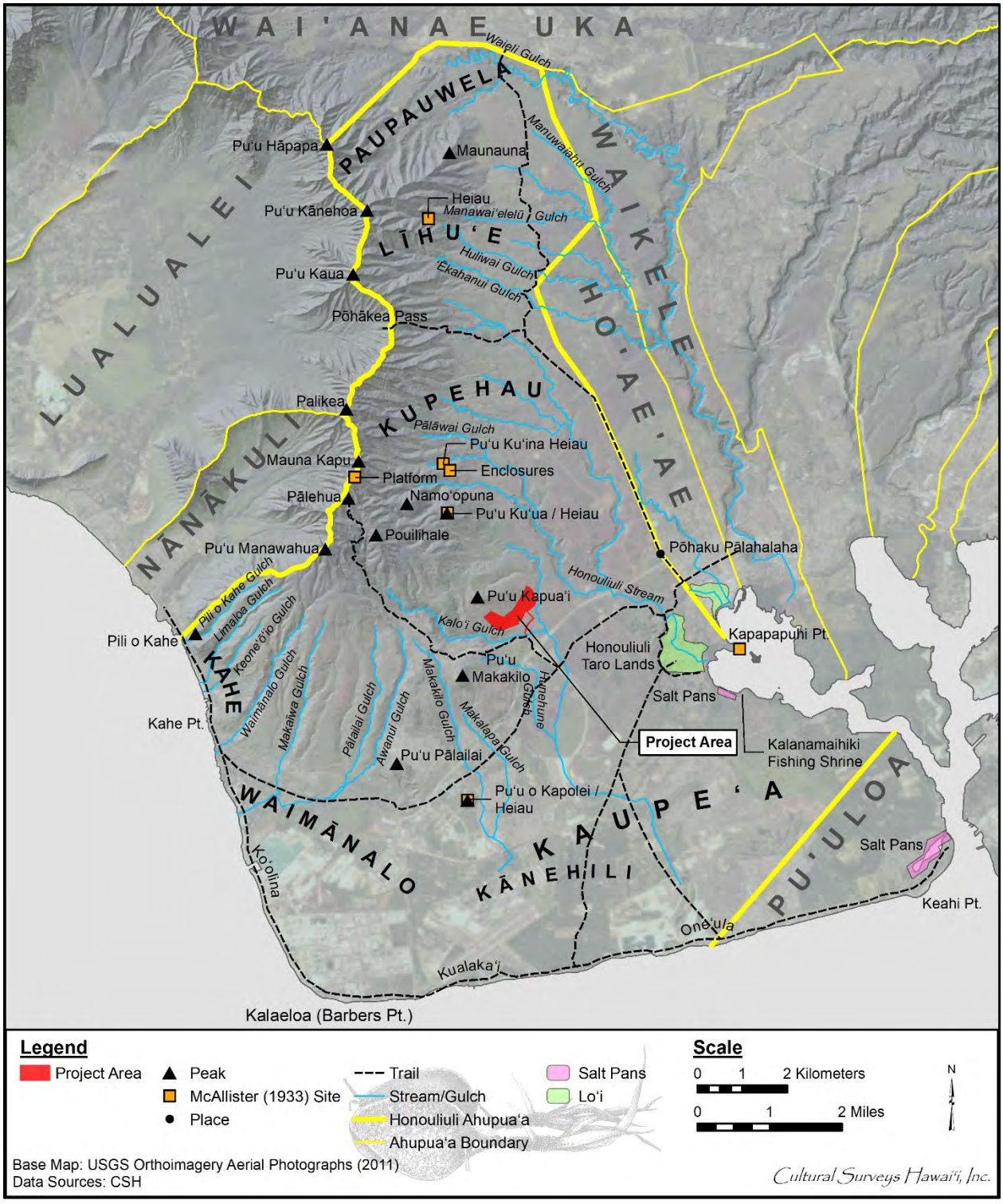

Figure 7. Portion of a USGS Orthoimagery aerial photograph (2011) showing place names, trails and streams of Honouliuli Ahupua‘a with the location of the project area

Connections with Kahiki are found in numerous place names, traditional events, and in the beings associated with Honouliuli. There are several versions of Kaha‘i leaving from Kalaeloa for a trip to Kahiki to bring breadfruit back to ‘Ewa (Kamakau 1991:110). There are several stories that associate places in the region with Kamapua‘a and the Hina family, as well as with Pele’s sisters, all of whom have strong connections with Kahiki (Kamakau 1961:111; Pukui et al. 1974:200).

