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August 13, 2019

Mr. Scott Glenn, 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: Final Environmental Assessment (FEA), Proposed Kunia Wells IV Exploratory Wells Project, Ewa, Oahu, Hawaii - Tax Map Key: 9-4-003: 010

With this letter, the Honolulu Board of Water Supply (BWS) transmits a Final Environmental Assessment (FEA) and Finding of No Significant Impact (FONSI) for the Kunia Wells IV Exploratory Wells Project. The project is located in the Ewa District, on the island of Oahu on a BWS-owned parcel identified by Tax Map Key: 9-4-003: 010. The property is approximately 1.9 acres in size and contains the existing Kunia 665' Reservoir. Publication is requested for the next available edition of the Environmental Notice.

Enclosed is a completed Office of Environmental Quality Control (OEQC) Publication Form, one copy of the FEA-FONSI, an Adobe Acrobat PDF file of the FEA-FONSI, and an electronic copy of the OEQC Publication Form in Microsoft Word.

If there are any questions, please contact Joanne Hiramatsu at Belt Collins Hawaii LLC at 521-5361.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Enclosures:

1. One hard copy of the OEQC Publication Form
2. ~~One~~ Two hard copy of the FEA-FONSI
3. ~~One~~ Two compact disc with the FEA-FONSI and OEQC Publication Form

20-054

AGENCY
PUBLICATION FORM

Project Name:	BWS Kunia Wells IV Exploratory Wells Project
Project Short Name:	Kunia Wells IV Exploratory Wells
HRS §343-5 Trigger(s):	(1) Propose the use of county lands and the use of county funds
Island(s):	O'ahu
Judicial District(s):	'Ewa
TMK(s):	9-4-003:010
Permit(s)/Approval(s):	various (see document)
Proposing/Determining Agency:	Honolulu Board of Water Supply Ernest Y.W. Lau, Manager and Chief Engineer
Contact Name, Email, Telephone, Address	Arlen Ledward Board of Water Supply 630 S. Beretania St., Honolulu, HI 96843 (808) 748-5061 Email: aledward@hbws.org
Accepting Authority:	
Contact Name, Email, Telephone, Address	
Consultant:	Belt Collins Hawaii
Contact Name, Email, Telephone, Address	Joanne Hiramatsu 2153 North King Street, Suite 200, Honolulu, HI 96819 (808) 846-3309, jhiramatsu@bchdesign.com

Status (select one)	**Submittal Requirements**
____ DEA-AFNSI	Submit 1) the proposing 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.
__X__ FEA-FONSI	Submit 1) the proposing 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 proposing 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 proposing 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 accepting authority, 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 accepting authority, 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 accepting authority simultaneously transmits to both the OEQC and the proposing agency 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	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.

____ Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency 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

The Honolulu Board of Water Supply (BWS) proposes four (4) exploratory wells on an existing BWS owned site in Kunia, O'ahu. The purpose for this project is to drill, case ,and test the exploratory wells for sufficient water capacity and acceptable water quality. Presently, the Kunia 665' Reservoir and a reservoir pad exist on-site. The reservoir pad is for a future proposed 2.0 million gallon tank. Placement of the proposed exploratory wells considers proximity to the reservoir pad and would not preclude the installation of the second reservoir tank in the future.

If the exploratory wells can be successfully developed for water production, they will be placed into service at a later date. When this happens, the wells will provide additional supply to meet the projected increase in water demand. Each of the wells is expected to produce 1.5 Million Gallons Per Day (MGD), for a total capacity of 6.0 MGD (4 wells) on the project site. Based on this expected yield, two wells will be needed to meet Average Daily Demand, and three wells will be needed to meet the Maximum Daily Demand. A fourth well is proposed for standby operations.

FINAL ENVIRONMENTAL ASSESSMENT

KUNIA WELLS IV EXPLORATORY WELLS PROJECT

‘Ewa, O‘ahu, Hawai‘i

Board of Water Supply
City and County of Honolulu

August 2019

FINAL ENVIRONMENTAL ASSESSMENT

KUNIA WELLS IV EXPLORATORY WELLS PROJECT

‘Ewa, O‘ahu, Hawai‘i

August 2019

Prepared for

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

Prepared by

BELT COLLINS HAWAII LLC
HONOLULU, HAWAI‘I

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Appendix A Public and Agency Pre-consultation Comments and Responses and Draft Evironmental Assessment Comments and Responses
Appendix B Flora and Fauna Survey
Appendix C Archaeological Literature Review and Field Inspection
Appendix D Cultural Assessment for the Kunia Wells IV Exploratory Project

ACRONYMS AND ABBREVIATIONS

ADD	Average Day Demand
AG-1	Agricultural Restricted
BMP	Best Management Practices
BWS	City and County of Honolulu, Board of Water Supply
CIP	Capital Improvement Program
City	City and County of Honolulu
COSCP	Central O‘ahu Sustainable Communities Plan
COWMP	Central O‘ahu Water Management Plan
CSH	Cultural Surveys Hawai‘i
CWRM	State of Hawai‘i, Commission on Water Resource Management
CZM	Coastal Zone Management
DBEDT	State of Hawai‘i, Department of Business, Economic Development and Tourism
DDC	City and County of Honolulu, Department of Design and Construction
DFM	City and County of Honolulu, Department of Facility Maintenance
DHHL	State of Hawai‘i, Department of Hawaiian Home Lands
DLNR	State of Hawai‘i, Department of Land and Natural Resources
DOA	State of Hawai‘i, Department of Agriculture
DOH	State of Hawai‘i, Department of Health
DOT	State of Hawai‘i, Department of Transportation
DPP	City and County of Honolulu, Department of Planning and Permitting
DPR	City and County of Honolulu, Department of Parks and Recreation
DTS	City and County of Honolulu, Department of Transportation Services
EA	Environmental Assessment
EMS	Emergency Medical Service
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
GAC	Granular Activated Carbon
HAR	Hawai‘i Administrative Rules
HDOA	Hawai‘i Department of Agriculture
HECO	Hawaiian Electric Company
HFD	City and County of Honolulu, Honolulu Fire Department
HPD	City and County of Honolulu, Honolulu Police Department
HRS	Hawai‘i Revised Statutes
IBC	International Building Code

KyA	Kunia silty clay, 0 to 3 percent slopes
LCA	Land Commission Awards
LUO	Land Use Ordinance
MBTA	Migratory Bird Treaty Act
MDD	Maximum Daily Demand
MG	Million-Gallon
MGD	Million Gallons per Day
msl	mean sea level
NPDES	National Pollutant Discharge Elimination System
OEQC	State of Hawai‘i, Office of Environmental Quality Control
OHA	State of Hawai‘i, Office of Hawaiian Affairs
$PM_{2.5}$	Particulate Matter (2.5 microns or smaller diameter)
PM_{10}	Particulate Matter (10 microns or smaller diameter)
SCP	Sustainable Communities Plan
SHPD	State of Hawai‘i, State Historic Preservation Division
SMA	Special Management Area
SWCA	SWCA Environmental Consultants
TMK	Tax Map Key
WMP	Watershed Management Plans

1 SUMMARY

PROPOSING AGENCY	City and County of Honolulu, Board of Water Supply (BWS)
APPROVING AGENCY	City and County of Honolulu (City), BWS
GENERAL PROJECT DESCRIPTION	The Honolulu BWS is proposing development of four exploratory wells on an existing BWS-owned 81,387 square foot Agricultural Restricted (AG-1) zoned TMK 9-4-003:010 parcel that contains the existing Kunia 665' Reservoir. The project site is located approximately 600 feet from Kunia Road, on the eastern side. The BWS proposes to undertake the drilling, casing, and testing of these wells. This project is outlined in the BWS' 2016 Water Master Plan as a major recommended capacity improvement within the 30-year planning period (long term). The Kunia Wells IV exploratory wells project is to expand capacity and diversify water supply for projected future water demand. The BWS' current goal is to test the exploratory wells for sufficient water quantity and acceptable water quality. The proposed exploratory wells would not be put into production until a later date.
PROJECT LOCATION	The exploratory wells would be located entirely within the approximately 81,387 square foot site which includes the Kunia 665' Reservoir. The first three wells would be drilled along the bottom perimeter. (southeastern property edge). A fourth well may be drilled on the north edge of the property. The site is located approximately 600 feet from Kunia Road, 'Ewa, O'ahu, Hawai'i. The Tax Map Key (TMK) for the BWS-owned property is TMK 9-4-003:010. The Waiāhole Ditch Irrigation System, which is owned by the State of Hawai'i, runs immediately north of the project site.
DETERMINATION	Finding of No Significant Impact (FONSI)
CONSULTED AGENCIES DURING CONSULTATION PERIOD *Comments received from parties for early consultation are italicized.* **Comments received on Draft EA	**State of Hawai'i Agencies** Office of Environmental Quality Control (OEQC) Department of Agriculture (DOA) Department of Health (DOH) ***Department of Land and Natural Resources (DLNR)* Land Division Commission of Water Resource Management (CWRM) State Historic Preservation Division (SHPD) Office of Hawaiian Affairs (OHA) Department of Hawaiian Home Lands (DHHL)

	Department of Business, Economic Development and Tourism (DBEDT) ***Department of Transportation (DOT)* **State Legislature** Senator Michelle Kidani (District 17) Representative Ty J.K. Cullen (District 41) **City Council** Councilmember Ron Menor (Council District 9) **City and County of Honolulu Agencies** ***Department of Planning and Permitting (DPP)* *Department of Design and Construction (DDC)* ***Department of Facility Maintenance (DFM)* ***Department of Parks and Recreation (DPR)* Department of Transportation Services (DTS) ***Honolulu Fire Department (HFD)* Honolulu Police Department (HPD) Neighborhood Board No. 25 (Mililani/Waipi‘o/Melemanu) **Adjacent Landowners** Robinson Kunia Land LLC (TMK 9-4-0003:001) Guyland LLC (TMK 9-4-004:009) **Other Interested Parties** Hawaiian Electric Company Hawai‘i Gas Hawaiian Telcom *Spectrum* Royal Kunia Country Club

2 DESCRIPTION OF PROPOSED ACTION

2.1 Purpose and Need

The purpose of the proposed action is to undertake the drilling, casing, and testing of four exploratory wells, for its proposed Kunia Wells IV location, at the BWS' site which contains the Kunia 665' Reservoir in Ewa, O‘ahu, Hawai‘i. The site is located approximately 600 feet east of Kunia Road, near the convergence of the Waiāhole Ditch with Kunia Road (Figure 1). The approximately 81,387 square foot site is identified as TMK 9-4-003:010. Large agricultural parcels surround this property. The BWS has 10 potable water sub-systems serving O'ahu (Figure 2). This project is in the ‘Ewa-Waipahu sub-system, which has the highest demand increase of all sub-systems.

The exploratory wells, if placed into production, can support the 'Ewa-Waipahu water use district by supplying additional potable water. According to the 2016 BWS' Water Master Plan, there is a projected Average Day Demand (ADD) increase from 27.7 Million Gallons per Day (MGD) in 2012 to 40.8 MGD ADD in 2040 (high range projection) for the 'Ewa-Waipahu system.

The BWS develops projects in three primary categories: renewal and replacement; capacity expansion; and research and development. This is a capacity expansion project. There is projected future population growth in transit-oriented development areas such as 'Ewa and Central O'ahu; the proposed exploratory wells are to ensure sufficient water quantity and acceptable water quality to accommodate projected population growth and planned TODs along the Honolulu Rail Transit System. The first phase of the rail system anticipates operating in 2020.

2.2 Background

2.2.1 Site of Proposed Exploratory Wells

Construction of the 1.5 MG reservoir, the Kunia 665' Reservoir, was completed in 1995. The as-built plan's general site plan shows an area reserved for a second, larger, proposed reservoir of 2.0 MG. A site visit conducted on June 20, 2018 shows the existence of a pad for the second reservoir. The Waiāhole Ditch Irrigation System runs north of the site and serves as a non-potable water source for agricultural needs and is managed by the State of Hawai'i, Department of Agriculture, Agribusiness Development Corporation (ADC).

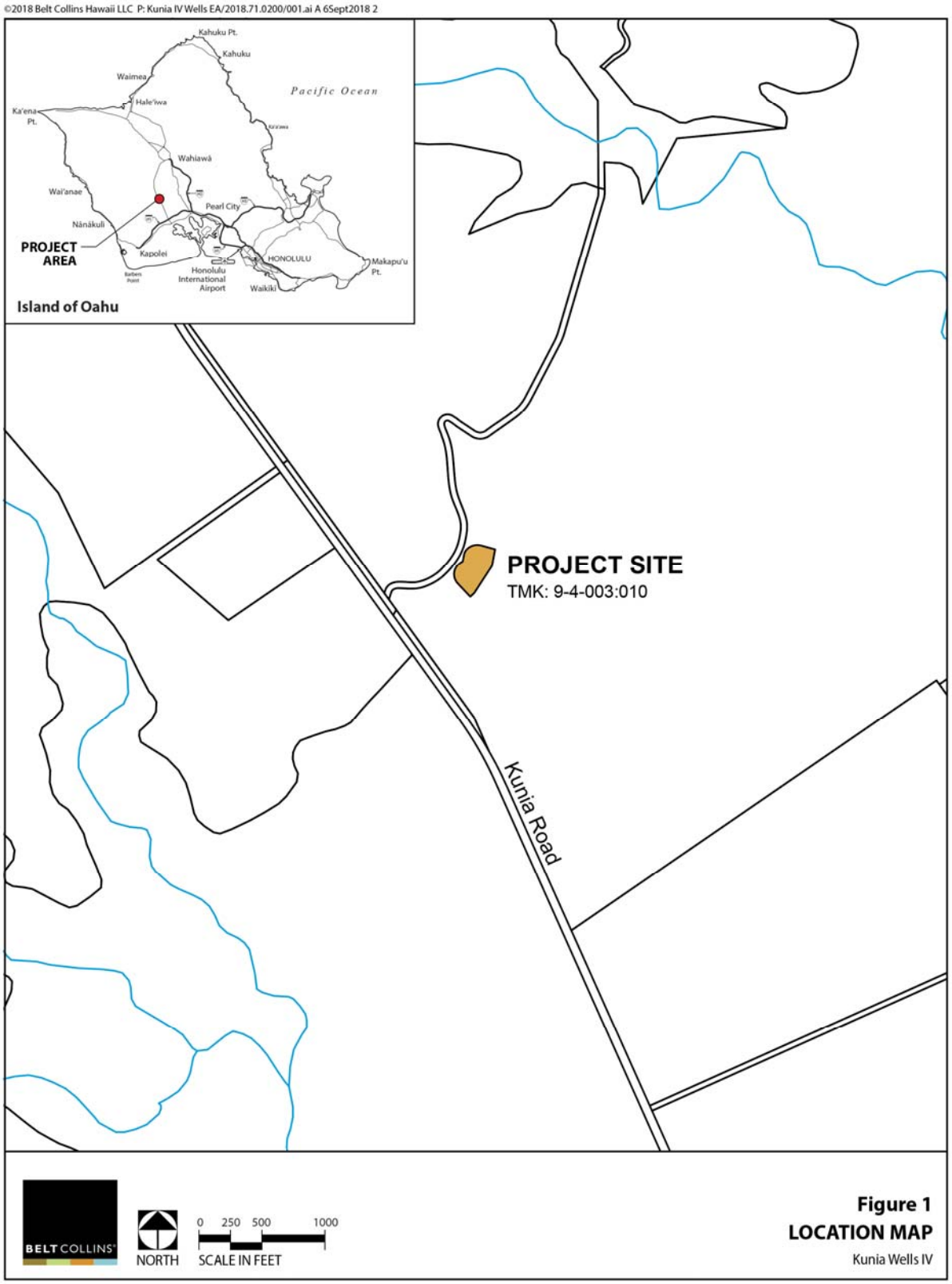
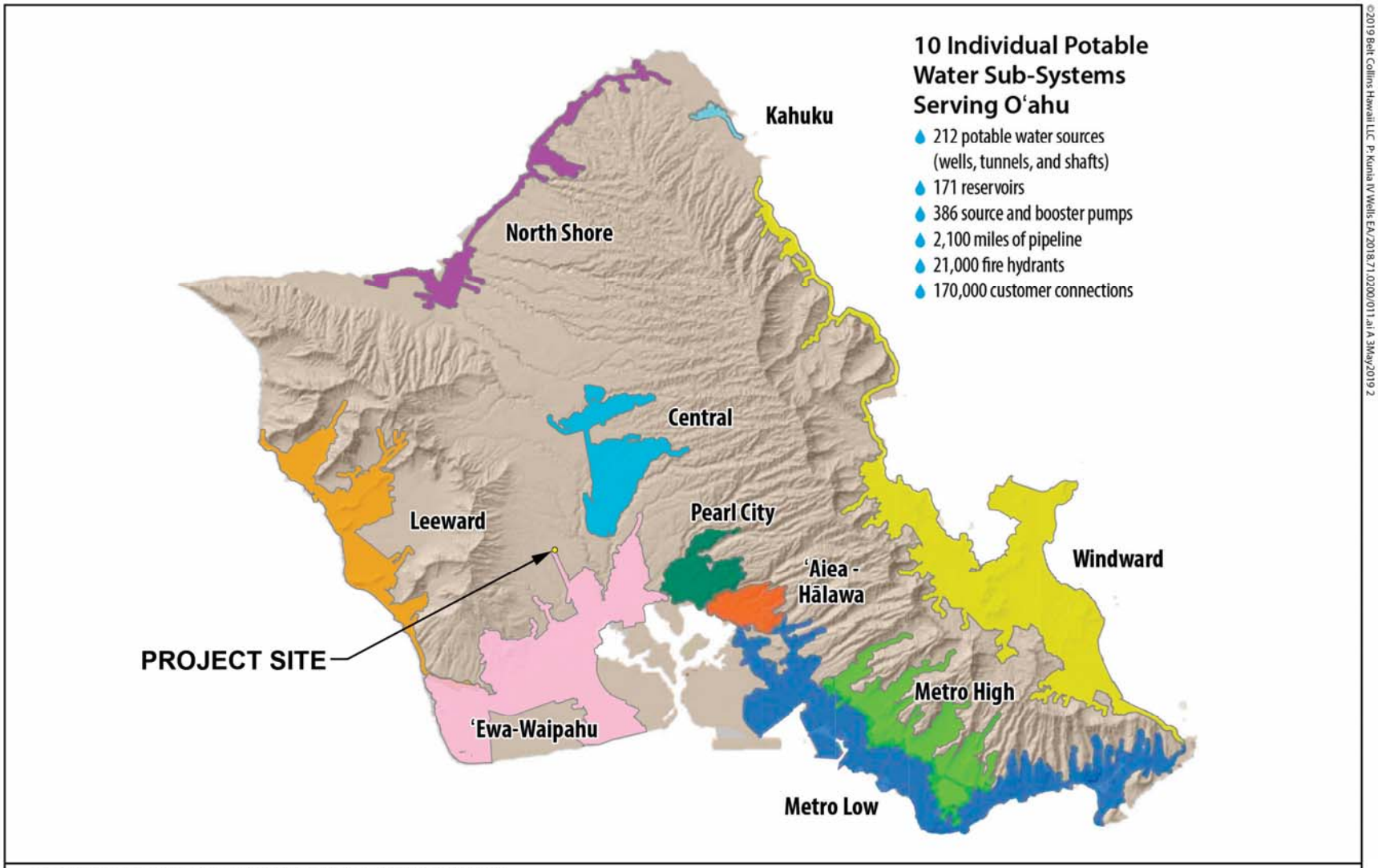


Figure 1
LOCATION MAP
Kunia Wells IV



Source: City and County of Honolulu, Board of Water Supply. October 2016. Water Master Plan

BELT COLLINS

NORTH

Figure 2
BWS HYDRAULIC MODELS
Kunia Wells IV

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Lying west of the site, adjacent to Kunia Road, is an open reservoir, Reservoir 225, which is used for water storage for the Waiāhole Ditch and for agricultural irrigation. It is part of the Waiāhole Irrigation Ditch system and managed by HDOA's Agribusiness Development Corporation. Reservoir 225 is approximately 20 feet deep, at its deepest point, and the Reservoir's top bank elevation ranges from 650 to 653 feet above mean sea level (msl). [1] Today, with the expansion of diversified agriculture and water restoration to the windward side of O'ahu, the Waiāhole Ditch Irrigation System has seen a reduction in the amount of available water in the System and the Reservoir.[2]

Currently, the Kunia 665' Reservoir, an instrument house, a reservoir pad, perimeter fencing, gates and security exist on the project site. The site is secured by a chain-link fence with autograph trees internally lining much of the fence's footprint. Additionally, there are a few Mindanao gum (rainbow eucalyptus trees) on the site's south side. The property is zoned AG-1 and is surrounded by farm land. Aside from the construction of the 1.5 MG reservoir and reservoir pad, no other improvements have occurred. (Figure 3).

In 2017, the BWS commissioned engineering consultant Belt Collins Hawaii LLC to prepare an Environmental Assessment (EA). Subconsultants Cultural Surveys Hawai'i (CSH) were hired to conduct an archaeological literature review and cultural assessment. For the flora and fauna survey, subconsultants SWCA Environmental Consultants (SWCA) were hired.

2.2.2 Board of Water Supply's Mission and Strategic Plan

The mission of the BWS is to provide "Water for Life," a safe, dependable, and affordable water supply, now and into the future. In identifying projects which meet these goals, the BWS develops projects in three categories and, as discussed in Section 2.1, this project is a capacity expansion project. This type of project is developed to meet growing potable water demand. BWS also focuses on protecting the natural environment, important watersheds, and water sources by monitoring the island's rainfall and aquifer water levels and salinity. BWS takes the appropriate precautions to ensure the sustainability of the island's potable water supply.

The 2016 BWS Water Master Plan outlines their three-year Strategic Plan. The Strategic Plan is broken down into three strategic goals—resource, operational, and financial sustainability. The resource goal outlines objectives which ensure that the natural groundwater supplies are protected and managed efficiently. The operational goal outlines objectives that fosters a competent workforce that can provide dependable and efficient services with current technological systems. The financial goal outlines objectives that strive for the soundest fiscal strategies that make the water supply affordable for its customers.

---

[1] U.S. Army Corps of Engineers. Final Environmental Assessment for Waiāhole Reservoir System Reservoirs 155 and 225 Improvement Project O'ahu, Hawai'i. 2017. Prepared by HDR, Inc. Retrieved from: http://oeqc2.doh.hawaii.gov/EA_EIS_Library/2019-02-08-OA-FEA-Waiahole-Reservoir-System Improvements.pdf#search=waiahole

[2] ibid

An objective of the operational sustainability goal is to "renew and improve the water system to ensure water system adequacy, dependable service, and operational efficiency." The proposed exploratory wells' purpose is to ensure an adequate and dependable water supply for projected future growth.

The BWS has initiated preparation of its watershed management plans (WMPs) for O'ahu's eight watershed planning districts. Each of these plans will be used to meet the requirements of preparing a county water use and development plan under the State Water Code and City and County of Honolulu (City) Ordinance. This project is located in the Central Oahu Water Management Plan (COWMP). A goal of the COWMP is to provide sustainable ground water for present and future users; the proposed exploratory wells are for projected increase in water supply demand.

The goal of the WMPs are to provide short-, mid-, and long-range guidance for the sustainable management and infrastructure development; to ensure that the use of O'ahu's surface water and groundwater resources meet demands consistent with the City's land use plans. The four planning districts that have completed their WMPs are: Wai'anae, Ko'olauloa, Ko'olaupoko, and North Shore.

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Waiahole Ditch
PROJECT SITE
Reservoir 225
BELT COLLINS
NORTH
0 25 50 100
SCALE IN FEET
Figure 3
KUNIA WELLS IV PROJECT SITE
Kunia Wells IV

2.2.3 BWS Capital Improvement Program

The BWS has a multi-tiered Capital Improvement Program (CIP) planning process of 30-Year (Long-Range), 10-Year (Medium-Range), 6-Year (Short-Range), and 1-Year (current) project timelines. The majority of BWS funding comes from water rates paid by customers. Project tier placement and funding allotment are prioritized based on risk. Types of projects, and subsequent funding, are for water system facilities such as pipelines, pump stations, supplies (wells, tunnels, shafts), water treatment facilities, reservoirs, and base yards. The BWS Water Master Plan outlines wells, inclusive of tunnels and shafts, to make up an approximate nine percent of estimated cost from total CIP funding.

The BWS categorizes CIP projects in the three general categories of capacity expansion projects; renewal and replacement projects; and research and development. The proposed project is a capacity expansion project because its purpose is to meet projected future water capacity demand. Capacity projects are prioritized by and placed within the multi-tiered CIP planning process timeframe dependent on projected system demands and anticipated expansion time.

The BWS Water Master Plan outlines recommended capacity improvements within the 30-Year planning period by 2040. If put into production, the proposed wells will be a new water source planned to be developed during this 30-Year planning period.

2.3 Proposed Action

2.3.1 Proposed Exploratory Wells

The proposed action calls for the drilling, casing, and testing of four exploratory wells at the BWS site that contains the Kunia 665' Reservoir (Figure 4). If the exploratory wells can be successfully developed for water production, they will be placed into service at a later date. When this happens, the wells will provide additional supply to meet the projected increase in water demand. Each of the wells is expected to produce 1.5 MGD, for a total capacity of 6.0 MGD (4 wells) on the project site. Based on this expected yield, two wells will be needed to meet average daily demand (ADD) and three wells will be needed to meet the maximum daily demand (MDD). The fourth well will be used for standby operations. The first three wells would be drilled along the bottom perimeter (southeastern property edge). The fourth well may be drilled on the north edge of the property. These proposed exploratory wells are in the 'Ewa-Waipahu model system. Projected ADD is calculated to increase from 27.7 MGD in 2012 to 40.8 MGD in 2040, under the high range projection. MDD is calculated to increase from 32.7 MGD in 2012 to 48.5 MGD by 2040, under the high range projection. One of the projected new sources, as outlined in the 2016 BWS Water Master Plan, will be the Kunia Well IV site. The proposed exploratory wells follow the BWS' mission of supplying a dependable source of water that is available now and into the future. It also aligns with the BWS' strategic plan of operational sustainability that provides infrastructure for current and projected use.

A drill rig will be moved onto the site to drill the exploratory wells; they will likely be drilled one at a time, with the drilling duration depending on existing geological conditions. Each drilled well's water quality will be tested prior to the drilling of the next well. The final design of all the wells should include casing deep enough to minimize contamination, such as from e.coli. It is the contractor's responsibility for maintaining the solid wastes on-site, treatment and disposal, and acquiring any permits, if required,

during the well drilling. Well drilling slurries, lubricating fluids wastewater, and well purge wastewater is typically kept on-site in a bermed off or protected staging area. Once drilled, testing for pump capacity generally takes four days; water generated from testing will likely be discharged into the grated drain inlet on site, with appropriate best management practices (BMPs) in place for sediment removal and velocity dissipation.

2.4 Preliminary Project Timetable

Well construction (drilling, casing, and testing) of the exploratory wells is planned for the budget appropriations in Fiscal Year 2022. The construction and testing for the exploratory wells are projected to take 6 months to a year. The estimated construction cost of this project is 5.6 million dollars.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Existing Land Use

3.1.1 Land Use

The project site is located in Central O‘ahu, approximately 600 feet east of Kunia Road, near the convergence of the Waiāhole Ditch Irrigation System with Kunia Road. The property is zoned AG-1. Since the proposed project is classified as a Type-A utility, the development of the exploratory wells is considered a permitted use subject to standards in Article 5, Specific Use Development Standards of the Land Use Ordinance (LUO).

Access to the proposed project is via an unnamed, gated, dirt road. The BWS manages gate access for this dirt road. There is a farm located within the perimeter of the external fence. All abutting land to the project site is zoned AG-1. Immediately southwest of the property is an earthen irrigation reservoir. Traveling south, on the eastern side of Kunia Road, is vacant land zoned Industrial Limited, Business Neighborhood, Preservation General, and AG-1. The project site is not located in the Special Management Area (SMA).

The project site is secured by an additional fence within the external agricultural fencing. It is approximately 81,387 square feet and contains an existing reservoir, Kunia 665’ Reservoir, a reservoir pad, and an instrument house. Currently, no wells exist at this location.

3.1.2 Existing Water System

The project is in the ‘Ewa-Waipahu Model System. In general, the BWS infrastructure includes wells and shafts as sources for the system’s potable water; reservoirs and tanks as storage facilities; and booster pumps, transmission lines, and service laterals as distribution systems to BWS customers. These system components are not necessarily dedicated solely to the service of that system. The systems in the neighboring districts are interconnected and are able to share resources. As a result, when the demand for

water is unexpectedly high in one district, water from the neighboring district can be conveyed over to supplement the affected district.

The existing Kunia 665' Reservoir is integrated into the BWS water system via a concrete pipe that connects to the Kunia Booster. Water is pumped from Kunia Wells II upland to the Kunia 665' Reservoir for storage. To ensure enough water pressure, a reservoir must be between 100-250 feet above the supplied, receiving end of the system. The Kunia Wells II site consist of two reservoirs, Kunia 440' Wells, a treatment plant, and a GAC filter.

3.2 Land Tenure

The Kunia 665' Reservoir site is comprised of one parcel identified by TMK as 9-4-003:010 (Figure 4). The parcel is owned by the BWS.

3.3 Geology/Physiography/Soils

3.3.1 Geology

O‘ahu is the third largest island in the state of Hawai‘i with an approximate land area of 604 square miles. It is composed of the Wai‘anae volcanic range to the west and the Ko‘olau volcanic ranges to the east; both were formed by shield volcanoes. The Wai‘anae range is older than the Ko‘olau range. Both volcanic ranges erupted a type of rock known as basalt. Eruption and lava flow from the Ko‘olau range banked up against the older lava flows of the Wai‘anae coast to create a plateau; this plateau makes up Central O‘ahu and is where this project is located.

The island's current shape is from erosion and sea level change through the millions of years after its formation. O‘ahu is divided into four main areas—the Wai‘anae Range, the Ko‘olau Range, the Schofield Plateau, and the coastal planes. This project is located on the Schofield Plateau. This plateau is in a youthful stage of erosion.

3.3.2 Physiography

The site is relatively level with elevations ranging from 640 feet above sea level at the eastern boundary of the property to 650 feet above sea level at the western boundary of the property. The predominant slope across this area is approximately 1 percent. Surface runoff occurs generally by sheet flow. There is a swale with a 3:1 slope running along the northerly portion of the site. This swale directs runoff to the south and northeast areas of the property. On the south side, there is an inlet that directs runoff into the drainage system; the northeast area directs water off the site.

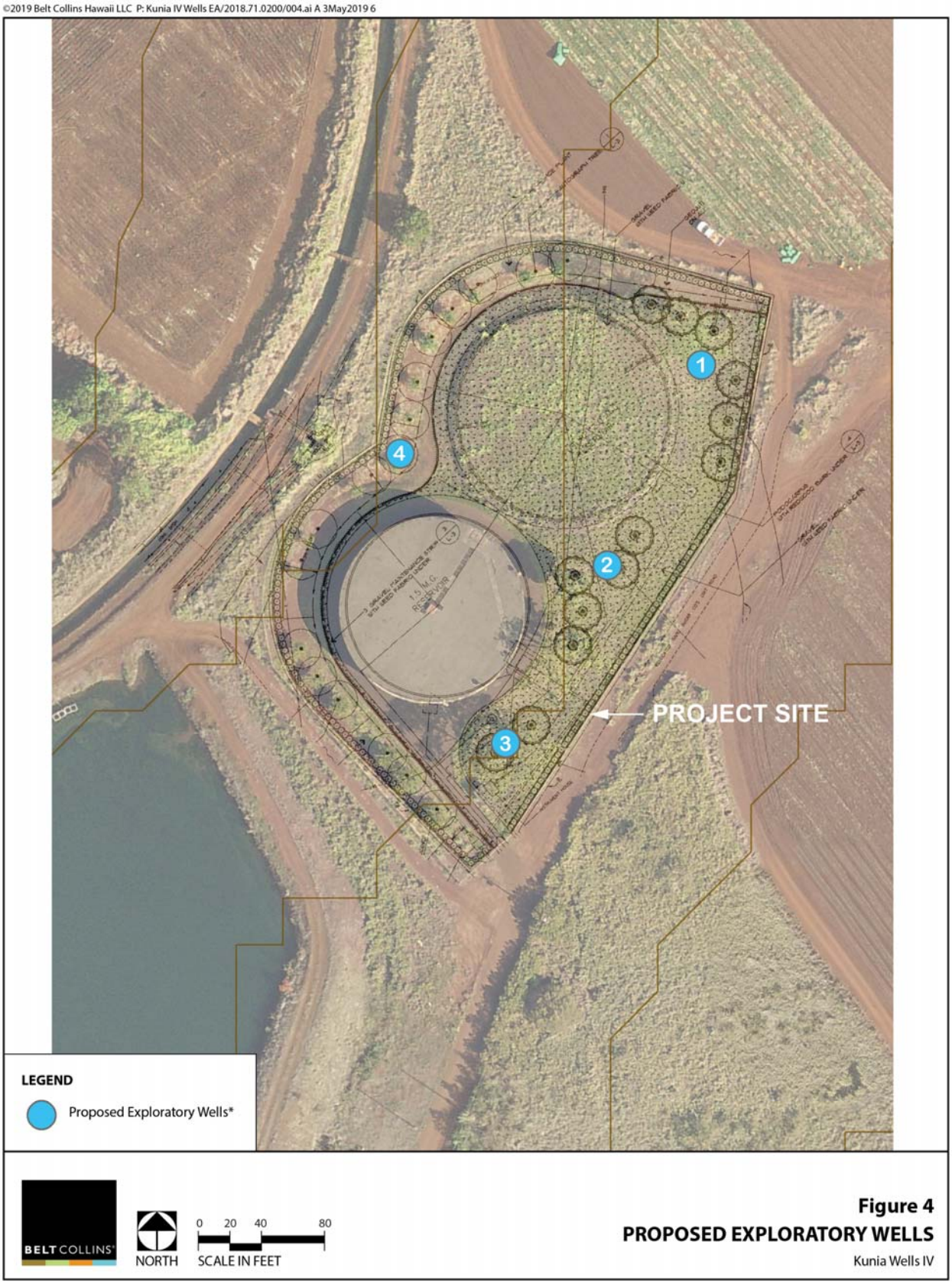

Figure 4
PROPOSED EXPLORATORY WELLS
Kunia Wells IV

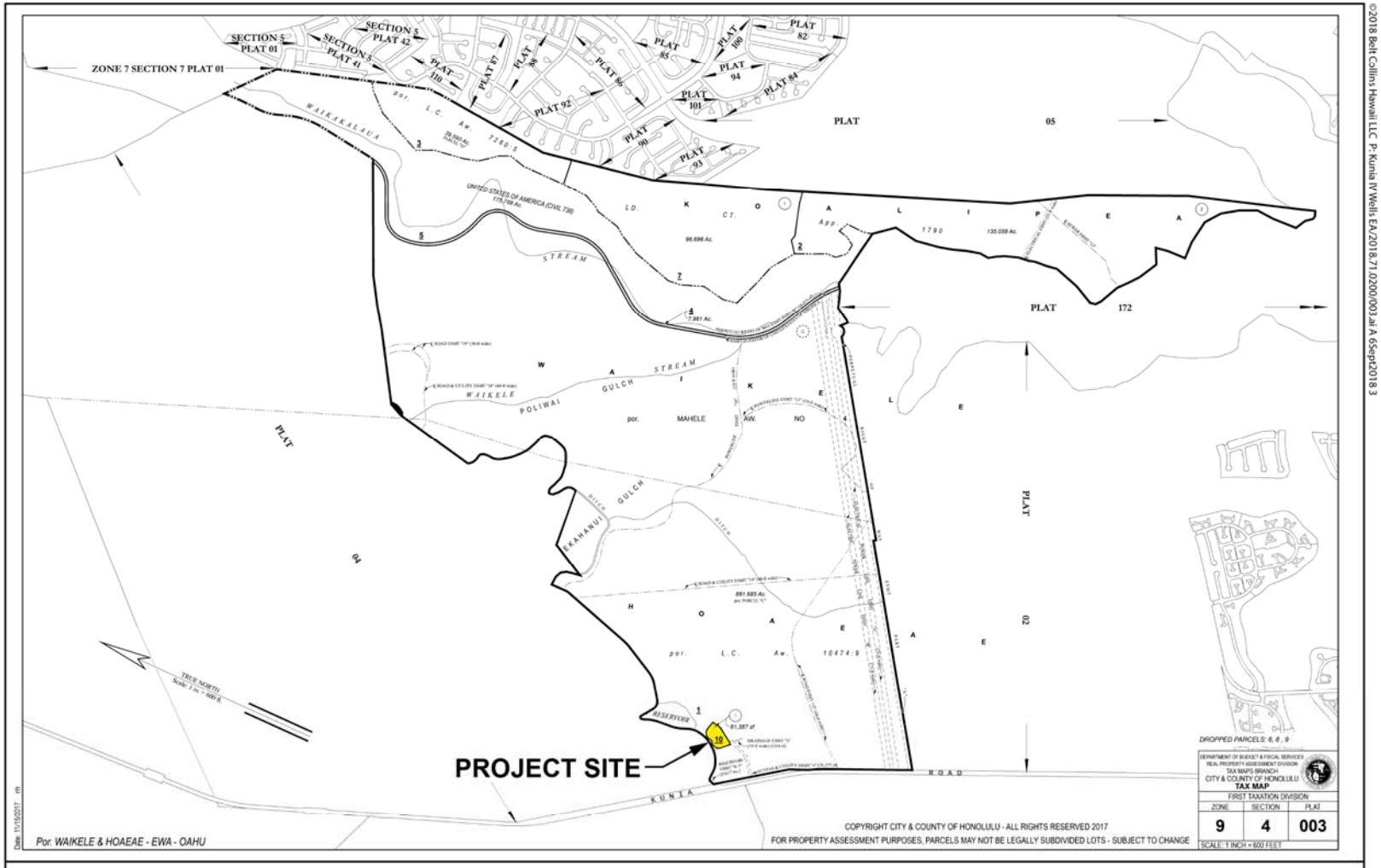

Figure 5
TAX MAP OF PROJECT SITE
Kunia Wells IV

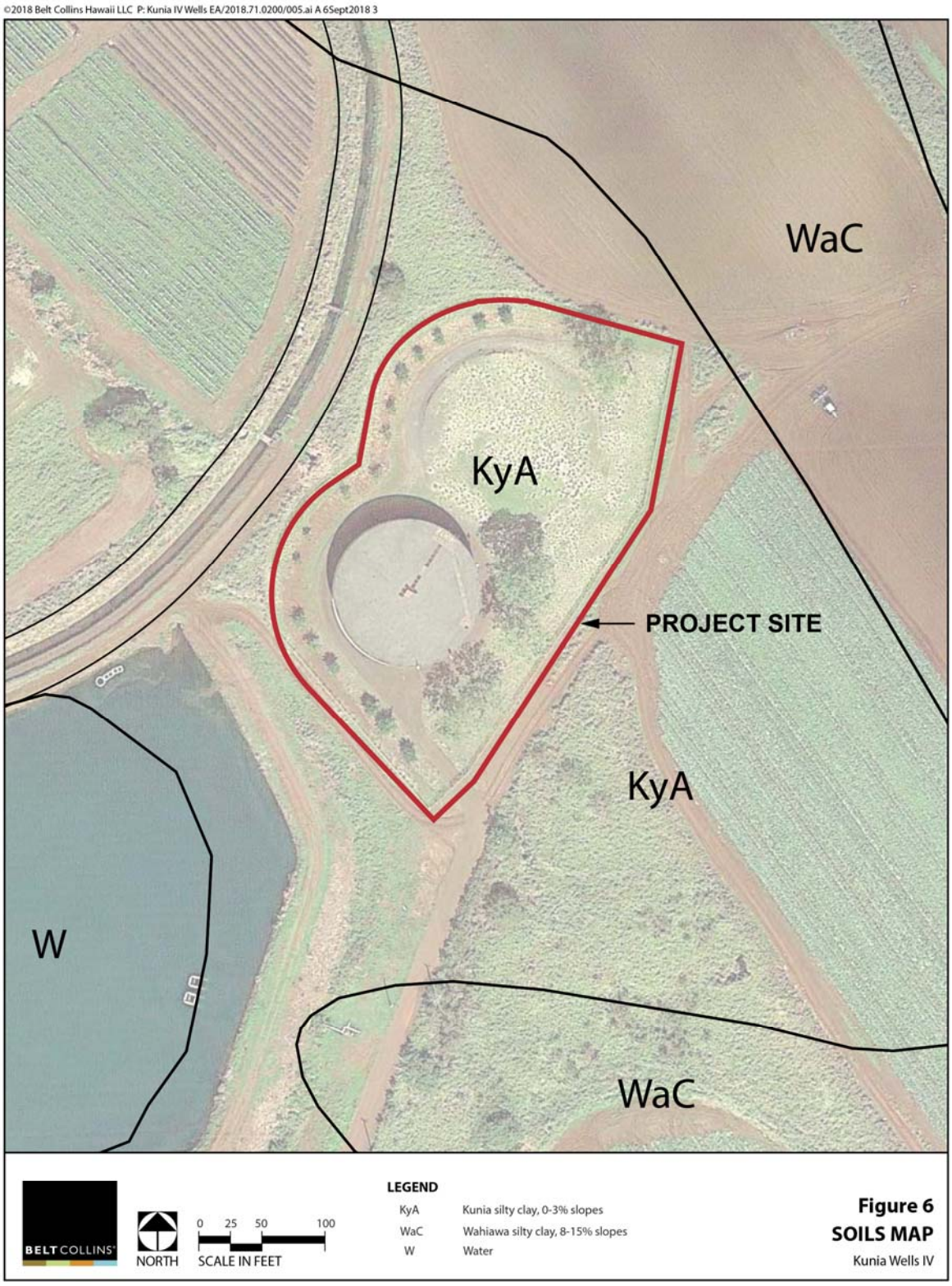

Figure 6
SOILS MAP
Kunia Wells IV

3.3.3 Soils

The United States Soil Conservation Service, now known as the Natural Resources Conservation Service, classifies the soil on the property as, Kunia silty clay, 0 to 3 percent slopes, (KyA) (Figure 6). The soil permeability is moderate, with slow runoff, and low erosion hazard. This soil type is generally found on broad, smooth slopes. It is part of the Kunia Series which are soils that developed in old alluvium. These soils are well drained and are located on upland terraces and fans. There is moderate permeability with this soil series.[3]

3.4 Hydrology and Water Resources

3.4.1 Groundwater

Groundwater occurs in the project area as a "basal fresh water lens" which is freshwater that rests on seawater or brackish water beneath the surface. The proposed exploratory wells are located within the Pearl Harbor Aquifer, an unconfined basal aquifer. Since it is an unconfined aquifer, water is often found within a few hundred feet of the ground surface. In Central O‘ahu, groundwater is the primary source of water supply for most needs (municipal, military, and agricultural). Water replenishment, or recharge, of groundwater, in this area, is from rainwater infiltration and upgradient groundwater bodies from areas such as the Ko‘olau and Wai‘anae mountain ranges.