Pu‘u ‘o Kapolei (approximately 4 km southwest of the project area) was one of the more sacred places in Honouliuli (cf. Sterling and Summers 1978:33). Pu‘u ‘o Kapolei is connected with Kahiki, as the hill is noted as the home of Kamapua‘a’s grandmother, Kamaunuaniho, the Kahiki ancestor to the people of O‘ahu (Fornander 1916:5:318; Kahiolo 1978:81, 107). By name, Kapolei is associated with the goddess Kapo, another connection with the Pele and Kamapua‘a stories (Kamakau 1976:14).

McAllister (1933:108) records that a *heiau* (pre-Christian place of worship) was once located on Pu‘u ‘o Kapolei, but was destroyed before his survey of 1930. The *heiau* may have been associated with the sun, as the hill was used as a point of solar reference or as a place where such observations were made (Fornander 1916:3:292). Pu‘u ‘o Kapolei might have been understood as the gate of the setting sun. It is notable that the rising sun at the eastern gate of Kumukahi in Puna is associated with the Hawaiian goddess Kapo (Emerson 1978:41). There is little specific information for Pu‘u ‘o Kapolei, but the place name itself (“hill of beloved Kapo”) is hard to ignore. It is mentioned in some cosmologies that Kū was the god of the rising sun, and Hina should be associated with the setting sun (Hina is the mother of Kamapua‘a). Fornander (1916:3:292) states, Pu‘u ‘o Kapolei may have been a jumping off place (also connected with the setting sun) and associated with the dead who roamed the adjacent Plain of Kaupe‘a.

Pu‘u ‘o Kapolei was the primary landmark for travelers between Pearl Harbor and the west O‘ahu coast, with a main trail running inland of it (‘Ī‘ī 1959:27, 29). Pu‘u ‘o Kapolei was probably the most common name used as a reference for the area of the ‘Ewa Plain in traditional Hawai‘i (Fornander 1916:2:318; Nakuina 1992:54; E.M. Nakuina 1904 in Sterling and Summers 1978:34).

3.1.2 Early Historic Period

Early historical accounts indicate the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *ali‘i* (chiefly class). This substantial population can largely be attributed to the plentiful marine and estuarine resources available at the coast, along which several sites interpreted as permanent habitations were located. Other attractive subsistence-related features of the *ahupua‘a* included irrigated lowlands suitable for wet land taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods.

Exploitation of the forest resources along the slopes of the Wai‘anae Range—as suggested by E.S. and E.G. Handy—probably acted as a viable subsistence alternative during times of famine:

> The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the *wao*, or upland jungle, than was the case on the windward coast. Yet the *wao* here was more extensive, giving greater opportunity to forage for wild foods during famine time. [Handy and Handy 1972:469–470]

These upper valley slopes may have also been a significant resource for opportunistic quarrying of basalt for the manufacturing of stone tools. This is evidenced in part by the existence of a probable quarrying site (State Inventory of Historic Places [SIHP] # 50-80-12-4322) in Makaīwa Gulch at 152 m (500 ft) above mean sea level, west of the current project area (Hammatt et al. 1991).

The Hawaiian *ali‘i* were also attracted to the region. One historical account of particular interest refers to an *ali‘i* residing in Ko Olina, southwest of the current project area:

> Ko Olina is in Waimanalo near the boundary of Ewa and Waianae. This was a vacationing place for chief Kakuhihewa and the priest Napuaikamao was the caretaker of the place. Remember reader, this Ko Olina is not situated in the Waimanalo on the Koolau side of the island but the Waimanalo in Ewa. It is a lovely and delightful place and the chief, Kakuhihewa loved this home of his. [Sterling and Summers 1978:41]

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (Figure 8 through Figure 10) which in later historic times encircled and crossed the Wai‘anae Range. These trails allowed passage from West Loch to the Honouliuli lowlands, past Pu‘u ‘o Kapolei and Waimānalo Gulch to the Wai‘anae coast and onward circumscribing the shoreline of O‘ahu (‘Ī‘ī 1959:96–98). The main trail along the south shore of O‘ahu would have been approximately 1.5 km to the southeast. A main trail extending up the central valley of O‘ahu would have been approximately 3 km to the east. The 1825 Malden map (see Figure 9) shows a trail extending from the main trail along the south shore of O‘ahu into the uplands in the Pālehua area, passing just a couple hundred meters to the southwest of the project area. The 1873 Alexander map (see Figure 10), one of the earliest detailed maps of the vicinity, shows no development near the project area.

Other early historical accounts of the general region typically refer to the more populated areas of the ‘Ewa district, where missions and schools were established, and subsistence resources were perceived to be greater. However, the presence of archaeological sites along the coral plains and coast of southwest Honouliuli Ahupua‘a indicate prehistoric and early historic populations also adapted to less inviting areas, despite the environmental hardships.