Theoretically, in fresh water lenses, for each foot of freshwater above sea level, there exists approximately 40 feet of freshwater below sea level.[4] The BWS Water Master Plan states that the average water table, in the Pearl Harbor Aquifer, is 20 feet above sea level; therefore, there is approximately 800 feet of freshwater aquifer thickness below sea level at any given area on this Aquifer.

The proposed exploratory wells will be deep water wells given their geographical location over the aquifer and required drilling depth to reach proper water depths. Pumping water from the wells requires either a submersible motor, located within the well, or a turbine motor, located externally, on top of the well. A submersible motor is quieter and (generally) used for shallower, artesian wells. If put into production, submersible motor pumps or turbine motor pumps may be used.

3.4.2 Pearl Harbor Sector Aquifer

The Commission on Water Resource Management (CWRM) identifies this area's aquifer sector as the Pearl Harbor Aquifer Sector Area which provides water to the eastern and western sides of the island. The Pearl Harbor Aquifer Sector Area is further divided into aquifer system areas of which this sector area is composed of three: Waimalu, Waipahu-Waiawa, and ‘Ewa-Kunia.[5] The project area is located east of Kunia Road and is therefore in the Waipahu-Waiawa System Area. This aquifer system area contains a basal lens in the Ko‘olau mountains. The Pearl Harbor Aquifer Sector Area is bound by the Ko‘olau

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3 U.S. Department of Agriculture, Soils Conservation Service. Issued August 1972. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawai‘i*, U.S. Department of Agriculture, Soils Conservation Service, Issued August 1972. Retrieved from https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/hawaii/islandsHI1972/Five_islands_SS.pdf

4 City and County of Honolulu, Board of Water Supply. October 2016. Water Master Plan. Retrieved from http://www.boardofwatersupply.com/bws/media/files/water-master-plan-final-2016-10.pdf

5 City and County of Honolulu, Board of Water Supply. May 2007. Central O‘ahu Watershed Study. Retrieved from http://www.boardofwatersupply.com/bws/media/files/watershed-study-central-oahu-final.pdf

Mountain Range to the east, the Schofield Plateau to the north, the Wai‘anae mountain range to the west and the ‘Ewa Plains to south.

Using current official CWRM criteria to define sustainable yields, the Pearl Harbor Aquifer Sector Area has a total sustainable yield of 165 MGD and the Waipahu-Waiawa System Area has a sustainable yield of 104 MGD of that total[6]. The primary source of water in the Central O‘ahu Watershed is the Waipahu-Waiawa Aquifer System Area.[7]

3.4.3 Existing Water System and Usage

The BWS defines any facility, system, or equipment that conveys, treats, or process potable and non-potable water to be part of the water infrastructure system. Water sources can be from wells, shafts, tunnels, springs, rainfall, streams, or human activity. Potable water infrastructure consists of sources, reservoirs, pipelines (transmission mains and laterals), booster stations, treatment systems, control valves, fire hydrants, and water meters.

The BWS water system that serves the Pearl Harbor Sector consists of an interconnected network of subsystems each containing their own wells, reservoirs, transmission mains, pump stations, pressure reducing valves, and service laterals. The interconnection of these subsystems assures that when the source of one subsystem is down, for whatever reason, the sources for the other subsystems can readily feed the down area without causing overall disruption in BWS service.

3.4.4 Exploratory Well Impact on Existing Area Wells and Groundwater Resource

The proposed exploratory wells are expected to have no adverse impact on other BWS wells in the vicinity, the Kunia 665’ Reservoir, and the existing groundwater in the project area. The total Pearl Harbor Aquifer Sector Area sustainable yield is 165 MGD with the Waipahu-Waiawa System Area’s sustainable yield at 104 MGD, currently permitted within that 165 MGD allotment. The proposed exploratory wells are estimated to have a 3.0 MGD ADD yield when complete; this projected yield capacity would not exceed the permitted 104 MGD within this system. The proposed exploratory wells’ location and test drilling will ensure sustainable pumping capacity. Each proposed exploratory well has been placed approximately 150 feet apart from the other to be outside of each’s radii of influence; the average depth of each well will be 800 feet. Additionally, the testing of the wells will determine the sustainable capacity of each, so that pumping under normal conditions (expected demand) will not cause upcoming of brackish or salt water into the well. Chloride levels will be tested to ensure that they are within permitted levels for potable water usage. Once put into production, the Kunia Wells IV will pump into the Kunia 665’ Reservoir and will be able to service the Kunia 665’ Reservoir or 440’ service elevation zones.

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6 City and County of Honolulu, Board of Water Supply. May 2007. Central O‘ahu Watershed Study. Retrieved from http://www.boardofwatersupply.com/bws/media/files/watershed-study-central-oahu-final.pdf

7 ibid

Prior to drilling and development of the new wells, a well construction permit and pump installation permit will be secured from the CWRM. The CWRM is responsible for managing use of and regulating the State's water resources.

3.4.5 Central O'ahu Watershed Management Plan

The 2007 Central O'ahu Watershed Management Plan (COWMP) is currently being updated by the BWS and the Department of Planning and Permitting (DPP)and will include the Kunia IV wells into the plan. The COWMP consists of 70,921 acres and follows the same boundary as the City's Central O'ahu Sustainable Communities Plan. There are 30,359 acres of agricultural land, 25,645 acres of conservation land and 14,917 acres of urban land. The COWMP is one of eight districts on O'ahu that will have a WMP. North Shore, Ko'olau Loa, Ko'olau Poko and Wai'anae have been adopted. East Central O'ahu and East Honolulu are being developed. These eight plans will then be summarized into the O'ahu Water Management Plan (OWMP).

The goal of the OWMP is:

To formulate an environmentally holistic, community-based, and economically viable watershed management plan that will provide a balance between:

- *The preservation and management of Oahu's watersheds; and*
- *Sustainable ground water and surface water use and development to serve present users and future generations*

This project is in alignment with the goal of the COWMP.

3.4.6 Potential Contamination

The Central O'ahu region has historically been agricultural fields of pineapple and sugarcane. Most contaminated wells on O'ahu are located in the Central O'ahu study area and contain contaminants from years of pesticide use on the agricultural fields.[8] Wells containing contaminants, such as pesticides and herbicides, are treated with GAC filters to purify the water.

The BWS Annual Water Quality Report indicates water quality, from the water system serving the project area, has been tested and treated to meet all Federal and State standards.[9]. If put into production, the proposed exploratory wells would be subject to the same Federal and State monitoring and testing requirements that is done for all wells.

[8] City and County of Honolulu, Board of Water Supply. May 2007. *Central O'ahu Watershed Study*. Retrieved from http://www.boardofwatersupply.com/bws/media/files/watershed-study-central-oahu-final.pdf

[9] City and County of Honolulu, Board of Water Supply. 2018. *Water Quality Report*. Retrieved from http://www.boardofwatersupply.com/water-quality/water-quality-report/search-ccr?key=kunia%20road

3.5 Flora

3.5.1 Existing Conditions

The project site is completely enclosed by a 6-foot high chain link fence. The SWCA study **(Appendix B: Flora and Fauna Study)** found a total of 19 plant species, none of which are federally or state-listed threatened, endangered, or candidate plant species. Ruderal vegetation is found throughout the site with the dominant type being Guinea grass (Urochloa maxima). Additional, but limited, herbaceous species were the narrow-leaved plantain (Plantago Lanceolata), cow pea (Macroptilium Lathyroides), and creeping indigo (Indigofera Spicata). Two tree species, the autograph tree (Clusia rosea) and Mindanao gum (Eucalyptus deglupta) are planted on the site.

Species of note include the ‘uhaloa (Waltheria indica) which is possibly indigenous to the Hawaiian Islands and the yellow wood sorrel (Oxalis corniculata), which was possibly introduced by the Polynesians.

3.5.2 Impacts and Mitigation Measures

Vegetation on the property is comprised predominantly of nonnative species; the vegetation type and species identified on-site are not unique. No federal or state listed endangered or threatened plant species were observed or recorded on the property. No mitigation is required.

3.6 Fauna

3.6.1 Existing Conditions

In a fauna survey of the project site[10] 12 non-native bird species were observed. Three of the observed birds are Migratory Bird Treaty Act (MBTA) protected: the cattle egret (bubulcus ibis), house finch (Haemorhous mexicanus), and the northern cardinal (Cardinalis cardinalis). Additionally, although not observed, the MBTA-protected golden plover (Pluvialis fulva) and wandering tattler (Tringa incana) may forage at the site; neither bird nest in Hawai‘i. While not located on the site, Reservoir 225 and the Waiāhole Ditch System may provide nesting and foraging habitat for the federally and state listed Hawaiian Stilt (Himantopus mexicanus knudseni), Hawaiian coot (Fulica alai), and Hawaiian moorhen (Gallinula galeata sandvicensis). Of these three birds, the Hawaiian stilt is the only species that may forage and loaf in the existing Guineagrass of the project site. Additional birds that may be present but not observed, during the study, are the Hawaiian goose and the Hawaiian Short-eared owl.

The only mammal observed near the property was a dog (Canis familiaris). The conducted survey concludes that, while not observed, the feral cat (Felis catus), rat (Rattus spp.), mouse (Mus musculus), and mongoose (herpestes javanicus) are probably present. The Hawaiian hoary bat was not observed, and no acoustic study was conducted. It should be noted, however, that suitable habitat and vegetation was observed for the hoary bat.

[10] A biological survey was conducted on the property by SWCA Environmental Consultants on July 2018 and its findings are provided in the report, Kunia Exploratory Wells Site O‘ahu, Hawai‘i (see Appendix B of this EA).

3.6.2 Impacts and Mitigation Measures

For the three observed MBTA protected bird species (the cattle egret, the house finch, and the northern cardinal), the study recommends a nest survey be conducted a maximum of seven days before construction. If nests are found, then they should be left undisturbed and a qualified biologist should monitor the active nests during construction. For the Hawaiian stilt, it is recommended that, if any are present, or fly into the area during construction, all construction activities within 100 feet should cease until it leaves the area. For the Hawaiian goose, it is recommended that, if any are present, all work cease within 100 feet of the bird until it leaves the area. Additionally, if Hawaiian geese are observed during their breeding season, it is recommended that a qualified biologist survey the area for nests.

Habitat for the Hawaiian Short-eared owl was observed. It is recommended that if any Hawaiian short-eared owl nest is discovered, all activities within 150 feet should cease and the Department of Land and Natural Resources should be contacted. The use of barbless top-strand wire for any fencing is also recommended.

There is potential for seabirds to transition between their nest sites and the ocean. These birds may be attracted and disoriented by bright lights while traveling. If they become grounded due to disorientation, they may become vulnerable to mammalian predators and vehicles. To limit the effect of disorienting bright lights, it is recommended that construction activities be limited to daylight hours; that upward radiation of lighting is minimized; that automatic light sensors are installed; and that all unneeded outside lights are turned off from dusk through dawn.

While not observed during the study, Hawaiian Hoary Bat habitat was noted. To prevent direct impact, it is recommended that no tree taller than 15 feet at the site be trimmed or removed between June 1 and September 15, when flightless juveniles may be roosting in the trees. Barbless fencing is also recommended to prevent bat entanglement.

The proposed project is not expected to have any long-term adverse impacts of the above recommended avoidance and mitigation measures are followed.

3.7 Air Quality

3.7.1 Existing Conditions

Air quality around the project area is typical of agricultural lands in Central O‘ahu. The State Department of Health (DOH) operates four air quality monitoring stations around Honolulu and Leeward O‘ahu. These monitoring stations collect measurements of ambient level pollutants.

The two stations closest to the project site are in Kapolei and Pearl City. For the Kapolei Station, the monitoring equipment is located on Lauwiliwili Street and stands as an independent, secured, station. The Pearl City Station is located on a rooftop on Fourth Street in Pearl City.

The Kapolei Station monitors for sulfur dioxide, carbon monoxide, nitrogen dioxide, particulate matter 10 microns or smaller diameter (PM_{10}), and particulate matter 2.5 microns or smaller diameter ($PM_{2.5}$). The Pearl City Station monitors PM_{10} and $PM_{2.5}$. Air quality readings (for Kapolei and Pearl City) have

typically shown a Good rating for air quality on a scale that ranged from Good to Hazardous.[11] Higher readings are expected when extreme conditions occur, for instance on days when wind conditions are still, and nearby traffic is extremely heavy or congested.

3.7.2 Impacts and Mitigation Measures

Construction-related air emissions would not be significant as they would be short-term and controlled through implementation of required construction management procedures. Fugitive dust generated by earthwork or other site preparation activities would be controlled by BMPs such as sprinkling of water over exposed dirt areas, covering dirt stockpiles, and temporarily halting site preparation activities during gusty wind periods. Diesel-powered trucks and construction equipment will be properly maintained to mitigate dirty emissions. HAR 11-60.1 permit will be obtained by the contractor for use of any regulated stationary source equipment in construction. After construction and during facility operations, no emissions from the proposed action would be generated. No mitigation measures are required.

3.8 Acoustical Environment

3.8.1 Existing Conditions

There is minimal noise pollution at the site with the highest sustained noise levels from vehicles traveling Kunia Road. The Kunia 665' Reservoir and instrument house require minimal maintenance and produce minimal audible sounds.

The drilling, casing, and pumping of the proposed exploratory wells will produce a short term, temporary noise impact. Construction is expected to take six months to a year. In cases where the construction noise is expected to exceed the State's "maximum permissible" level as provided in HAR, Chapter 46, Community Noise Control,[12] a permit must be obtained from DOH prior to the construction activity. The site is zoned AG-1 and HAR 11-46-3 classifies lands zoned agriculture to be Class C for maximum permissible sound levels in dBA. Table I of HAR 11-46-4(a) states daytime and nighttime maximum permissible levels to be 70 dBA. Since the closest residence, Royal Kunia, is 1.5 miles away and the land is zoned AG-1, there are no noise mitigation requirements for this project.

[11] DOH's assessment of air quality at its monitoring station is conducted daily and is based on an Air Quality Index which is scaled from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. When the AQI is in the range of 0 to 50, the level of health concern is the least and is thus rated Good, 51 to 100 is rated Moderate, 101 to 150 is Unhealthy for Sensitive Groups, 151 to 200 is Unhealthy, 201 to 300 is very Unhealthy, and 301 to 500 is Hazardous

[12] Chapter 46, Community Noise Control, Department of Health, State of Hawai'i, HAR, Title 11, September 23, 1996. Retrieved from https://www.nonoise.org/lawlib/states/hawaii/hawaii.htm

3.9 Natural Hazards

3.9.1 Flood

The Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency under the National Flood Insurance Program does not identify any major floodways or floodplains in the project area (Figure 7). According to the FIRM, the exploratory wells are located in Flood Zone D, which are unstudied areas where flood hazards are undetermined, but flooding is possible.[13]

The Waiāhole Ditch Irrigation System and associated Reservoir 225 are within the vicinity of the proposed project. As aforementioned in Section 2.2.1, due to water diversion from the Waiāhole Ditch and increased use of irrigation water for diversified agriculture, the amount of water retained in either the Reservoir or Ditch has been diminished, which may result in a reduced possibility of flooding.

The site is located approximately four miles north from the West Loch and is at an elevation ranging from approximately 600 to 640 feet above mean sea level; the proposed exploratory wells would not be affected by any tsunami inundation.

[13] Flood Insurance Rate Map, Panel 0220F of the Flood Assessment Report, City and County of Honolulu, Hawai‘i, Map No. 15003C0220F.

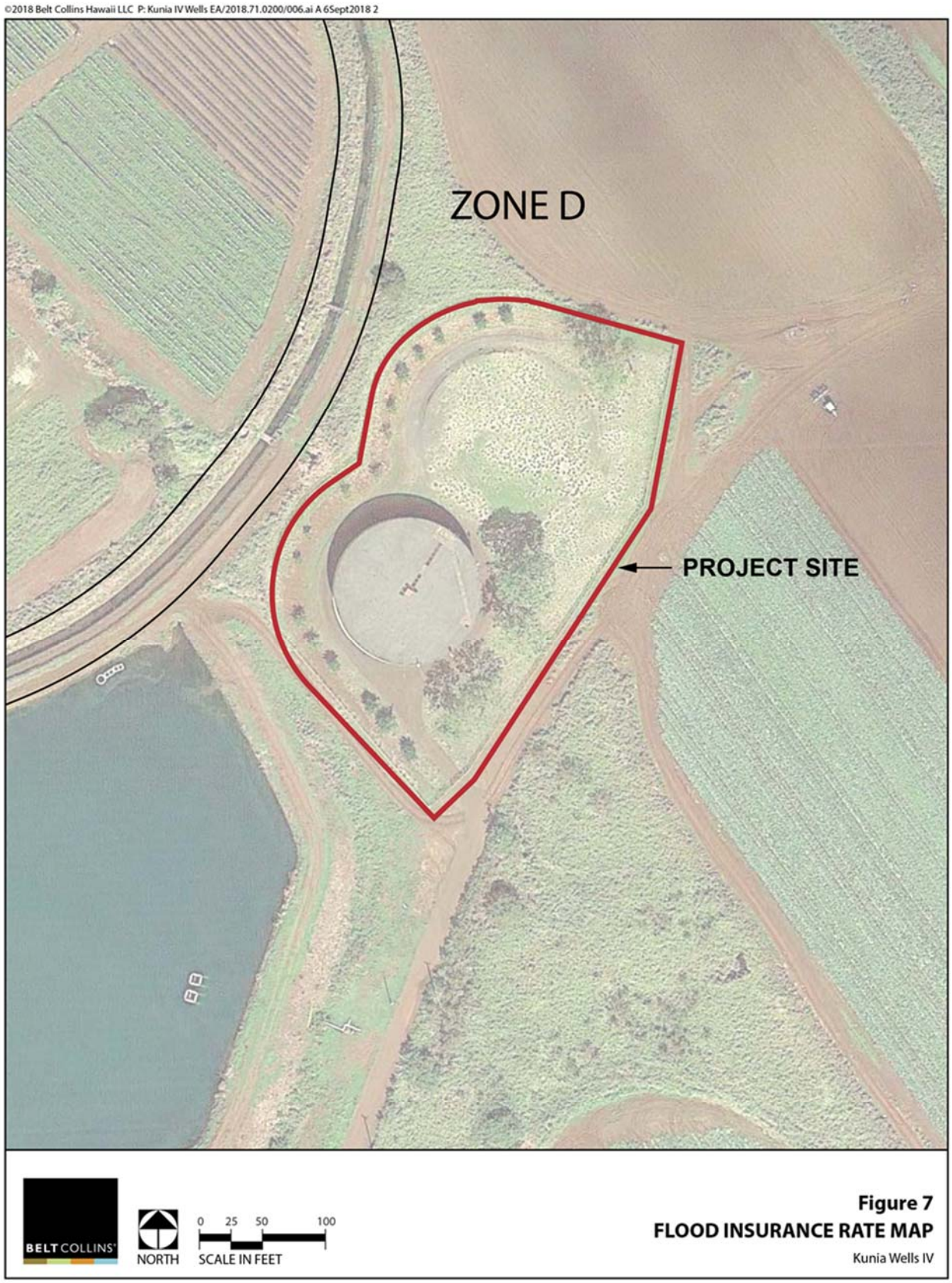

Figure 7
FLOOD INSURANCE RATE MAP
Kunia Wells IV

3.9.2 Earthquake

Earthquakes occur frequently in Hawai‘i with the majority on or near Hawai‘i Island. Most of these earthquakes are too small to be felt and can only be detected by a seismometer. Earthquakes in Hawai‘i fall into three main classes: volcanic, caused from magma travelling upward or laterally; tectonic, slippage along tectonic faults; and mantle, the bending of Earth’s lithosphere (crust and upper mantle) from the weight of the islands and occurs deep below the earth’s surface.[14] The class of earthquake most likely to cause damage to O‘ahu is from the third earthquake category. The most recent earthquake to cause damage to O‘ahu, the 1973 Earthquake off the coast of Hawai‘i Island, and the most severe earthquake on record, the Lāna‘i Earthquake of 1871, were both from the third earthquake class.[15]

Thus, while earthquakes are a common occurrence within the State of Hawai‘i, they are much less frequent on the island of O‘ahu. Today, mitigation from an earthquake’s damage is through building codes that guide new design and construction as well as building alteration and maintenance. The International Building Code (IBC) applies to most types of new buildings.

3.9.3 Hurricanes

Hurricanes are part of the Tropical Cyclone storm family. They are characterized by high winds speeds (more than 74 miles per hour), storm surge, and heavy rains. Hurricanes can cause severe damage to life and property. The City and County’s Department of Emergency Management uses a multi-layered warning system through television, radio, sirens, and internet for events such as a hurricane. These early warning systems should provide residents with ample preparation time to evacuate susceptible areas and minimize or avoid life-threatening situations.

While hurricanes are rare events in Hawai‘i, they can occur. The damage incurred by hurricanes is enhanced by the Hawaiian Islands’ topography which may funnel and amplify winds across ridges and through island channels.[16] Additionally, flying debris from structures (such as roofing materials and metal sidings), lawn furniture, signs and vegetation can be a danger to life and property. The most recent, and damaging, Hurricane to strike the Hawaiian Islands was Hurricane Iniki, a Category four Hurricane, in 1992.

Hurricane Iniki was the most destructive hurricane to strike Hawai‘i in the 20th Century, and while Kaua‘i took the brunt, every island in the State suffered damage from strong winds and destructive surf.[17]

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14 U.S. Department of the Interior, U.S. Geological Survey. May 2017. *About Earthquakes in Hawai‘i* https://volcanoes.usgs.gov/observatories/hvo/about_earthquakes.html

15 Fryer, Gerard. 2009. *O‘ahu Earthquakes.* Retrieved from https://www.soest.hawaii.edu/GG/ASK/oahu-quakes2.html

16 Businger, Steven. 1998. *Hurricanes in Hawai‘i.* Retrieved from http://www.soest.hawaii.edu/met/Faculty/businger/poster/hurricane/

17 U.S. Department of Commerce, National Oceanic and Atmospheric Administration. National Disaster Survey Report, Hurricane Iniki. Retrieved from https://www.weather.gov/media/publications/assessments/iniki1.pdf

3.10 Scenic Resources

3.10.1 Existing Conditions

The visual characteristic of the project vicinity could be described as agricultural plains with rather flat terrain. The visual expectation for this area is of agricultural lands with pockets of suburban development. Kunia Road is a state owned and maintained north-south arterial roadway that varies in the number of lanes. At the southern end of the road, near the H-1 Freeway, Kunia is a six-lane principal arterial and transitions, traveling north, to a four-lane principal arterial near the Royal Kunia area. Traveling further north, Kunia transitions to a two-lane minor road; it is a two-lane road nearest to the project site. Southeast of the property is Pearl Harbor. There is a visual view of downtown Honolulu from the project site. East of the property is a view of the Koʻolau mountain range; west of the property is a view of the Waiʻanae mountain range. The general, immediate, view is of agricultural plains.

The Central Oʻahu Sustainable Communities Plan (COSCP) includes, as a key element of its vision, a network of open space and greenways. This network is to be created by linking the local land uses (mountain and agricultural areas, parks, golf courses) via waterways and greenways to create an Open Space Network. Agricultural lands along Kunia Road, in which this project is located, are part of the mountain and agricultural areas vision for the Central Oʻahu Open Space Network.[18]

3.10.1.1 Impacts and Mitigation Measures

The proposed exploratory wells and connecting lines would consist of improvements primarily below grade. Some well fixtures, such as the standing well casing, valves and connecting pipes, and concrete pad would be above grade but low to the ground. Alternatively, a manhole cover may be the only surface evidence of the well location. Overall, the visual impact of the proposed action would be minor or very negligible. No mitigation measures are required.

3.11 Historic, Archaeological, and Cultural Resources

3.11.1 Historic Properties

3.11.1.1 Existing Conditions

CSH conducted a study of historic properties for the project site and the surrounding area. They located historic properties within the vicinity of the site, the closest being the Waiāhole Irrigation Ditch and the associated Reservoir 225 (Figure 8). The Waiāhole Ditch runs from northeast to southwest and is north of the project site. It is an historic irrigation ditch initially constructed between 1913-1916 for sugarcane crop irrigation. The Reservoir 225 is treated as part of the Waiāhole Ditch Irrigation system. The study concluded that development of the exploratory wells would not adversely impact the Waiāhole Ditch or the Reservoir 225.

The CSH study found some historic properties relating to twentieth century sugarcane production within the vicinity of the project area. These historic properties are not adjacent to or within the project site. The historic properties are located southwest of the site and include two historic bridges and a plantation

[18] City and County of Honolulu, Department of Planning and Permitting. February 18, 2003. *Central Oʻahu Sustainable Communities Plan*. Retrieved from https://www.honolulu.gov/rep/site/ocs/roh/SCP_Central_Oahu.pdf

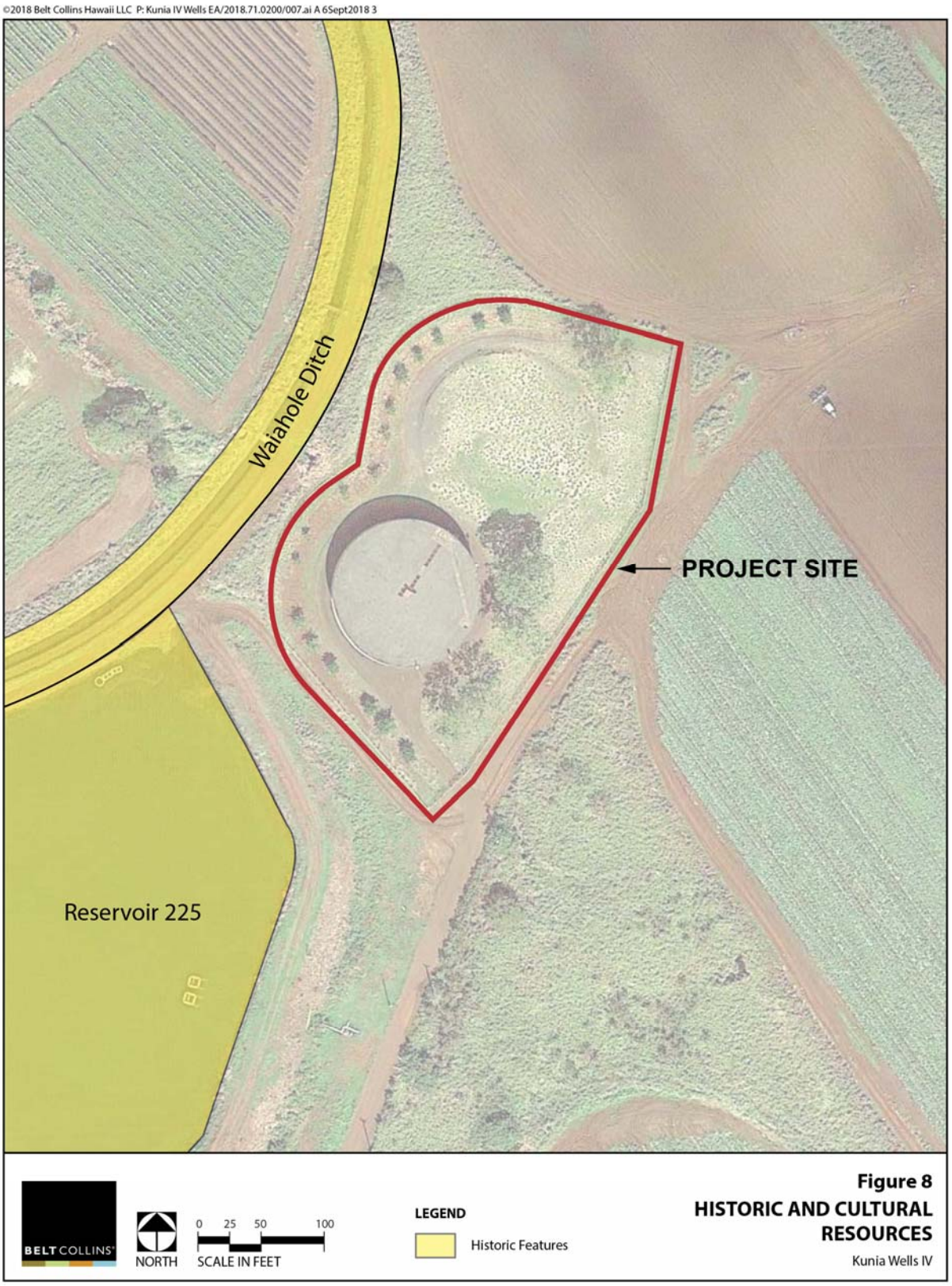
agricultural complex, noted by the Groza et al. (2007) study. Two surveys for historic properties, Kennedy 1987 and McElroy & Duhaylonsod 2016, were conducted for property immediately north of the project site; both surveys found no historic properties.

3.11.1.2 Probable Impacts

No property on this parcel is over 50 years old and therefore no property on this parcel is historic. The study conducted by CSH found that the proposed exploratory wells will have no effect on significant historic properties with "no historic properties affected."

3.11.1.3 Mitigation

No mitigation is required because no historic structures will be affected.


©2018 Belt Collins Hawaii LLC P: Kunia IV Wells EA/2018.71.0200/007.ai A 6Sept2018 3
Waiahole Ditch
PROJECT SITE
Reservoir 225
BELT COLLINS
NORTH
0 25 50 100
SCALE IN FEET
LEGEND
Historic Features
Figure 8
HISTORIC AND CULTURAL RESOURCES
Kunia Wells IV

3.11.2 Archaeological Sites

3.11.2.1 Existing Conditions

Archaeological research was conducted by CSH. The subsequent report states that, "while the southwest corner of the island of Oʻahu has been subjected to many archaeological studies, none have been located within or immediately adjacent to the current project." This report reviewed several past archaeological studies that found archaeological sites within the vicinity of the project site. Most notable are studies conducted by Groza et al. (2007) and Groza et al. (2014) identifying the Waiāhole Ditch and features associated with it. Southeast of the project site Stark et al. (2017) identify 5 features pertaining to agricultural activity conducted by the Oʻahu Sugar Company. Additionally, southwest of the project site, a study conducted by Wong, and Spear (2015) locates an historic road complex. None of these identified features area located within or adjacent to the project site.

3.11.2.2 Probable Impacts and Mitigation

The construction of the proposed exploratory wells would not impact the surrounding, surveyed, archaeological sites. CSH states, "prior archaeological studies in the vicinity have identified no traditional Hawaiian historic properties." Therefore, no mitigation is required because no archaeological sites of Hawaiian historic significance have been found within the vicinity of the project area.

3.11.3 Cultural Resources

A cultural assessment was conducted by CSH. This assessment examines the historical, cultural, and archaeological background of the project area, and its environs, to determine if cultural resources may be affected.

3.11.3.1 Existing Conditions

The project site is located within the Hoʻaeʻae Ahupuaʻa, ʻEwa District in south central Oʻahu. The northerly edge of this Ahupuaʻa does not extend to the mountains, but rather is cut off by the Honouliuli and Waikele Ahupuaʻa.
Of the four Ahupuaʻa in central ʻEwa, Hoʻaeʻae historically had the smallest population. There are few recorded place names within the Hoʻaeʻae Ahupuaʻa as compared to neighboring Ahupuaʻa in central Oʻahu.

While there are documented cultural resources in the Hoʻaeʻae Ahupuaʻa, the majority focus was in the southerly portion. Hawaiian accounts, including *kaʻaʻo* (legends); *wahi pana* (storied places); *ʻōlelo noʻeau* (proverbs); *oli* (oli); *mele* (songs); traditional *moʻolelo* (stories) recount cultural history in the Hoʻaeʻae Ahupuaʻa. An example is the Legend of Kaleiopuʻu which tells how the Kahuna lāʻau lapaʻau (medicinal healers) came to Hoʻaeʻae to harvest their medicines. They conducted their harvest within the area where Kaleiopuʻu Elementary School is now, south of the project site. Another example is the legendary hero Pikoi. His arrow shooting skill was commemorated in a saying that mentions the plain of Keahumoa.[19] This plain stretches over the uplands of Hoʻaeʻae.

There are several pre-contact/early historic trails that crossed ʻEwa. The project area is in close proximity to the mauka-makai trail that followed the approximate boundary of the Honouliuli and Hoʻaeʻae Ahupuaʻa and a cross-ahupuaʻa trail that connected Honolulu to Waiʻanae. The Organic Acts of 1845 and

[19] From the Cultural Assessment for the Kunia Wells IV Exploratory Wells, see Appendix C

1846 began the process of the Māhele, the division of Hawaiian lands. The Land Commission Awards (LCA), created during the Māhele, introduced private property into Hawaiian society. The bulk of land claims are near West Loch; no kuleana (native land rights) LCA claims were near the present project site.

By the twentieth century, sisal and sugar operations eclipsed the ranch as "an economic and social force in Hoʻaeʻae."[20] On a 1906 Donn Hawaiʻi Territory Survey Map of Oʻahu, the project site is shown to be on the very edge of the "approximate area of sugar plantations."

3.11.3.2 Probable Impacts and Mitigation

CSH conducted cultural research through various sources and focused background research on land transformation, development, and population changes from the early post-Contact era to present day. Based on their research, they conclude that the proposed project "should not have any impacts to cultural resources." They add that "although highly unlikely," if cultural resources are encountered, the following mitigation should be followed:

1. All work should cease immediately, and appropriate agencies should be notified pursuant to Hawaiʻi Revised Statutes (HRS) 13-300 if burials, subsurface deposits, or pit caves (sinkholes) with openings greater than 1 meter are discovered.
2. The State Historic Preservation Division (SHPD) and the Police Department will be notified pursuant to HAR 13-300-40, if iwi kūpuna are identified during earth moving activities. If human remains are discovered, a burial treatment plan is recommended in compliance with HAR 13-300 and HRS 6E-43.
3. If iwi kūpuna and/or cultural finds are found, project proponents should consult with cultural and lineal descendants of the area to develop a reinternment plan and/or preservation plan.

4 SOCIOECONOMIC SETTING

4.1 Socioeconomic Background

If put into production, the proposed exploratory wells will be integrated into the BWS water system and will serve consumers throughout Oʻahu. The site is located entirely in an agricultural area and is surrounded by farmland. The proposed project is approximately 1.5 miles from the residential neighborhood of Royal Kunia (Figure 9).

Recent data gathered by the U.S. Census shows Census Tract 89.24 (Table 1 and Figure 10) to be home to 7,304 persons, 0.7% of the total population of the City.[21] A majority of residents identify themselves as Asian. The share of occupied housing units is greater for this Census tract than for the County as a whole. The characterization of the residents that emerges is of a neighborhood of middle- to high-income workers.

[20] ibid

[21] The data are from samples gathered over five years, from 2012-2016

Table 1: 2016 American Community Survey Indicators, Census Tract 89.24

Population Characteristics	Census Tract 89.24		City and County of Honolulu	
	Number	Percent	Number	Percent
Population	7,302		992,605	
Median Age (Years)	37.8		37.4	
Race (alone or in combination)				
White		25.4%		23.0%
Black or African American		.7%		23.0%
American Indian and Alaska Native		2.0%		1.3%
Asian		78.3%		36.6%
Native Hawaiian and other Pacific Islander		17.9%		14.9%
Some other race		2.2%		1.3%
Average Number of Race Identifications	1.27		1.68	
Hispanic or Latino (of any race)	453		96,722	
Housing Units				
Total Housing Units	2,066		347,458	
Occupied Housing Units	2,017	97.6%	309,169	89.0%
Median Household Income	116,010		80,513	
Employment Status				
Armed	179		38,109	
Civilian	4,131		488,421	
Civilian Unemployment rate		3.1%		5.1%
Income Below Poverty Line (past 12 months)				
All People		1.7%		8.5%
Under 18 years		2.2%		9.6%
18 to 64 years		1.0%		8.0%
65 years and over		4.5%		8.9%
Total with Disability		7.8%		11.0%
Under 18 years		1.2%		2.9%
65 years and over		31.9%		33.9%

Source: 2012-2016 American Community Survey, five-year estimates for Census Tract data. 2016 American Community Survey 1-year data for the City and County of Honolulu data. Both are downloaded from http://census.hawaii.gov/acs/acs-2016/. Since 2005, economic and household information that had earlier been part of the decennial census long form is gathered annually by the U.S. Census.

Figure 9
AREA MAP
Kunia Wells IV

Table 2: City and County of Honolulu Socioeconomic Projections

Population Character	Year 2000 (Actual) Number	Year 2035 (Projected) Number	Percent Change
Population (Village Park/Kunia)	12,178	17,424	43%
Population (Central O‘ahu)	148,208	181,423	22%
Population (O‘ahu)	876,156	1,038,317	18%

Source: 2000-2035 Development Plan Area and Subarea downloaded from http://www.honoluludpp.org/Portals/0/pdfs/planning/demographics2/Projections/2000-2035byDPA.pdf .

Table 3: 2010-2045 DBEDT Long Range Forecast

Population Character	City and County of Honolulu Number	Percent Change	Average Annual Growth rate
Population 2010	956,325		
Population 2045	1,073,796	1.2%	.3%

Source: Population and Economic Projections for the State of Hawai‘i to 2045. Data Downloaded from http://dbedt.hawaii.gov/economic/economic-forecast/2045-long-range-forecast/

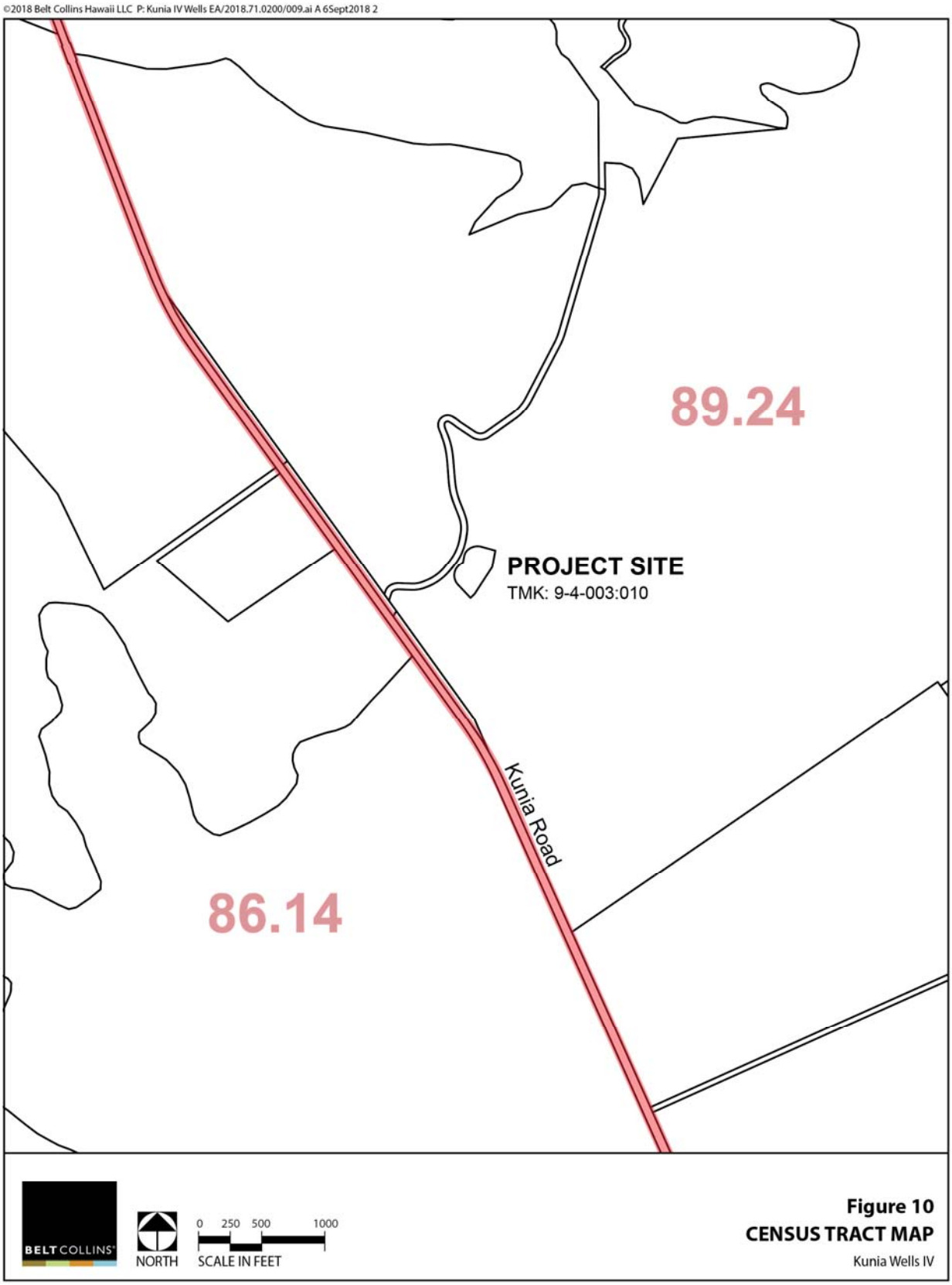


Figure 10
CENSUS TRACT MAP
Kunia Wells IV

4.2 Economic Considerations

The proposed action will involve construction for a period of six months to a year. The wells are exploratory and will not put into production until a later date. Consequently, the proposed project would have limited economic impacts. If the proposed exploratory wells are put into production, they will provide additional sources of water for the projected population increase for the region and the island.