Subsequent to Western Contact in the area, the landscape of the ‘Ewa Plain and Wai‘anae slopes was adversely affected by the removal of the sandalwood and other trees, and the introduction of domesticated animals and new vegetation. Goats, sheep, and cattle were brought to the Hawaiian Islands by Vancouver in the early 1790s and allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Wai‘anae by at least 1840 (Frierson 1972:10). During this time, perhaps as early as 1790, exotic vegetation species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates for the introduction of exotic vegetation are given by R. Smith and outlined by Frierson (1972:10–11):

1. ‘early,’ c. 1790: for the establishment of Prickly pear cactus, (*Opuntia tuna), Haole koa, (Leucaena leucocephala)* and Guava (*Psidium guajava)*
2. 1835-1840: Burmuda [*sic*] grass (*Cynodon dactylon)* and Wire grass (*Eleusine indica)*
3. 1858: Lantana (*Lantana camara)*

The *kiawe* tree (*Prosopis pallida*) was also introduced during this period, either in 1828 or 1837 (Frierson 1972:11).

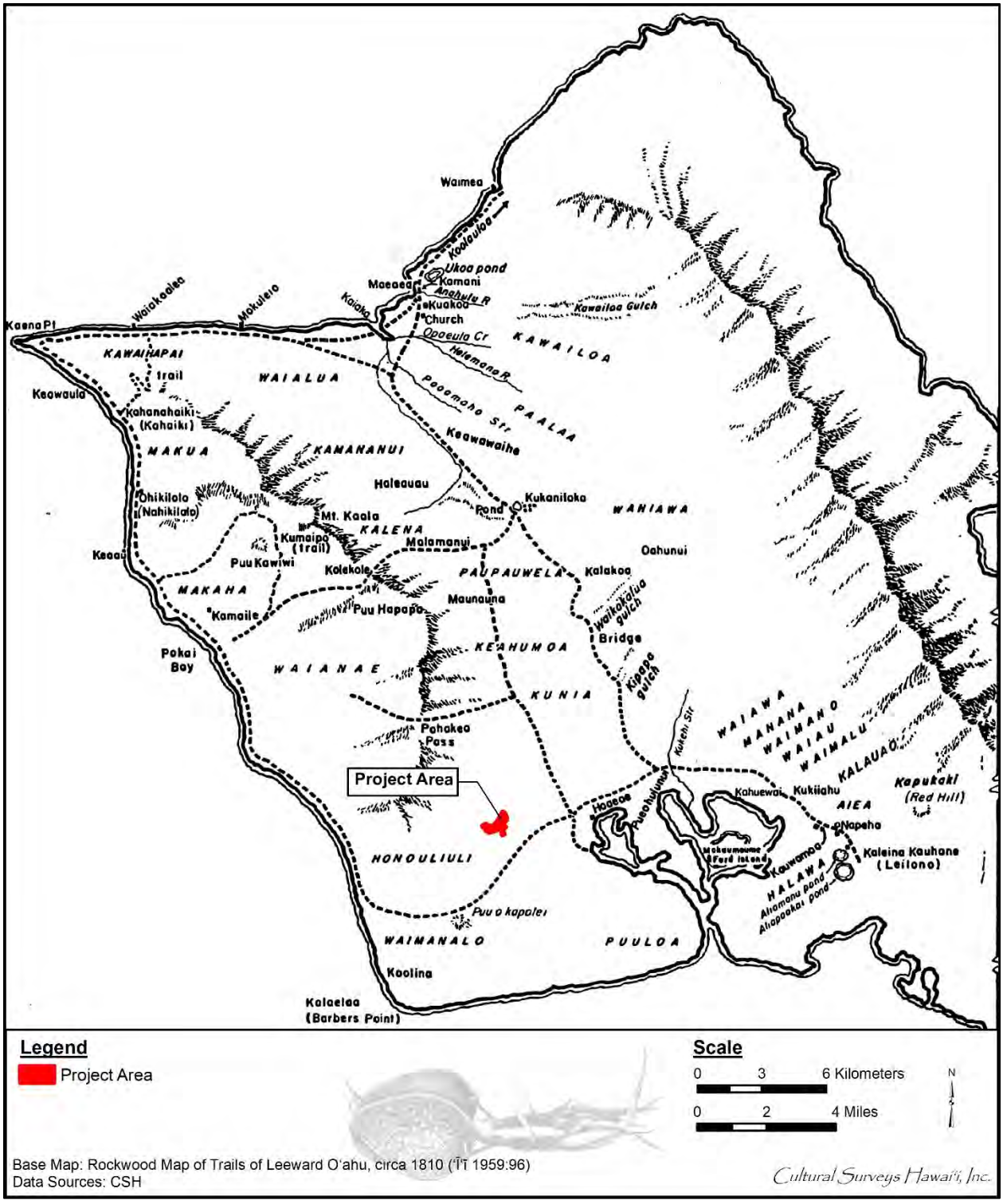

Figure 8. Portion of the 1810 Rockwood map of trails of Leeward O‘ahu with overlay of project area (Īʻī 1959:96)