4.3 Social Considerations

The proposed action is intended to test pump capacity for exploratory wells in anticipation for projected demand increase. The BWS calculates a projected increase of 8.0 MGD (43%) from 2012-2040 for the 'Ewa-Waipahu system.[22] Each of the wells is expected to produce 1.5 MGD, for a total capacity of 6.0 MGD (4 wells) on the project site. They are an important component of the BWS' public utility which is designed to improve and sustain the quality of life in the community. The wells would occur within the existing BWS-owned 81,387 square foot site. There would be no need for displacement of existing structures or buildings or to relocate adjacent land uses.

The site is located on agricultural land with no surrounding residences. No noise mitigation is required for construction. If placed into production, the surrounding population and the island will have additional water sources for consumption.

5 PUBLIC FACILITIES AND SERVICES

5.1 Public Roads

5.1.1 Circulation and Traffic

Existing Conditions: The proposed exploratory wells are located approximately 600 feet northeast of Kunia Road (State Route 750). Approximately 2.5 miles south of the project site is the Interstate Route H-1 (H-1 Freeway) with Kunia Road being the closest highway interchange. Kunia Road is a principal north-south road that is a two-lane minor roadway starting at Anonui Street to Schofield Barracks; the project site is located within this area. Access to the project site is via an unnamed and gated dirt road off Kunia Road. The dirt road is secured by a fence with BWS access. Within the fenced area is a farm. Traffic on this dirt road is minimal.

Potential Impacts and Mitigation Measures: Drilling for the exploratory wells at the project site should have no long-term impacts on traffic for Kunia Road and the unnamed dirt road. Operations at the project site are self-operating and run without an operations crew; only routine maintenance is required to monitor and service the facility. The project site should not affect commuter traffic on the surrounding roadways. All current site operations will continue normally during the drilling operation.

[22] BWS Master Plan which is based on DPP population growth estimates which are based on allowable uses.

During well drilling, some traffic will be generated to transport equipment and supplies. These trips would be short-term, infrequent, and temporary. The construction contractor would schedule these deliveries during off-peak hours to avoid any delays in travel time by the public.

5.1.2 Sewer, Electricity and Telecommunications

Existing Conditions: There are no restroom facilities on-site for this property. There is no sewer service to this site and no wastewater is currently discharged. Electrical service is provided by the Hawaiian Electric Company (HECO) through overhead lines along Kunia Road. Electricity is primarily used to power the existing instrument house and lighting on the property.

Hawaiian Telecom and Ocean TWC also provide services for the site.

Potential Impacts and Mitigation Measures: The proposed action would result in an increased electrical demand, but not substantially enough to adversely impact existing HECO facilities. Wastewater generated and telecommunications usage on the property are not anticipated to change as a result of the project.

5.1.3 Solid Waste

Existing Conditions: Solid waste generated at the site consists primarily of vegetation clippings and debris from regular maintenance of the reservoir grounds. Maintenance crews from the BWS Field Operations Division regularly remove the solid waste from the area.

Potential Impacts and Mitigation Measures: Solid waste and minor construction debris generated at the site during construction is not anticipated to have a notable effect on the island's landfills or solid waste disposal sites. Any recycling or reuse of construction debris by the contractor would help minimize the amount of solid waste disposal.

When construction is completed, little or no increase in generated solid waste over existing generated solid waste from the site is expected to occur.

5.2 Public Facilities and Services

5.2.1 Education

Existing Conditions: The proposed exploratory wells are located in the State Department of Education's Pearl-City Waipahu Complex Area. It contains seventeen public schools, including elementary, middle, and high schools. The nearest public school is Kaleiopu‘u Elementary which is located less than half a mile from Kunia Road, close to the H-1 Freeway.

Potential Impacts and Mitigation Measures: If the wells are put into production, they will provide increased potable water supply for the area schools. The proposed action is not expected to generate any adverse effect on the functioning of the State's educational system. No mitigation is needed.

5.2.2 Parks and Recreation

Existing Conditions: The DPR operates parks and recreational facilities throughout the island. This project is located in the Leeward park system with the closest park to the project site being located at 94-709 Ka‘aholo Street, Waipahu, Ho‘ae‘ae Community Park. This park is approximately 3.2 miles from the project site. Additionally, the Royal Kunia Country Club, located at 94-1509 Anonui Street, Waipahu, is approximately 3.3 miles from the project site.

Potential Impacts and Mitigation Measures: The proposed action is not expected to generate adverse effects on the functions of the City’s parks system. No mitigation is needed.

5.2.3 Medical and Emergency Services

Existing Conditions: The nearest full-service hospital is the Queens Medical Center, located approximately 4 miles from the project site at 91-2141 Fort Weaver Road, ‘Ewa Beach.

Emergency medical service (EMS) is provided by the City with an EMS ambulance unit based at the Waipahu Fire Station, approximately 4 miles from the project site.

Potential Impacts and Mitigation Measures: If the wells are put into production, they would provide an additional water supply to the City’s medical facilities. The proposed action would not adversely affect existing medical and emergency services in the community. No mitigation is needed.

5.2.4 Fire Protection

Existing Conditions: The HFD provides emergency service to the project area from its Waipahu Fire Station located approximately 4 miles south from the project site. Support could come from the Waikele Fire Station, located approximately 5.1 miles southeast of the project site.

Potential Impacts and Mitigation Measures: As part of the BWS’ objective of system reliability and adequacy, the proposed exploratory wells, if put into production, would ensure uninterrupted reliable future water supplies to emergency services such as the fire department. No mitigation is required.

5.2.5 Police

Existing Conditions: The project area is located in Sector 1 (Waipahu, Waikele) of the HPD Patrol District 3 – Pearl City. The district uses the department’s office at the Pearl City Police Station located off Waimano Home Road as its district’s headquarters.

Potential Impacts and Mitigation Measures: No police assistance is required to control traffic during the drilling of the exploratory wells. Security of construction equipment stored on the pump station site during construction would be the responsibility of the contractor.

After drilling, testing, and construction of the exploratory wells, long-term well operations are not expected to impact regular police operations serving the area. No mitigation is needed.

6 RELATIONSHIP TO PUBLIC AND LAND USE POLICIES

6.1 Hawai‘i State Plan

The Hawai‘i State Plan, as established under the Hawai‘i State Planning Act, Chapter 226, HRS, has served as a guide for the long-range development of the state since adoption of the law in 1978. The Plan identifies goals, objectives, and policies for the State government to (1) provide a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources; (2) improve coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities; and (3) establish a system for plan formulation and program coordination to provide for an integration of all major state and county activities.

Of the 107 sections that comprise Chapter 226, HRS, five sections are directly applicable to this EA: (1) HRS § 226-16 – Objectives and Policies for Facility Systems – Water; (2) HRS § 266-6 – Objectives and Policies for Facility Systems – In General; (3) HRS § 266-11 – Objectives and Policies for the Physical Development – Land-based, Shoreline, and Marine Resources; (4) HRS § 226-12 – Objectives and Policies for the Physical Environment – Scenic, Natural Beauty, and Historic Resources; and (5) HRS § 226-13 – Objectives and Policies for the Physical Environment – Land, Air, and Water Quality. The following table presents the relevant sections, assesses the project’s conformance with the State Plan’s goals and objectives, and summarizes the project’s benefits and probable impacts.

Table 4: Applicable Sections of the Hawai‘i State Planning Act

Section	Chapter – Part I. Overall Theme, Goals, Objectives and Policies
226-16	**OBJECTIVES AND POLICIES FOR FACILITY SYSTEMS – WATER**
(a)	Planning for the State’s facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational and other needs within resource capacities.
(b)	To achieve the facility systems water objective, it shall be the policy of this State to:
(1)	Coordinate development of land use activities with existing and potential water supply.
(2)	Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.
(4)	Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.
(5)	Support water supply services to areas experiencing critical water problems.

Table 4: Applicable Sections of the Hawai‘i State Planning Act

Section	Chapter – Part I. Overall Theme, Goals, Objectives and Policies
Comments: The basic responsibility of the BWS is to manage O‘ahu’s municipal water resources and distribution system and provide a safe and dependable drinking water supply for both present and future generations. In carrying out this responsibility, the BWS’s objectives are to ensure that this water supply is reliable, adequate, and sustainable for current and future users. The proposed exploratory wells purpose and intent are consistent with this State objective because the goal of the project is to achieve reliable and safe drinking water to meet future water requirements for O‘ahu.	
226-14	**OBJECTIVES 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 Hawai‘i’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.
Comments: The BWS would not interfere with the State’s guided efforts to achieve general facility systems (in general). As a public utility, the BWS would coordinate its plans with the State and County plans, and as an agency of the County, it would allow flexibility in design and development of facility systems to provide compliance with minimum agency design standards. The BWS is also bound by its public function to manage and control facilities costs for its users.	
226-11	**OBJECTIVES AND POLICIES FOR THE PHYSICAL DEVELOPMENT – LAND-BASED, SHORELINE, AND MARINE RESOURCES**
(a)	Planning for the State’s physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives.
(1)	Prudent use of Hawai‘i’s land-based, shoreline, and marine resources.
(2)	Effective protection of Hawai‘i’s unique and fragile environmental resources.
(b)	To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of the State to:
(1)	Exercise an overall conservation ethic in the use of Hawai‘i’s natural resources.
(2)	Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.
(3)	Take into account the physical attributes of areas when planning and designing activities and facilities.

Table 4: Applicable Sections of the Hawai‘i State Planning Act

Section	Chapter – Part I. Overall Theme, Goals, Objectives and Policies
(4)	Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.
(5)	Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.
(8)	Pursue compatible relationships among activities, facilities, and natural resources.
Comments: The proposed action would occur on an existing BWS site on agricultural lands in south central O‘ahu. There will be no impact to shoreline or marine resources because of its inland location. This project will not adversely impact the surrounding environment and is compatible with existing uses; this existing BWS site is already being used for potable water retention. This EA, prepared for the BWS, evaluated the potential impacts of the project and, where applicable, indicated potential mitigation measures to minimize or avoid impacts.	
226-12	**OBJECTIVES AND POLICIES FOR THE PHYSICAL ENVIRONMENT – SCENIC, NATURAL BEAUTY, AND HISTORIC RESOURCES**
(a)	Planning for the State’s physical environment shall be directed towards achievement of the objective of enhancement of Hawai‘i’s scenic assets, natural beauty, and multicultural/historical resources.
(b)	To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:
(1)	Promote the preservation and restoration of significant natural and historic resources.
(3)	Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.
(4)	Protect those special areas, structures, and elements that are an integral and functional part of Hawai‘i’s ethnic and cultural heritage.
Comments: The proposed action would involve primarily underground improvements which would not interfere with aboveground scenic amenities or visual corridors. The historic and cultural assessment conducted by CSH found “no historic properties affected.” Historic properties in the vicinity of the project, such as the Waiāhole Ditch, will not be impacted by the proposed project.	
226-13	**OBJECTIVES AND POLICIES FOR THE PHYSICAL ENVIRONMENT – LAND, AIR, AND WATER QUALITY**
(a)	Planning for the State’s physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:
(1)	Maintenance and pursuit of improved quality in Hawai‘i’s land, air, and water resources.
(2)	Greater public awareness and appreciation of Hawai‘i’s environmental resources.
(b)	To achieve the land, air, and water quality objectives, it shall be the policy of this State to:
(2)	Promote the proper management of Hawai‘i’s land and water resources.

Table 4: Applicable Sections of the Hawai‘i State Planning Act

Section	Chapter – Part I. Overall Theme, Goals, Objectives and Policies
(3)	Promote effective measures to achieve desired quality in Hawai‘i’s surface, ground, and coastal waters.
Comments: It is in the BWS’ inherent responsibility to exercise proper management of O‘ahu’s land and water resources as well as to maintain and pursue their improved or desired quality. A goal of the BWS’ Master Plan, 2016, is that potable water is consistently safe to drink and that the water supply is maintained in a sustainable way so as not to hinder the physical environment’s long-term integrity.	

6.2 State Land Use Law

The Hawai‘i State Legislature adopted the State Land Use Law in 1961 to protect Hawai‘i’s valuable land from development that resulted in short-term gains from a few developments and long-term losses to the income and growth potential of the state’s economy. Accordingly, the Legislature established an overall framework of land-use management. HRS, Chapter 205, placed all lands in the state in one of four land use districts: Urban, Agricultural, Conservation, or Rural (the Rural District was added in 1963), and established the State Land Use Commission to administer the law.

The State Land Use District Maps, which designates the location of the various land use districts, identifies this site in the Agricultural District. The proposed exploratory wells are permitted in the designated Agricultural District. As such, the proposed action would take place in an agricultural environment where agricultural lands and suburban development are anticipated and planned. No costly changes in land use, buildup of infrastructure, or consequent adverse impacts are anticipated.

6.3 State Environmental Policy

The State Environmental Policy under HRS Chapter 344 established an environmental policy that (1) encourages productive and enjoyable harmony between people and their environment; (2) promotes efforts that would prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity; and (3) enriches the understanding of the ecological systems and natural resources important to the people of Hawai‘i.

The proposed action is consistent with Section 344-3(1) of the State Environmental Policy which states:

> *Conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State’s unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which humanity and nature can exist in productive harmony and fulfill the social, economic, and other requirements of the people of Hawaii.*

The BWS’ mission is to provide a safe and dependable water supply for its customers. Its five main objectives are: to provide safe and high-quality water that maintains the natural water quality of water

sources; to provide a reliable water system which provides uninterrupted service at all times; water conservation that optimizes water resources sustainably; proactive water management that ensures a sustainable water supply today and in the future. The BWS undertakes diversified approaches and projects in conservation, potable groundwater, and alternative water supplies, including brackish, recycled, and desalinated water to meet future demands. Efforts are also focused on protecting the natural environment, important watersheds, and water sources by monitoring the island's rainfall and aquifer water levels and salinity; and taking appropriate precautions to ensure the sustainability of the island's potable water supplies.

6.4 Hawai‘i Coastal Zone Management Program

The Federal Coastal Zone Management (CZM) enforcement authority (Public Law 92-583), as amended, has been delegated to the state and enacted as HRS, Chapter 205A. The Hawai‘i CZM Program was promulgated in 1977 in response to the federal CZM Act of 1972. The areas encompassed by the CZM are all the lands and waters of the state, including the northwestern Hawaiian Islands. Following is a list of the CZM's main objective and policy headings and an assessment of the project's relationship to those public parameters.

Recreational Resources

The proposed project is not located near the coast and would not interfere with, nor obstruct public efforts to meet the CZM objective and policies relating to providing coastal recreational opportunities accessible to the public.

Historic Resources

There are no archaeological, culture, or historic resources of significance directly related to the project site. There are historic sites located near the property, such as the Waiāhole Ditch Irrigation System, but they will not be affected by the proposed project; therefore, the proposed action is not expected to adversely affect the identified historic features within proximity the property.

Scenic and Open Space Resource

The proposed action would not interfere with nor obstruct public efforts to meet the CZM objective and policies relating to protection, preservation, and restoration or improvement of the quality of coastal scenic and open space resources.

Coastal Ecosystem

The proposed project is inland, located in Central O‘ahu; it would not adversely affect valuable coastal ecosystems, including reefs.

Economic Uses

The CZM objective and policies pertaining to economic uses provide for public or private facilities and improvements important to the state's economy in suitable locations. The selected location is suitable because there are currently no wells at this site and the sustainable yield for this aquifer is currently not maximized. A BWS goal is to ensure a consistent safe and dependable supply for current and projected requirements.

Coastal Hazards

The proposed project is located more than 4 miles, upland, from the West Loch of Pearl Harbor. It would not be adversely affected by coastal hazards, such as tsunami inundation, storm waves, stream flooding near the shoreline, and coastal erosion, subsidence, or pollution.

Managing Development

The proposed action would not interfere with public efforts to improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Public Participation

The proposed action is engaged in public participation by undertaking this EA preparation and public comment and response process. Through this environmental review, information and public awareness are generated on the project and its affected environment.

Beach Protection

The proposed action would not interfere with public efforts to protect beaches for public use and recreation. If placed into production, operations of the proposed exploratory wells would not have any direct adverse impact on these natural resources of the state.

Marine Resources

The proposed action would not obstruct public efforts to implement the State's ocean resources management plan.

6.5 City and County of Honolulu General Plan

The City's General Plan is comprised of 11 sections relating to: *Population; Economic Activity; Natural Environment; Housing; Transportation and Utilities; Energy; Physical Development and Urban Design; Public Safety; Health and Education; Culture and Recreation;* and *Government Operations and Fiscal Management*.

The sections on *Population, Natural Environment*, *Housing, Transportation and Utilities,* and *Physical Development and Urban Design* are relevant to the proposed action and this EA and are presented and described in Table 7.

Table 5: Applicable Sections of the City and County of Honolulu General Plan

Section	Objective/Policy
POPULATION	
Objective B	To Plan for future population growth.
Policy 1	Allocate efficiently the money and re-sources of the City and County in order to meet the needs of O'ahu's anticipated future population.
Objective C	To establish a pattern of population distribution that will allow the people of O'ahu to live and work in harmony.

Table 5: Applicable Sections of the City and County of Honolulu General Plan

Section	Objective/Policy
Policy 2	Encourage development within the secondary urban center at Kapolei and the ‘Ewa and Central O‘ahu urban-fringe areas to relieve developmental pressures in the remaining urban-fringe and rural areas and to meet housing needs not readily provided in the primary urban center.
Policy 4	Direct growth according to Policies 1, 2, and 3 by providing land development capacity and needed infrastructure to seek a 2025 distribution of O‘ahu’s residential population as follows (pertinent locations): Central O‘ahu 17% share of 2025 island wide population. (This is the second greatest share behind the Primary Urban Core at 46% share).
Section	**Objective/Policy**
NATURAL ENVIRONMENT	
Objective A	To protect and preserve the natural environment.
Policy 4	Require development projects to give due consideration to natural features such as slope, flood and erosion hazards, water-recharge areas, distinctive land forms, and existing vegetation.
Policy 7	Protect the natural environment from damaging levels of air, water, and noise pollution.
Policy 10	Increase public awareness and appreciation of O‘ahu’s land, air, and water resources.
Objective B	To preserve and enhance the natural monuments and scenic views of O‘ahu for the benefit of both residents and visitors.
Policy 1	Protect the Island’s well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands.
HOUSING	
Objective C	To provide the people of O‘ahu with a choice of living environments which are reasonably close to employment, recreation, and commercial centers and which are adequately served by public utilities.
Policy 4	Encourage residential development in areas where existing roads, utilities, and other community facilities are not being used to capacity.
TRANSPORTATION AND UTILITIES	
Objective B	To meet the needs of the people of O‘ahu for an adequate supply of water and for environmentally sound system of waste disposal.
Policy 1	Develop and maintain an adequate supply of water for both residents and visitors.
Policy 2	Develop and maintain an adequate supply of water for agricultural and industrial needs.
Policy 4	Encourage a lowering of the per-capita consumption of water and the per-capita production of waste.
Objective C	To maintain a high level of service for all utilities.
Policy 1	Maintain existing utility systems in order to avoid major breakdowns.

Table 5: Applicable Sections of the City and County of Honolulu General Plan

Section	Objective/Policy
Policy 2	Provide improvements to utilities in existing neighborhoods to reduce substandard conditions.
Policy 3	Plan for the timely and orderly expansion of utility systems.
Objective D	To maintain transportation and utility systems which will help O‘ahu continue to be a desirable place to live and visit.
Policy 1	Give primary emphasis in the capital -improvement program to the maintenance and improvement of existing roads and utilities.
Policy 2	Use the transportation and utility systems as a means of guiding growth and the pattern of land use on O‘ahu
Policy 4	Evaluate the social, economic, and environmental impact of additions to the transportation and utility systems before they are constructed.
PHYSICAL DEVELOPMENT AND URBAN DESIGN	
Objective A	To coordinate changes in the physical environment of O‘ahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located.
Policy 1	Plan for the construction of new public facilities and utilities in the various parts of the Island according to the following order of priority: first, in the primary urban center; second, in the secondary urban center at Kapolei; and third, in the urban- fringe and rural areas.
Policy 2	Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation, and public safety facilities.

Comments: The proposed action is consistent with the above City objectives and policies. It is a small scale project calling for the development of exploratory wells in preparation of future water demands within Central O‘ahu and elsewhere on the island. The project is proposed in order to provide a safe and dependable water source for residents and visitors to meet demand from the ‘Ewa-Waipahu area. Population increase in ‘Ewa is expected to be larger than other areas on O‘ahu. This increase is attributed to factors including development along incoming rail and directed City and State objectives to growth in this area.

These proposed exploratory wells would have no significant impact on the environment. The BWS is responsible for managing O‘ahu’s municipal water resources and distribution system and providing residents with a safe and dependable drinking water supply. A BWS Water Master Plan objective is water resource sustainability and proactively managing and improving the watershed and ground supply; this objective actively supports policies in the General Plan. As a result, the BWS’ actions are entirely consistent with City objectives and policies.

6.6 Central O‘ahu Sustainable Communities Plan

“In 1989, the Honolulu City Council approved changes to the General Plan which designated the urban fringe areas in Central O‘ahu as one of O‘ahu's principal residential development areas. Since then, Central O‘ahu, along with the Primary Urban Center and the Secondary Urban Center and urban fringe areas in ‘Ewa, have provided the bulk of the new housing developed on the island”.

The intent of the COSCP is to guide public policy, investment, and decision-making through the 2025 planning horizon with population growth in planned community developments as they are built out and to look beyond 2025 in order to better understand what Central O‘ahu would look like “fully” developed. The intent is to manage growth by balancing the need to accommodate development and preserve agricultural land and open space.

A map showing the boundaries of the COSCP is shown below (Figure 11). The vision for the COSCP’s future emphasizes containing urban fringe growth with preservation of open spaces and agricultural lands. The key elements of the COSCP include:

- Protect agricultural lands, open space, and natural, historic, and cultural resources;
- Revitalize Waipahu and Wahiawā;
- Build master planned residential communities that support walking, biking, and transit use;
- Design communities to reduce automobile use as the principal mode of transport, and;
- Provide adequate infrastructure to meet the needs of new and existing development.

The City recognizes the BWS as the utility entity responsible for controlling, managing and operating O‘ahu’s municipal water system. The BWS is aware of the need to integrate water resource planning for urban development, in-stream uses, agricultural uses, possible use of reclaimed water, and the sustainability of groundwater aquifers. As a result, the BWS is engaged in long-range integrated water resources planning in coordination with the CWRM. The project action therefore is consistent with COSCP’s objectives.

Water Allocation and System Development

Section 4.2.1 of the COSCP sets out relevant policies for “Water Allocation and System Development”[23]. Policy “Adequacy of Water Supply” requires the BWS to verify adequate potable and non-potable water prior to zoning approval for new residential and commercial developments. Policy “Development and Allocation of Potable Water” states that the BWS should coordinate new residential and commercial developments with the allocation of potable water for urban use on O‘ahu. The State Legislature has appropriated $1 million to the Department of Land and Natural Resources for the design and construction of one exploratory well to meet future potable requirements for diversified agricultural.

The COSCP identifies that the “Pearl Harbor aquifer is the most cost-effective and accessible water resource of potable quality.” Table 4.2 of COSCP “Potential sources of potable and non-potable water for

[23] Department of Planning and Permitting, Central Oahu Sustainable Communities Plan , 2002, p. 4-17

Ewa and Central Oahu" identifies "Kunia Wells III" and "Kunia Wells II Addition" to have a combined capacity of 4.5 MGD.

The proposed project is in the Pearl Harbor aquifer and implements the potential wells in Table 4.2 of COSCP. The BWS would supply extracted water to meet demand in the 'Ewa-Waipahu area. The proposed project is, therefore, consistent with policies for "Water Allocation and System Development".

Adequate Facilities Requirement

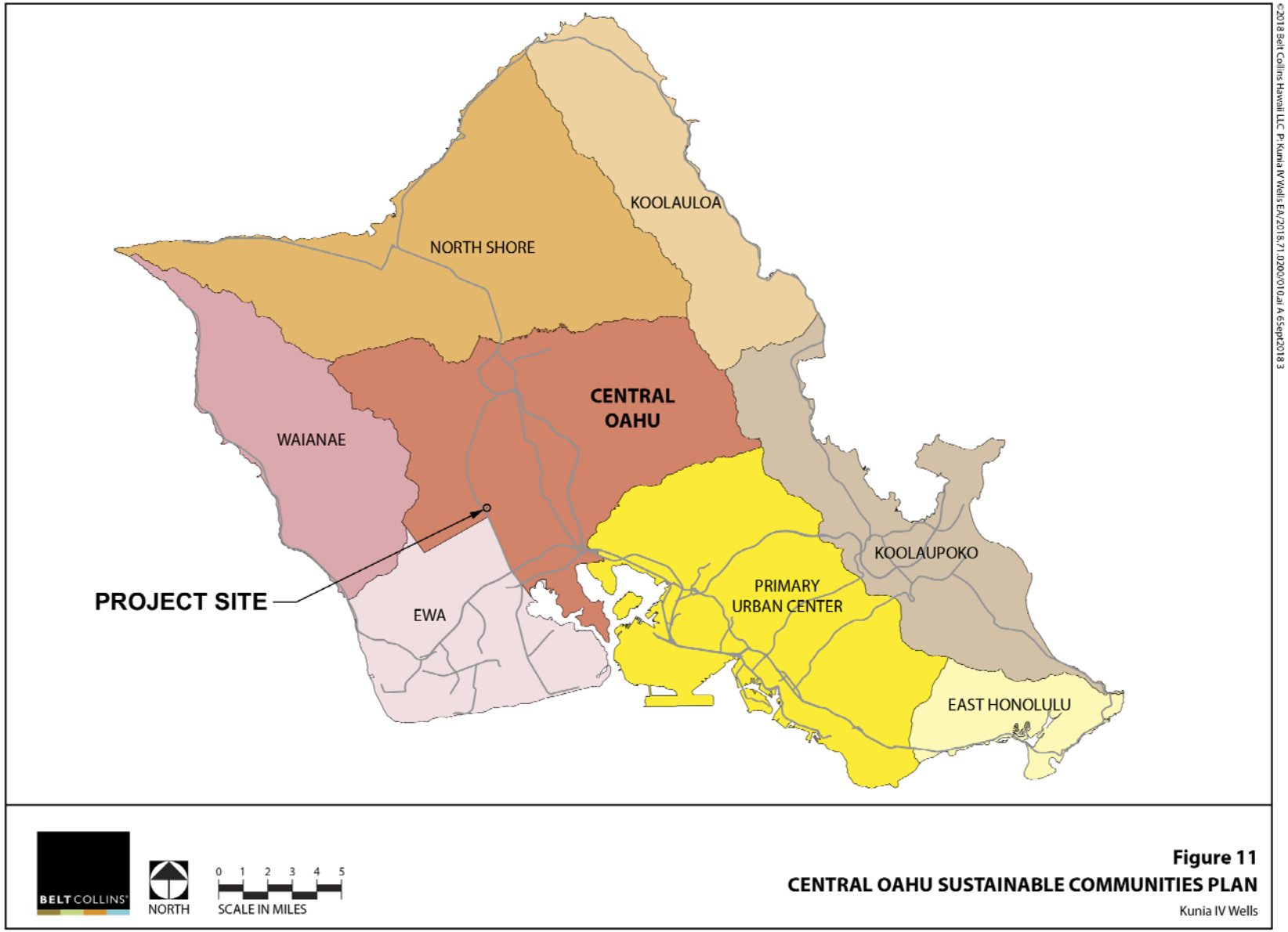
Section 5.4.1 of COSCP emphasizes the adequacy of infrastructure to facilitate orderly development[24]. The proposed project seeks to ensure safe and dependable supply of potable water. The project, therefore, meets the objectives of "Adequate Facilities Requirement".

6.7 Land Use Ordinance

The LUO of the City regulates land uses on the island of O'ahu. The LUO is a set of regulations, consisting of permitted land uses for specific agricultural areas, development standards, application procedures, and criteria for granting permits and other land use approvals.

The project parcel (TMK 9-4-003:010) is designated as AG-1. This zoning designation allows the BWS to continue use of the property for public utility purposes. Specifically, the proposed project is classified as a Type-A utility, the development of exploratory wells is considered a permitted use subject to standards in Article 5.

[24] Department of Planning and Permitting, Central Oahu Sustainable Communities Plan , 2002, p. 100


KOOLAULOA
NORTH SHORE
CENTRAL OAHU
WAIANAE
PROJECT SITE
EWA
PRIMARY URBAN CENTER
KOOLAUPOKO
EAST HONOLULU
BELT COLLINS
NORTH
0 1 2 3 4 5
SCALE IN MILES
Figure 11
CENTRAL OAHU SUSTAINABLE COMMUNITIES PLAN
Kunia IV Wells
©2018 Belt Collins Hawaii LLC P: Kunia IV Wells EA/2018.71.0200/010.ai A 6Sept2018 3

6.8 Special District

There are seven special districts on Oʻahu: Hawaiʻi Capitol, Diamond Head, Punchbowl, Chinatown, Thomas Square Honolulu Academy of Arts, Waikīkī, and Haleʻiwa. They were created to provide a means by which certain areas in the community may be designated as special areas to guide development. They are meant to protect and/or enhance the physical and visual uniqueness of those areas for the benefit of the community as a whole.

There are no special districts near the proposed project. Therefore, the City's land use requirements relating to special districts, which begin with the LUO Section 21-9.20, are not applicable to this project.

6.9 Special Management Area

In 1977, the Hawaiʻi Coastal Zone Management Act, Chapter 205A, HRS, became law and incorporated many of the features of the Hawaiʻi Shoreline Protection Act of 1975. Under the new law, each county in the state established its own procedures for administering the SMA and issuing a SMA use permit.

The SMA for Oʻahu encompasses a band of coastal land around the island. The proposed project is located approximately 4 miles from the nearest SMA boundary, Pearl Harbor West Loch, and not subject to the City's SMA rules and regulations.

6.10 Other Permits and Approvals

The contractor will comply with the Hawaiʻi Well Construction and Pump Installation Standards (2004), amended by the DLNR under HRS 174C and HAR 13-168-14. All wells for potable water supply must meet the Department of Health Safe Drinking Water Branch's "Rules Relating to Potable Water Systems" per Title 11, Chapter 20. A grubbing permit will be needed to clear vegetation for the access road, exploratory well development and staging area.

For well drilling, it is commonly the contractor's responsibility for maintaining the solids onsite, treatment and disposal, and if choosing to discharge treated process effluent to State Waters, for getting a National Pollutant Discharge Elimination System (NPDES), Form C, coverage for storm water discharge associated with construction activity. For exploratory well development only, it is conceivable that the land disturbance could be restrained to less than 1-acre; and therefore, not require a NPDES, Form C, permit. Since there is no city storm drainage adjacent to the property, it is recommended that the BWS/Contractor address pump test water disposal on their own; i.e. not obtain a permit to discharge effluent into the Municipal Separate Storm Sewer System. It is suggested that the BWS negotiate with the adjacent landowner, Robinson Kunia Land LLC, to safely discharge pump test water onto adjacent property for irrigation. Alternatively, a Storm Drain Connection Permit may be required from the DPP for the discharge of pump test water and well water into the City stormwater drainage system, unless the BWS already has a blanket approval for such operations from the City. There are two grated drainage inlets on the property that connect to the City's drainage system.

6.11 Summary of Required Permits and Approval

The following are major land use permits and approvals required for the drilling, casing, and testing of the exploratory wells.

Table 6: Required State and City Land Use Permits and Approvals

Permit/Approval	Approving Agency
State of Hawai‘i	
Well Construction Permit	State Commission on Water Resource Management
Pump Installation Permit	State Commission on Water Resource Management
NPDES Form C	Hawai‘i State Department of Health, Clean Water Branch
City and County of Honolulu	
Storm Drain Connection Permit	City & County Department of Planning and Permitting
Grubbing Permit	City & County Department of Planning and Permitting
Grading Permit	City & County Department of Planning and Permitting

7 SUMMARY OF MAJOR IMPACTS

7.1 Short-Term Probable Impacts

Construction of the exploratory wells may occur within a single timeframe rather than in sequence at different timeframes over a number of years. In terms of evaluating the proposed action’s largest short-term probable impacts, this EA has reviewed the construction of the wells within a single timeframe; to occur simultaneously or in tight sequence, one after the other. Consecutive drilling would take advantage of testing and evaluation procedures before moving to the next well and to work within the contractor’s capacity, particularly if limited drilling equipment is available.

The noise generated from well drilling will be in limited increments for each exploratory well. The closest residence is 1.5 miles south of the site; no noise mitigation is required.

The property immediately downslope and south of the proposed exploratory well site is owned by Robinson Kunia Land LLC and zoned agriculture. It is suggested that the BWS negotiate with the adjacent landowner to safely discharge pump test water onto the adjacent property for irrigation use. If the discharge is not allowed, a Storm Drain Connection permit may be required.

7.2 Long-Term Probable Impacts

Impacts from the long-term construction of the exploratory wells would be confined within the grounds of the BWS facility. If conditions are seen as adequate to develop ground water, the exploratory wells may be converted to production wells when needed. If put into production, any noise generated in the long-

term will be minimal and generate inaudible sounds beyond the immediate area of the wells. Routine monitoring and maintenance are required to upkeep the facilities and continue its operation. Since regular operations at pump stations are unmanned, there will be little or no adverse impacts generated on the environment.

7.3 Cumulative Impacts

There are no cumulative impacts for the exploratory wells. The testing for pump capacity is a short-term activity. If placed into production, the wells will not exceed the permitted sustainable yield capacity outlined in the BWS Water Master Plan for this region.

8 PROPOSED MITIGATION MEASURES

8.1 Mitigation Measures for Short-Term Impacts

Noise generated during construction would be short-term and localized to the construction vicinity. It is located on agricultural lands that are not near residences and no construction noise permit is required.

Construction equipment and vehicles that emit gas or other emissions during construction (excluding pneumatic hand tools weighing less than 15 pounds) must be equipped with mufflers. The drilling rig for the exploratory wells would be powered by a portable diesel engine that emits exhaust.

The use and movement of heavy construction equipment on the pump station site may generate fugitive dust, especially during windy days. For those days, dust control measures such as dust screens, frequent water sprinkling over exposed dirt areas, and temporary ceasing of operations could be employed.

No archaeological or cultural features were identified on the property. If any buried cultural deposits are uncovered during construction, work would be halted in the immediate location of the find and SHPD would be notified and consulted for proper treatment before any construction work is resumed. There were no historic structures identified on the property.

Erosion and sedimentation control measures and BMPs, such as berms, silt screens, gravel bags, compost socks, and sedimentation basins, would be employed, if necessary, to ensure that sediment-laden runoff from the construction site does not flow into adjacent properties, drainage facilities and the abutting Waiāhole Irrigation Ditch. All solid waste and debris generated during construction would be collected and hauled away by the construction contractor to a permitted landfill or solid waste disposal site.

Probable impacts on traffic during construction are expected to be minor as nominal construction equipment and supply trips would occur. The construction contractor would still be responsible for scheduling its equipment and supply deliveries during nonpeak hour periods.

As a public utility, it is the BWS' usual protocol to coordinate its facility installations with other utility companies. This coordination would help ensure uninterrupted service by all the utilities and any unnecessary added cost in utility line realignments.

8.2 Mitigation Measures for Long-Term Impacts

No mitigation measure is required for the exploratory wells. The BWS' purpose for the proposed action is to establish and assess the water quantity and water quality of new exploratory wells. The current site location's reservoir is an unmanned operation requiring only routine facility monitoring and maintenance as well as periodic systems upkeep and repair by off-site BWS crews. With these operations in place, minimal impact is generated on the economic and social environment of the community.

A subsequent EA will address the impacts of the production wells, which may require additional pumping, treatment, and distribution facilities. There is no long-term use of electrical energy because once the testing for pump capacity is completed no electricity will be further required for this activity.

9 ALTERNATIVES CONSIDERED

9.1 No Action Alternative

Under the No Action alternative, no improvements to the site would occur. There would be no alteration to the land and, as a result, no impact to existing land uses and the natural environment. No funds would be expended for the facility, no construction revenues would be generated, and no economic benefits would be realized.

Under the No Action alternative, the BWS would not proceed with any capital improvements to increase the water supply for projected future demand at this site. The existing reservoir, on-site, would continue to store potable water for consumption, but there would be no increase in water supply. The No Action alternative would not meet the purpose and need of the BWS mission of supplying reliable, sustainable, and a cost-efficient water supply for projected future demand.

9.2 Alternative Site

The BWS considered an alternative site for the exploratory wells. The alternative site, located on TMK 9-2-001:014, is across Kunia Road from the existing BWS Kunia Wells II Station and Kunia 440' Reservoir. If this site was selected, and the exploratory wells were put into production, a pipeline would be required to cross Kunia Road to interconnect with the existing Kunia 440' system. Crossing Kunia Road would require a Use and Occupancy Agreement from the State Department of Transportation (DOT) Highways Division Construction and Maintenance Branch.

The alternative site would also require DOT Highway Right-of-Way for a new driveway. If this site were chosen, it would preclude other potential ancillary uses for the adjacent Kunia Wells II site, such as GAC treatment or other facility expansion. This site is also nearer to BWS wells than the preferred, chosen, site and it was decided by the BWS that it was better to spread demand out on the aquifer by choosing the Kunia 665 Reservoir site for the exploratory well testing. The Kunia Wells II Station would also require a noise study because of the proximity to residential uses.

10 DETERMINATION

This EA demonstrates that the proposed action would have no significant adverse impact on the environment and that an Environmental Impact Statement would not be warranted. Therefore, a FONSI is warranted for this project.

11 FINDINGS AND REASONS SUPPORTING DETERMINATION

The following findings and reasons demonstrate how the proposed action would have no significant adverse impact on the environment and in doing so supports the above determination. All findings and reasons provided in this section are referenced with the significance criteria specified in the HAR, Section 11-200-12.

(1) *Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.*
The proposed action calls for the drilling, casing, and testing of exploratory wells within an enclosed site owned by the BWS. Modifications to the site would be minimal with the proposed project. Construction work associated with the proposed project would not impact any historic structures or cultural resources as identified by historic and cultural studies recently conducted on the property.

(2) *Curtails the range of beneficial uses of the environment.*
The proposed project would be constructed on a site with existing infrastructure for water consumption. There would be no change in use of the project site and therefore would not curtail the range of beneficial uses of the environment.

(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.*
As demonstrated in Chapter 6.3 of this document, the proposed action is consistent with the State's long-term environmental policies and guidelines as expressed in HRS, Chapter 344.

(4) *Substantially affects the economic or social welfare of the community or state.*
The proposed project is expected to have a minor effect on the economic or social welfare of the community. Construction of the project is expected to mobilize a limited number of construction workers and have minor effects in increasing salary incomes in the local economy.

A purpose of the proposed project is to keep with the BWS goal of a diversified approach to potable water supply for future demand. Areas of Central O‘ahu, of which this project is part, are expected to see an increase in population. The proposed exploratory wells are one measure to the sustainable, diversified water approach of the BWS to keep pace with projected water demand.

(5) *Substantially affects public health.*
Existing State DOH regulations protect air and water quality in the state. The water will be tested to ensure the water quality is good for human consumption. Additionally, BMPs would be employed by the construction contractor during construction for sediment removal and velocity dissipation. Construction noise would be minimized through compliance with HAR, Chapter 11-46, Community Noise Control, requirements and recommendations.

(6) *Involves substantial secondary impacts, such as population changes or effects on public facilities.*
The proposed action is intended to increase water capacity for future population growth in the surrounding area. Population growth is not intended to be a consequence of increased water supply from the proposed exploratory wells. The proposed wells are a result of projected future population increase in the ʻEwa-Waipahu system and supplying potable water to areas with reduced pumping capacity throughout the island. Currently, at the proposed site, no wells exist; thus, if the exploratory wells do become production wells, they will have a positive impact on the area's public facilities by providing water for the growing population.

(7) *Involves a substantial degradation of environmental quality.*
Studies on the probable impacts from the proposed action show no substantial degradation of the area's environmental quality. Construction and operational impacts would be controlled by the use of BMPs and compliance with existing federal, state and county environmental laws, rules and regulations, and permit requirements.

(8) *Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.*
The proposed project is intended to expand potable water capacity within the region and elsewhere on the island. The project is for the construction of exploratory wells and would connect to existing BWS infrastructure. Thus, the project will have minimal effect upon the environment and does not involve a commitment for larger actions.

(9) *Substantially affects a rare, threatened, or endangered species, or its habitat.*
A flora and fauna study conducted for the project identified no rare, threatened, or endangered species at the project site. Habitat was found conducive for the Hawaiian Hoary Bat; mitigation measures will be put in place to limit any adverse effect to the mammal.