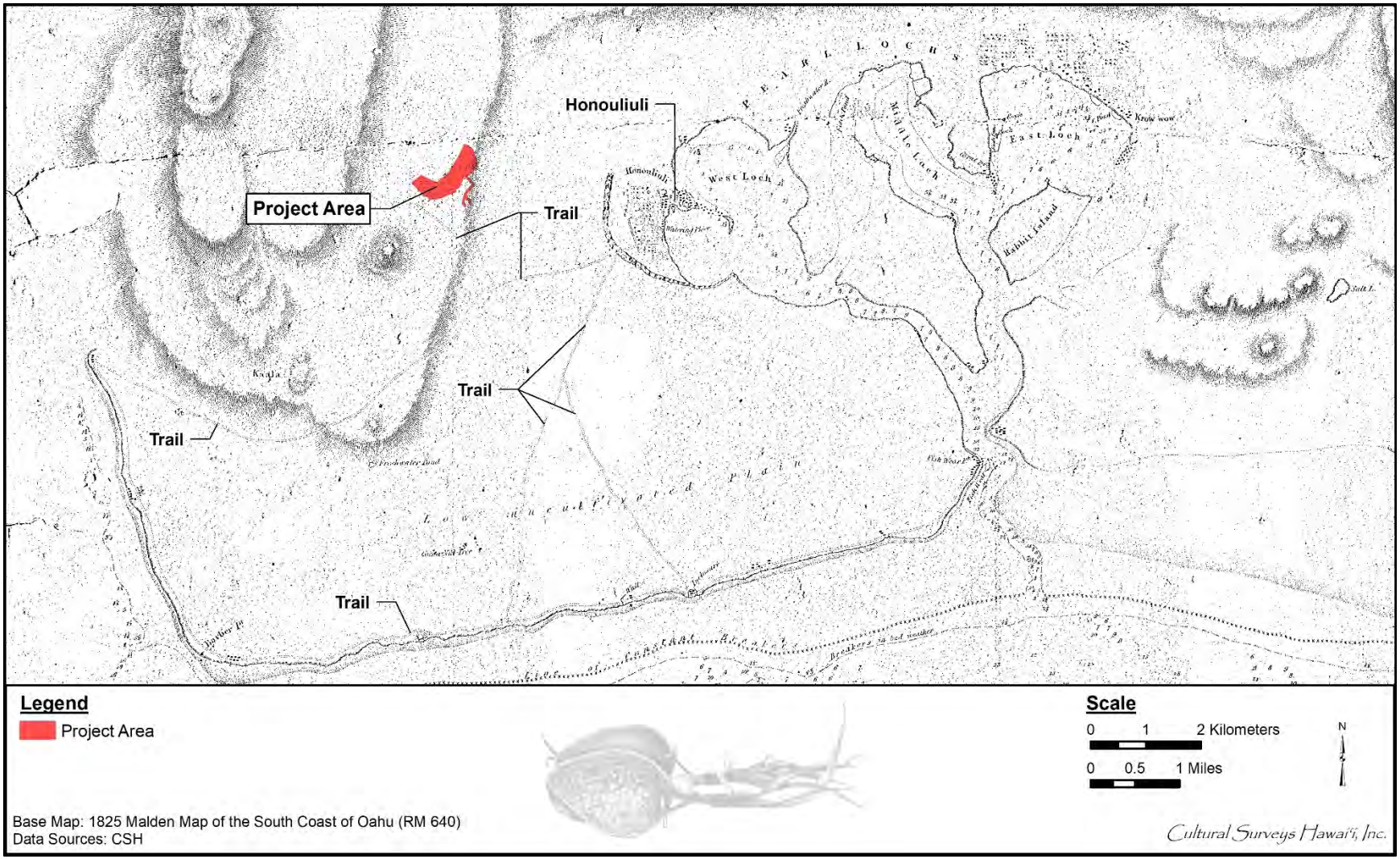

Figure 9. Portion of 1825 Malden map of the South Coast of Oahu (RM 640) showing the location of the project area