(10) *Detrimentally affects air or water quality or ambient noise levels.*
The anticipated impacts associated with the project construction work, such as dust, noise, and possibly erosion and discharges to waters of the State of Hawaiʻi, are short-term and temporary. These impacts would be minimized by the implementation of BMPs and use of mitigation measures in accordance with applicable federal, state, and county government statutes, laws, ordinances, rules and regulations, and permits.

(11) *Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters.*
The proposed project is located on a plateau of agricultural lands approximately 4 miles from the Pearl Harbor West Loch. It is located within an elevation ranging from approximately 600 feet above mean sea level to 640 feet. No coastal lands, floodplains, beaches, surface waters, and

estuaries would be impacted. The site is not located in any geologically hazardous or erosion-prone area.

(12) *Substantially affects scenic vistas and viewplanes identified in County or State plans or studies.*
The proposed action does not involve the construction of structures substantially above the surface of the ground. There would be no effects on existing scenic vistas or viewplanes as identified in current County or State plans.

(13) *Requires substantial energy consumption.*
The exploratory wells at the project site are not expected to substantially change overall energy consumption at the site.

12 DISTRIBUTION LIST

12.1 Pre-Consultation Distribution List

Agencies and interested parties contacted as part of the pre-consultation process are provided below. Comments received from parties are italicized. Comments and responses are included in Appendix A.

State Agencies

- Department of Hawaiian Home Lands
- Commission on Water Resource Management
- State of Hawai‘i Department of Agriculture
- Department of Business, Economic Development and Tourism, Planning Office
- Department of Health
- Department of Health, Office of Environmental Quality Control
- *Department of Land and Natural Resources*
- State Historic Preservation Division
- Office of Hawaiian Affairs
- *Department of Transportation*

State Legislature

- Senator Michelle Kidani (District 17)
- Representative Ty J.K. Cullen (District 41)

City Council

- Councilmember Ron Menor (Council District 9)

City and County of Honolulu Agencies

- *Department of Design and Construction*
- *Department of Facility Maintenance*
- *Department of Planning and Permitting*
- Department of Transportation Services
- *Department of Parks and Recreation*
- *Honolulu Fire Department*
- Honolulu Police Department
- Neighborhood Board No. 25 (Mililani/Waipiʻo/Melemanu)

Adjacent Landowners

- Robinson Kunia Land LLC (TMK 9-4-0003:001)
- Guyland LLC (TMK 9-4-004:009)

Other Interested Parties

- Hawaiian Electric Company
- Hawaiʻi Gas
- Hawaiian Telcom
- *Spectrum*
- Royal Kunia Country Club

Copies of the comment and response letters are included in Appendix A.

12.2 Draft EA Distribution List

The following agencies and organizations will receive the Draft EA. Comments received from parties are italicized. Comments and responses are included in Appendix A.

State Agencies

- Department of Hawaiian Home Lands
- Commission of Water Resource Management
- State of Hawaiʻi Department of Agriculture
- Department of Business, Economic Development and Tourism, Planning Office
- Department of Health
- Department of Health, Office of Environmental Quality Control
- *Department of Land and Natural Resources*

- State Historic Preservation Division
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Other Interested Parties

- Hawaiian Electric Company
- Hawai‘i Gas
- Hawaiian Telcom
- Spectrum
- Royal Kunia Country Club

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APPENDICES

Appendix A

Public and Agency Pre-consultation

Comments and Responses

and Draft Environmental Assessment

Comments and Responses

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

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BELT COLLINS HAWAII

KIRK CALDWELL
MAYOR

KATHY K. SOKUGAWA
ACTING DIRECTOR
TIMOTHY F. T. HIU
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

October 19, 2018

2018/ELOG-1857 (mw)
1645092

Joanne E. Hiramatsu
Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

SUBJECT: Draft Environmental Assessment Pre-Consultation
Kunia Wells IV Exploratory Wells Project
Kunia, O'ahu, Tax Map Key: 9-4-003: 010

This is in response to your pre-consultation letter dated September 19, 2018, for a Draft Environmental Assessment (DEA) for the proposed Kunia Wells IV Exploratory Wells Project. The Board of Water Supply (BWS) proposes to develop four exploratory wells at its existing Kunia Wells IV facility on Kunia Road, north of the proposed Royal Kunia Phase II. The existing facility has a water reservoir and several production wells, and the proposed four new wells will provide additional supply to meet the projected increase in water demand if they can be successfully developed for water production.

We have the following comments:

- The DEA should explain the role of the existing Kunia Wells IV facility within the BWS's regional municipal water system. Kunia Wells IV is an upper-level facility with a reservoir water level of 665 feet, therefore, the DEA should disclose whether or not the proposed additional water-supply capacity will serve the growth needs of the Royal Kunia area or if it is needed to serve lower-level reservoirs or the coastal areas of this part of Oahu.

- The DEA should also explain whether or not the downstream water mains are properly sized for the increases in flow that are being planned.

- The DEA should include a discussion on the BWS's long-range water plans for Oahu, including its plans for the Central Oahu area. The existing Oahu Water Management Plan provides detailed islandwide plans for the future, and we understand that the BWS is preparing a Central Oahu Watershed Management Plan.

- The DEA should describe how the proposal addresses the policies and guidelines of the Oahu General Plan and the Central Oahu Sustainable Communities Plan (CO SCP), especially as it relates to Section 4.2 of the CO SCP.

- The project may require a grading permit pursuant to Section 14-13.5(h), Revised Ordinances of Honolulu. If a grading permit is required, the project shall comply with the prevailing Rules Relating to Water Quality.

- The DEA should include a list of all required City, State, and federal approvals.

Should you have any questions, please contact Mike Watkins, of our staff, at 768-8044.

Very truly yours,

Dina L. T. Wong
Acting Chief
Planning Division

DLTW:bkg

November 21, 2018
2018.71.0200/18P-082

Ms. Dina L.T. Wong
Acting Chief
Department of Planning and Permitting
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Ms. Wong:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 19, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your comments. We are writing in response to comments provided in your letter.

1. *The DEA should disclose whether or not the proposed additional water-supply capacity will serve the growth needs of the Royal Kunia area or if it is needed to serve lower-level reservoirs or the coastal areas of this part of Oahu. Additionally, there should be explanation of the role of the existing Kunia Wells IV facility within the BWS's regional municipal water system.*

   When put into production, the four proposed exploratory wells will be for projected water demand in the 'Ewa-Waipahu hydraulic model system. Once put into production, the Kunia Wells IV will be utilized in the service areas at the 665' and 440' elevation.

2. *The DEA should explain whether or not the downstream water mains are properly sized for the increases in flow that are being planned.*

   If the proposed wells are put into service, the downstream water mains will be a proper size for this increased water flow. The BWS 2016 Master Plan conducted analysis on hydraulic water model systems (this project is in the 'Ewa-Waipahu Model System) and water flow requirements for proposed pumps and reservoirs. The new transmission lines outlined in the BWS Master Plan will provide enough capacity for the increased water supply.

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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3. *The DEA should include discussion on the BWS's long-range water plans for O'ahu, including its plans for the Central O'ahu area.*

   The DEA will include a discussion on the BWS's long-range water plans for the Central O'ahu area. More specifically, it will outline how this project is categorized within the Capital Improvement Program (CIP) as a capacity expansion project in the Central O'ahu area.

4. *The DEA should describe how the proposal addresses the policies and guidelines of the O'ahu General Plan and the Central O'ahu Sustainable Communities Plan (CO SCP).*

   The proposal will address the policies and guidelines of the City and County of Honolulu General Plan as it relates to this project. More specifically, the DEA will identify five of the eleven sections of this plan (Population, Natural Environment, Housing, Transportation and Utilities, and Physical Development and Urban Design) that are relevant to this project. Additionally, there will be discussion of the key elements of the CO SCP providing adequate infrastructure to meet the needs of new and existing development while also planning for the sustainability of groundwater aquifers.

5. *The project may require a grading permit; the DEA should include a list of all required City, State and Federal approval.*

   The project site is relatively flat and the drilling for the exploratory wells will be from existing grade; therefore, it is unlikely a grading permit will be required. All required City, State, and Federal approvals and permits will be included in the DEA.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 18, 2018

Belt Collins Hawaii LLC
Attention: Ms. Joanne E. Hiramatsu
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

via email: jhiramatsu@bchdesign.com

Dear Ms. Hiramatsu:

SUBJECT: Pre-Consultation for an Environmental Assessment for the Proposed Board of Water Supply **Kunia Wells IV Exploratory Wells Project**

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Land Division – Oahu District, (b) Engineering Division and (c) Commission on Water Resource Management on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 21, 2018

MEMORANDUM

RECEIVED
LAND DIVISION
2018 SEP 26 AM 5:55
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Consultation for an Environmental Assessment for the Proposed Board of Water Supply **Kunia Wells IV Exploratory Wells Project**
LOCATION: Kunia, Island of Oahu; TMK: (1) 9-4-003:010
APPLICANT: Honolulu Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **October 18, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
(x) We have no comments.
( ) Comments are attached.

Signed: Darlene Bryant-Takamatsu

Print Name: Darlene Bryant-Takamatsu
Date: 9/25/18

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2018 OCT -2 AM 10:43
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

'18 SEP 24 PM 1:34 ENGINEERING

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 21, 2018

MEMORANDUM

FROM

TO:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Consultation for an Environmental Assessment for the Proposed Board of Water Supply **Kunia Wells IV Exploratory Wells Project**
LOCATION: Kunia, Island of Oahu; TMK: (1) 9-4-003:010
APPLICANT: Honolulu Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **October 18, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____

Print Name: Carty S. Chang, Chief Engineer
Date: 9/26/18

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Pre-Consultation for an Environmental Assessment for the Proposed Board of Water Supply Kunia Wells IV Exploratory Wells Project, Kunia, Island of Oahu; TMK: (1) 9-4-003:010

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 9/26/18

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
COMMISSION ON WATER
RESOURCE MANAGEMENT
2018 SEP 24 PM 2:53

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 21, 2018

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Consultation for an Environmental Assessment for the Proposed Board of Water Supply **Kunia Wells IV Exploratory Wells Project**
LOCATION: Kunia, Island of Oahu; TMK: (1) 9-4-003:010
APPLICANT: Honolulu Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **October 18, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ Jeffrey T. Pearson, P.E.

Print Name: Deputy Director
Date: October 11, 2018

Attachments
cc: Central Files

FILE ID: RFD. 4947-3
DOC ID: 20536

http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

☐ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

☒ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☒ 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.

☒ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☐ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.

☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☒ OTHER: The proposed exploratory wells should be included in the County's Water Use and Development Plan as a potential potable water source. A discussion of how these wells will help to meet potable water demands and any required additional permitted use should also be included. There is currently 18.535 mgd available in the Waipahu-Waiawa Aquifer System Area, which should accommodate the proposed pumpage from these wells even with pending allocation requests which are around 6 mgd (Monsanto & DHHL)

If you have any questions, please contact W. Roy Hardy of the Regulation Branch at 587-0225 or Lenore Ohye of the Planning Branch at 587-0216.

November 21, 2018
2018.71.0200 / 18E-080

Mr. Russell Y. Tsuji
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Tsuji:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 18, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply (BWS), we have reviewed your comments. We are writing in response to comments provided in your letter.

The Engineering Department states that the Flood Hazard Zone must be researched and if it is in a Special Flood Hazard Area (high risk areas), then the rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR) must be followed. Please note that the project is in Flood Zone D; thus, not in a Special Flood Hazard Area.

The Commission on Water Resource Management (CWRM) outlines three required permits. We understand and will obtain a well construction and a pump installation permit for this project. We request verification for the (current) need of a water use permit. Please note that this EA is for four test (exploratory) wells that will be put into production at a later date. A water use permit will be obtained once the wells are permanent and placed into production. The proposed exploratory wells, Kunia IV, are in the Board of Water Supply's 2016 Master Plan as a future water source within the 'Ewa-Waipahu Model System. A discussion of how these wells will help meet potable water demands and any additional permits will be included in the DEA.

BWS is currently in the process of preparing the Watershed Management Plans that will meet the requirements of the County Water Use and Development Plan under the State of Hawai'i Water Code and City ordinance. The Kunia wells will be included in the Central O'ahu Watershed Management Plan.

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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We understand that the Land Division - O'ahu District currently has no comments for this project.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

RECEIVED

2018 OCT 12 PM 1:10

BELT COLLINS HAWAII

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu'ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 18-601

October 10, 2018

Ms. Joanne Hiramatsu
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

Subject: Pre-Assessment Consultation for an Environmental Assessment - Proposed BWS Kunia Wells IV Exploratory Wells Project, Kunia, TMK: 9-4-003:010

Thank you for the opportunity to review and comment on the subject project.

We have no comments at this time, as we do not have any facilities or easements on the subject property.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

Ross S. Sasamura, P.E.
Director and Chief Engineer

BELT COLLINS

November 21, 2018
2018.71.0200 / 18P-079

Mr. Ross S. Sasamura, P.E.
Director and Chief Engineer
Department of Facility Maintenance
City and County of Honolulu
1000 'Ulu'ohia Street, Suite 215
Kapolei, Hawai'i 96707

Dear Mr. Sasamura:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 10, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your letter.

We understand that, based on current information provided, you have no comments at this time because you do not have any facilities or easements on the subject property.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
Belt Collins Hawaii is an Equal Opportunity Employer

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

RECEIVED
2018 OCT 12 PM 1:09
BELT COLLINS HAWAII

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

October 10, 2018

Ms. Joanne Hiramatsu
Director of Planning
Belt Collins Hawaii, LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

Subject: Preconsultation for an Environmental Assessment
Proposed Board of Water Supply Kunia Wells IV Exploratory Wells Project
Kunia, Hawaii
Tax Map Key: 9-4-003: 010

In response to your letter dated September 19, 2018, regarding the abovementioned subject, the Honolulu Fire Department (HFD) determined that there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

Sincerely,

SOCRATES D. BRATAKOS
Assistant Chief

SDB/TC:bh

BELT COLLINS

November 21, 2017
2018.71.0200 / 18P-084

Mr. Socrates D. Bratakos
Assistant Chief
Honolulu Fire Department
City and County of Honolulu
636 South Street
Honolulu, HI 96813

Dear Mr. Bratakos:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 10, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your letter.

We understand that, based on current information provided, this project should have no significant impact to fire department services.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
Belt Collins Hawaii is an Equal Opportunity Employer

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

DTS201810081037NA

October 9, 2018

Ms. Joanne E. Hiramatsu
Director of Planning
Belt Collins Hawaii, LLC
2153 N. King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

Subject: Pre-Consultation for an Environmental Assessment
Proposed Board of Water Supply Kunia Wells IV Exploratory Well Project; Kunia, Oahu, Hawaii
TMK: (1) 9-4-003: 010

Thank you for the opportunity to provide comments on the pre-consultation request for the preparation of a Draft Environmental Assessment (Draft EA) for the Kunia Wells IV Exploratory Wells project. The pre-consultation review material was transmitted to our office via letter dated September 19, 2018.

It is our understanding the Honolulu Board of Water Supply (BWS) proposes the development of four exploratory wells on BWS owned land in Kunia, Oahu. Each of the four wells are anticipated to supply an additional 1.5 million gallons per day (mgd) of potable water. If the exploratory wells are successfully developed for water production, these wells will provide needed relief for the projected demand of potable water use for BWS customers on Oahu.

The Office of Planning (OP) has reviewed the transmitted material and has the following comments to offer:

1. The Hawaii State Planning Act.
   Hawaii Administrative Rules (HAR) § 11-200-10(4) requires Draft and Final Environmental Assessments to provide a general description of the action's technical, economic, social, and environmental characteristics. The Hawaii State Planning Act, Hawaii Revised Statutes (HRS) Chapter 226, is divided into Part I - Overall Themes, Goals, Objectives, and Policies; Part II - Planning Coordination and Implementation; and Part III - Priority Guidelines. HRS Chapter 226 serves as a guide for long-range development of the State, provides guidance for growth, development, and the allocation of resources throughout the state.

   In this regard, the Draft EA should provide a discussion on the project and its ability to

meet State goals and priorities as detailed in HRS Chapter 226. The analysis on the Hawaii State Planning Act should examine the project's consistency with all three parts of HRS Chapter 226, or clarify where the project conflicts with them. If any of these statutes are not applicable to the project, the analysis should affirmatively state such determination, along with discussion paragraphs.

2. The Hawaii Coastal Zone Management Program.
   The coastal zone management (CZM) area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (HRS § 205A-1).

   The proposed action should conform with all of the objectives and supporting policies of the Hawaii CZM program, as listed in HRS § 205A-2. Pursuant to HRS § 205A-4, in implementing the objectives of the CZM program, agencies shall give full consideration to ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. As this project utilizes BWS land and requires the approval of a government agency, the Draft EA should contain analysis on the project's consistency with HRS § 205A-2.

3. Stormwater Runoff, Erosion Control, and Flood Mitigation.
   Pursuant to HAR § 11-200-10(6) – identification and summary of impacts and alternatives considered; to ensure that the surface water and nearshore environment downslope of the project remain protected, the negative effects of stormwater inundation from this project should be evaluated in the Draft EA.

   Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, the potential vulnerability of surface water resources, the soil absorption characteristics in the project area, and the amount of permeable versus impervious surfaces. Assessing the need for mitigation measures in the protection for surface water resources and the coastal ecosystem should take this into account, pursuant to HAR § 11-200-10(7).

   It is noted that the Kunia 665' reservoir and reservoir pad are currently located in the project area. The placement and drilling of the exploratory wells will take into account the location of the reservoir pad. The review material does not indicate if any land disturbing activity will occur (aside from drilling of the exploratory wells). The Draft EA should provide greater detail on this matter.

   To assist in the planning for stormwater runoff mitigation, OP has developed the document Stormwater Impact Assessment. This guidance can be used in your

stormwater impact evaluation. This document can be used to identify and evaluate information on hydrology, stressors, sensitivity of aquatic and riparian resources, and management measures to control runoff occurrences. Mitigation measures and best management practices listed in this document can be applied to water runoff strategies to prevent damage to coastal ecosystems, and aide in the planning for this threat.

The document can be viewed or downloaded via the OP website at: http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_stormwater_impact_assessments_guidance.pdf.

If you have any questions regarding this comment letter, please contact Joshua Hekekia of our office at (808) 587-2845.

Sincerely,

Leo R. Asuncion
Director

BELT COLLINS

November 21, 2018
2018.71.0200 / 18P-077

Mr. Leo R. Asuncion
Director
Office of Planning
State of Hawai'i
235 South Beretania Street, 6th Floor
Honolulu, HI 96813

Dear Mr. Asuncion:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 9, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your comments. We are writing in response to comments provided in your letter.

The letter states that the DEA should provide discussion on the project and its ability to meet State goals and priorities of the Hawai'i State Planning Act, as detailed in HRS Chapter 226. The DEA will examine the project's consistency with HRS Chapter 226. Additionally, your letter states that the proposed action should conform with all of the objectives and supporting policies of the Hawai'i Coastal Zone Management Program (CZM) as listed in HRS 205A-2. The Draft EA will contain discussion on the project's consistency with HRS 205A-2. Lastly, appropriate Best Management Practices (BMPs) will be used and site management/runoff mitigation measures will be put into place as needed during construction. Any mitigation measures to protect surface water resources and the coastal ecosystem will be taken into account, pursuant HAR 11-200-10(7).

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk
cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
Belt Collins Hawaii is an Equal Opportunity Employer

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

SUSAN BALLARD
CHIEF

JOHN D. McCARTHY
JONATHON GREMS
DEPUTY CHIEFS

OUR REFERENCE EO-TS

October 5, 2018

Ms. Joanne E. Hiramatsu
Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Hiramatsu:

This is in response to your letter of September 19, 2018, requesting comments on the Draft Environmental Assessment for the proposed Board of Water Supply Kunia Wells IV Exploratory Wells Project.

Based on the information provided, this project should have no significant impact on the services or operations of the Honolulu Police Department at this time.

If there are any questions, please call Major Roy Sugimoto of District 3 (Pearl City) at 723-8803.

Thank you for the opportunity to review this project.

Sincerely,

ALLAN T. NAGATA
Assistant Chief
Support Services Bureau

RECEIVED
2018 OCT 11 PM 1:09
BELT COLLINS HAWAII

Serving and Protecting With Aloha

BELT COLLINS®

November 21, 2018
2018.71.0200/18P-085

Mr. Allan T. Nagata
Assistant Chief
Honolulu Police Department
City and County of Honolulu
801 South Beretania Street
Honolulu, HI 96813

Dear Mr. Nagata:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 5, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your letter.

We understand that, based on current information provided, this project should have no significant impact on the services and operations of the Honolulu Police Department at this time.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

RECEIVED
2018 OCT -9 PM 12: 50
BELT COLLINS HAWAII

KIRK CALDWELL
MAYOR

ROBERT J. KRONING, P.E.
DIRECTOR

MARK YONAMINE, P.E.
DEPUTY DIRECTOR

October 5, 2018

Belt Collins Hawaii LLC
ATTN: Joanne Hiramatsu
2153 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Hiramatsu,

Subject: Pre-Consultation for an Environmental Assessment Proposed Board Of Water Supply Kunia Wells IV Exploratory Wells Project
TMK: 9-4-003:010 Kunia, Oahu

Thank you for the opportunity to review and comment. The Department of Design and Construction does not have any comments at this time.

Should you have any further questions, please call me at 768-8480.

Sincerely,

Robert J. Kroning, P.E.
Director

RJK:ms (744877)

BELT COLLINS®

November 21, 2018
2018.71.0200 / 18P-078

Mr. Robert J. Kroning, P.E.
Director
Department of Design and Construction
City and County of Honolulu
650 South King Street, 11th Floor
Honolulu, HI 96813

Dear Mr. Kroning:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 5, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your letter.

We understand that you currently do not have any comments on this project.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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DAVID Y. IGE
GOVERNOR

RECEIVED
2018 OCT -9 PM 12: 50
BELT COLLINS HAWAII

JADE T. BUTAY
DIRECTOR

Deputy Directors
ROY CATALANI
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

IN REPLY REFER TO:
DIR 1074
STP 8.2530

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

October 2, 2018

Ms. Joanne E. Hiramatsu
Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Hiramatsu:

Subject: Kunia Wells IV Exploratory Wells Project
Pre-Consultation for Environmental Assessment (EA)
Kunia, Oahu, Hawaii
TMK: (1) 9-4-003:010

The Department of Transportation (DOT) has reviewed the subject request and understands the Honolulu Board of Water Supply (BWS) is proposing to dig, case, and test four (4) exploratory wells in the Kunia area for water capacity purposes. The project site is located off of Kunia Road which is under the jurisdiction of the State Highways Division.

While the details of the project are limited, based on what is being proposed by BWS, the project appears to have no significant impacts to State transportation facilities and therefore, DOT has no comments to provide at this time. However, DOT reserves the right to review and provide comments once additional information is provided in the draft EA.

If there are any questions, please contact Mr. Blayne Nikaido of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7979 or by email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

BELT COLLINS®

November 21, 2018
2018.71.0200 / 18P-081

Mr. Jade Butay
Director of Transportation
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, HI 96813-5097

Dear Mr. Butay:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated October 2, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your letter.

We understand that the project appears to have no significant impacts to State transportation facilities; therefore, the State Department of Transportation (DOT) has no comments to provide at this time. We understand that DOT reserves the right to review and provide comments once the DEA is provided.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
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Charter
COMMUNICATIONS

RECEIVED
2018 OCT -1 PM 5:17
BELT COLLINS HAWAII

September 28, 2018

Ms. Joanne Hiramatsu
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, HI 96819

Dear Ms. Hiramatsu,

Subject: **Proposed Board of Water Supply Kunia Wells IV Exploratory Wells Project**

Thank you for the opportunity to review and comment on the subject project. Charter Communications does not have any comment, as project does not have any negative impact on Charter's infrastructures or future planned projects in the vicinity.

If you any questions concerning the subject project, please contact me at 625-8378 or email me at tuan.nguyen1@charter.com.

Sincerely,

Tuan Nguyen

200 Akamainui Street Mililani, HI 96789-3912 t (808) 625-2100

BELT COLLINS®

November 21, 2018
2018.71.0200 / 18P-076

Mr. Tuan Nguyen
Charter Communications
200 Akamainui Street
Mililani, HI 96789-3912

Dear Mr. Nguyen:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated September 28, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your letter.

We understand that you have no comments because the project does not have any negative impact on Charter's infrastructure or future planned projects of Charter Communications.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
Belt Collins Hawaii is an Equal Opportunity Employer

DEPARTMENT OF PARKS & RECREATION
CITY AND COUNTY OF HONOLULU
1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

RECEIVED
2018 OCT -1 PM 1:31
BELT COLLINS HAWAII

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

September 26, 2018

Joanne E. Hiramatsu, Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

SUBJECT: Pre-Consultation for an Environmental Assessment
Proposed Board of Water Supply Kunia Wells IV Exploratory Wells
Project Tax Map Key: 9-4-003:010 Kunia, Oahu, Hawaii

Thank you for the opportunity to review and comment at the pre-consultation stage of the subject Draft Environmental Assessment.

The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the Department, you may remove us as a consulted party to the balance of the EIS process.

Should you have any questions, please contact John Reid, Planner at 768-3017.

Sincerely,

Michele K. Nekota
Director

MKN:jr
(744934)

BELT COLLINS®

November 21, 2018
2018.71.0200 / 18P-083

Ms. Michele K. Nekota
Director
Department of Parks and Recreation
City and County of Honolulu
1000 Uluohia Street, Suite 309
Kapolei, Hawai'i 96707

Dear Ms. Nekota:

Pre-consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated September 26, 2018 commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your letter.

We understand that the project does not impact any of the Department of Parks and Recreation programs or facility and you do not have any comments to offer. As requested, you will be removed from any further correspondence on this project.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

LD 975

July 5, 2019

Belt Collins Hawaii LLC
Attn: Ms. Joanne E. Hiramatsu
Director of Planning
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

via email: jhiramatsu@bchdesign.com

Dear Ms. Hiramatsu:

SUBJECT: Draft Environmental Assessment (**DEA**) **for the Kunia Wells IV Exploratory Wells Project** located at Ewa, Island of Oahu; TMK: (1) 9-4-003:010

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division, (b) Division of Forestry & Wildlife, and (c) Land Division – Oahu District on the subject matter. Should you have any questions, please feel free to contact Barbara Lee at (808) 587-0453 or by email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
LAND DIVISION
2019 JUN 19 AM 11:12
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

June 12, 2019

MEMORANDUM

LD 975

TO:

FROM

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

To

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment (**DEA**) **for the Kunia Wells IV Exploratory Wells Project**
LOCATION: Ewa, Island of Oahu; TMK: (1) 9-4-003:010
APPLICANT: Belt Collins Hawaii LLC on behalf of the Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. The DEA was published in OEQC's official publication, The Environmental Notice (TEN), on June 08, 2019. This issue of the TEN and a link to the DEA can be found at: http://oegc2.doh.hawaii.gov/The_Environmental_Notice/2019-06-08-TEN.pdf
Note that a flora and fauna survey, a cultural assessment, and an archaeological literature review and field inspection were conducted and are included in their entirety in the DEA appendices.

Please submit any comments by **July 03, 2019.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee by phone at 587-0453 or by email at barbara.j.lee@hawaii.gov with copy to darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
(√) We have no additional comments.
( ) Comments are attached.

Signed:
Print Name: Carty S. Chang, Chief Engineer
Date: 6/12/19

Attachments
Cc: Central Files

19807

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 12, 2019

MEMORANDUM

LD 975

TO: FROM:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

RECEIVED LAND DIVISION 2019 JUN 20 AM 11:01 DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

FROM: TO: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment **(DEA) for the Kunia Wells IV Exploratory Wells Project**
LOCATION: Ewa, Island of Oahu; TMK: (1) 9-4-003:010
APPLICANT: Belt Collins Hawaii LLC on behalf of the Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. The DEA was published in OEQC's official publication, The Environmental Notice (TEN), on June 08, 2019. This issue of the TEN and a link to the DEA can be found at: http://oegc2.doh.hawaii.gov/The_Environmental_Notice/2019-06-08-TEN.pdf
Note that a flora and fauna survey, a cultural assessment, and an archaeological literature review and field inspection were conducted and are included in their entirety in the DEA appendices.

Please submit any comments by **July 03, 2019.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee by phone at 587-0453 or by email at barbara.j.lee@hawaii.gov with copy to darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed:
DAVID G. SMITH, Administrator
Print Name:
Date: 6/18/19

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 12, 2019

MEMORANDUM

LD 975

TO:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment **(DEA) for the Kunia Wells IV Exploratory Wells Project**
LOCATION: Ewa, Island of Oahu; TMK: (1) 9-4-003:010
APPLICANT: Belt Collins Hawaii LLC on behalf of the Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. The DEA was published in OEQC's official publication, The Environmental Notice (TEN), on June 08, 2019. This issue of the TEN and a link to the DEA can be found at: http://oegc2.doh.hawaii.gov/The_Environmental_Notice/2019-06-08-TEN.pdf
Note that a flora and fauna survey, a cultural assessment, and an archaeological literature review and field inspection were conducted and are included in their entirety in the DEA appendices.

Please submit any comments by **July 03, 2019.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee by phone at 587-0453 or by email at barbara.j.lee@hawaii.gov with copy to darlene.k.nakamura@hawaii.gov. Thank you.

(x) We have no objections.
(x) We have no comments.
( ) Comments are attached.

Signed:
Print Name: Patti E. Miyashiro
Date: June 14, 2019

Attachments
Cc: Central Files

July 25, 2019
2018-71-0200 / 19P-046

Mr. David G. Smith, Administrator
Division of Forestry & Wildlife
State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Smith:

Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Ewa, O'ahu, Hawai'i

We thank you for your comment letter dated June 18, 2019 stating that the Department of Land and Natural Resources, Engineering Division, has reviewed the DEA for the Honolulu Board of Water Supply's (BWS) proposed Kunia Wells IV Exploratory Wells Project. You indicate that you have no comments at this time.

We appreciate your participation in this EA review process. If you have any questions or additional comments, please feel free to contact Joanne E. Hiramatsu at 521-5361, extension 309 or email at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Senior Associate, Director of Planning

JEH:hp

cc: Arlen Ledward, Honolulu Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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July 25, 2019
2018-71-0200 / 19P-047

Mr. Carty Chang, Chief Engineer
Engineering Division
Department of Land and Natural Resources
State of Hawaii
P. O. Box 373
Honolulu, Hawai'i 96809

Dear Mr. Chang:

Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Ewa, O'ahu, Hawai'i

We thank you for your comment letter dated June 18, 2019 stating that the Department of Land and Natural Resources, Engineering Division, has reviewed the DEA for the Honolulu Board of Water Supply's (BWS) proposed Kunia Wells IV Exploratory Wells Project. You indicate that you have no additional comments at this time.

We appreciate your participation in this EA review process. If you have any questions or additional comments, please feel free to contact Joanne E. Hiramatsu at 521-5361, extension 309 or email at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Senior Associate, Director of Planning

JEH:hp

cc: Arlen Ledward, Honolulu Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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BELT COLLINS

July 25, 2019
2018-71-0200 / 19P-040

Ms. Patti E. Miyashiro
Land Division
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street
Honolulu, Hawai'i 96813

Dear Ms. Miyashiro:

Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Ewa, O'ahu, Hawai'i

We thank you for your comment letter dated June 14, 2019 stating that the Department of Land and Natural Resources, Engineering Division, has reviewed the DEA for the Honolulu Board of Water Supply's (BWS) proposed Kunia Wells IV Exploratory Wells Project. You indicate that you have no objections or comments at this time.

We appreciate your participation in this EA review process. If you have any questions or additional comments, please feel free to contact Joanne E. Hiramatsu at 521-5361, extension 309 or email at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Senior Associate, Director of Planning

JEH:hp

cc: Arlen Ledward, Honolulu Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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DAVID Y. IGE
GOVERNOR

RECEIVED
2019 JUN 28 PM 1:28
BELT COLLINS HAWAII

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

IN REPLY REFER TO:
DIR 0589
STP 8.2701

June 26, 2019

Ms. Joanne E. Hiramatsu
Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Hiramatsu:

Subject: Kunia Wells IV Exploratory Wells Project
Draft Environmental Assessment
Kunia, Oahu, Hawaii
TMK: (1) 9-4-003: 010

The State Department of Transportation (DOT) understands the applicant proposes to drill, case, and test the exploratory wells for water capacity.

DOT does not anticipate that the subject project will have any significant impact to our State transportation facilities; therefore, we have no comments at this time.

If there are any questions, please contact Mr. Blayne Nikaido of the DOT Statewide Transportation Planning Office at (808) 831-7979 or by email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

July 25, 2019
2018-71-0200 / 19P-049

Mr. Jade T. Butay, Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

Dear Mr. Butay:

Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Ewa, O'ahu, Hawai'i

We thank you for your comment letter dated June 26, 2019 stating that the Department of Transportation has reviewed the DEA for the Honolulu Board of Water Supply's (BWS) proposed Kunia Wells IV Exploratory Wells Project. You indicate that the project will have no significant impact to State transportation facilities and have no comments at this time.

We appreciate your participation in this EA review process. If you have any questions or additional comments, please feel free to contact Joanne E. Hiramatsu at 521-5361, extension 309 or email at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Senior Associate, Director of Planning

JEH:hp

cc: Arlen Ledward, Honolulu Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@bchdesign.com
Belt Collins Hawaii is an Equal Opportunity Employer

DEPARTMENT OF FACILITY MAINTENANCE
CITY AND COUNTY OF HONOLULU
1000 Ulu'ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 19-322

July 2, 2019

Ms. Joanne Hiramatsu
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

Subject: Draft Environmental Assessment for
Proposed Kunia Wells IV Exploratory Wells Project
TMK: (1) 9-4-003:010

Thank you for the opportunity to review and comment on the subject project.

We have no comments at this time, as we do not have any facilities or easements on the subject property.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

Ross S. Sasamura, P.E.
Director and Chief Engineer

RECEIVED
2019 JUL -5 PM 2:27
BELT COLLINS HAWAII

BELT COLLINS

July 25, 2019
2018-71-0200 / 19P-045

Me. Ross S. Sasamura. P.E.
Director and Chief Engineer
City and County of Honolulu
Department of Facilities Maintenance
1000 Ulu'ohia Street, Suite 215
Kapolei, HI 96707

Dear Mr. Sasamura:

Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Ewa, O'ahu, Hawai'i

We thank you for your comment letter dated June 19, 2019 stating that the Department of Facility Maintenance has reviewed the DEA for the Honolulu Board of Water Supply's (BWS) proposed Kunia Wells IV Exploratory Wells Project. You indicate that you have no comments because you do not have any facilities or easements on the property.

We appreciate your participation in this EA review process. If you have any questions or additional comments, please feel free to contact Joanne E. Hiramatsu at 521-5361, extension 309 or email at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Senior Associate, Director of Planning

JEH:hp

cc: Arlen Ledward, Honolulu Board of Water Supply

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
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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
MAYOR

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ACTING DIRECTOR

TIMOTHY F. T. HIU
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

2019/ELOG-1160 (lii)
1732246

July 8, 2019

Ms. Joanne Hiramatsu
Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

SUBJECT: Draft Environmental Assessment
Proposed Kunia Wells IV Exploratory Wells Project
Tax Map Key 9-4-003: 010
Ewa, Oahu, Hawaii

Thank you for your letter dated June 7, 2019, notifying us of a Draft Environmental Assessment (EA) publication for four new exploratory wells for additional water supply for the Central Oahu area.

Upon review of the Draft EA, we have the following comments:

1. Our pre-consultation comment regarding the Central Oahu Sustainable Communities Plan has not been addressed. The comment was as follows:

   "The Draft EA should describe how the proposal addresses the policies and guidelines of the Oahu General Plan and the Central Oahu Sustainable Communities Plan (CO SCP), especially as it relates to Section 4.2 of the CO SCP."[1]

   The Draft EA mentions the key elements of the Vision of the CO SCP, but not land use or public facilities and infrastructure policies or guidelines. Please expand the discussion to describe how the proposal is consistent with the general policies of the CO SCP, particularly those found in Section 4.2 of the CO SCP.

[1] Letter dated October 19, 2018 from DPP to Joanne Hiramatsu, Subject: Draft Environmental Assessment Pre-Consultation, 2018/ELOG-1857 (mw).

Ms. Joanne Hiramatsu
July 8, 2019
Page 2

2. The Final EA should contain more discussion on how the project is being coordinated with or incorporated into the Central Oahu Watershed Management Plan development process.

3. The Final EA should note that a grading permit may be required. The project would be exempt from obtaining a grading permit if the proposed work complies with Revised Ordinances of Honolulu, Section 14-13.5(h). If a grading permit is required, the project shall comply with the prevailing Rules Relating to Water Quality.

Should you have further questions, please contact Lisa Imata, at 768-8041 or Lin Wong, at 768-8018.

Very truly yours,

Dina L.T. Wong
Acting Division Chief

DLTW:lli

BELT COLLINS

July 18, 2019
2018.71.0200/ 19P-050

Ms. Dina L.T. Wong
Acting Division Chief
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813

Dear Ms. Wong:

Consultation Letter for a Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Kunia, O'ahu, Hawai'i

Thank you for your letter dated July 8, 2019, commenting on the DEA for the Kunia Wells IV Exploratory Wells Project. As the consultant for the City and County of Honolulu (City), Board of Water Supply, we have reviewed your comments. We are writing in response to comments provided in your letter.

1. *The Draft EA mentions the key elements of the Vision of CO SCP, but not land use or public facilities and infrastructure policies or guidelines. Please expand the discussion to describe how the proposal is consistent with the general policies of the CO SCP, particularly those found in Section 4.2 of the CO SCP.*

   The FEA will assess the project's consistency with policies in Section 4.2 of the CO SCP. The State Legislature as appropriated $1million to the Department of Land and Natural Resources for the design and construction of one exploratory well to meet future potable requirements for diversified agricultural.

2. *The Final EA should contain more discussion on how the project is being coordinated with or incorporated into the Central Oahu Watershed Management Plan development process.*

   We are aware of the forthcoming Central Oahu Watershed Management Plan (COWMP). The preparation of the COWMP is beyond the scope of this project. Therefore, the FEA would not discuss the coordination of this project with the development of COWMP.

3. *The Final EA should note that a grading permit may be required. The project would be exempt from obtaining a grading permit if the proposed work complies with the Revised Ordinance of Honolulu, Section 14-13.5(h). If a grading permit is required, the project shall comply with the prevailing Rules Relating to Water Quality.*

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Ms. Dina L.T. Wong
July 25, 2019 – 19P-050
Page 2

The FEA will include grading permit in the list of required approvals. The BWS will monitor water quality.

Thank you for taking the time to submit your comments.

Very truly yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JEH:ajk

cc: Mr. Arlen Ledward, City and County of Honolulu, Board of Water Supply

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

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KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

June 21, 2019

Ms. Joanne E. Hiramatsu, Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Hiramatsu:

SUBJECT: Draft Environmental Assessment
Proposed Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003:010
Ewa, Oahu, Hawaii

Thank you for the opportunity to review and comment on the subject Draft Environmental Assessment.

The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the Department, you may remove us as a consulted party to the balance of the EIS process.

Should you have any questions, please contact John Reid, Planner at 768-3017.

Sincerely,

(for) Michele K. Nekota
Director

MKN:jr
(775424)

BELT COLLINS

July 25, 2019
2018-71-0200 / 19P-051

Ms. Michele Nekota, Director
City and County of Honolulu
Department of Parks and Recreation
1000 Ulu'ohia Street, Suite 309
Kapolei, HI 96707

Dear Ms. Nekota:

Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Ewa, O'ahu, Hawai'i

We thank you for your comment letter dated June 21, 2019 stating that the Department of Parks and Recreation has reviewed the DEA for the Honolulu Board of Water Supply's (BWS) proposed Kunia Wells IV Exploratory Wells Project. You indicate that you have no comments because the project will have no impact on any program or facility of the Department. As requested, your office will be removed as a consulted party for the environmental assessment process.

We appreciate your participation in this EA review process. If you have any questions or additional comments, please feel free to contact Joanne E. Hiramatsu at 521-5361, extension 309 or email at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Senior Associate, Director of Planning

JEH:hp

cc: Arlen Ledward, Honolulu Board of Water Supply

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HONOLULU FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

RECEIVED
2019 JUN 26 PM 1:10
BELT COLLINS HAWAII

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

June 24, 2019

Ms. Joanne Hiramatsu
Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

Subject: Draft Environmental Assessment
Proposed Kunia Wells IV Exploratory Wells Project
Tax Map Key: 9-4-003: 010

In response to your letter dated June 7, 2019, regarding the abovementioned subject, the Honolulu Fire Department determined that there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

Sincerely,

SOCRATES D. BRATAKOS
Assistant Chief

SDB/TC:bh

July 25, 2019
2018-71-0200 / 19P-052

Mr. Socrates D. Bratakos, Assistant Chief
City and County of Honolulu
Honolulu Fire Department
636 South Street
Honolulu, HI 96813-5007

Dear Mr. Bratakos:

Draft Environmental Assessment (DEA)
Kunia Wells IV Exploratory Wells Project
Ewa, O'ahu, Hawai'i

We thank you for your comment letter dated June 24, 2019 stating that the Department of Parks and Recreation has reviewed the DEA for the Honolulu Board of Water Supply's (BWS) proposed Kunia Wells IV Exploratory Wells Project. You indicated that the project will have no impact to the fire department services.

We appreciate your participation in this EA review process. If you have any questions or additional comments, please feel free to contact Joanne E. Hiramatsu at 521-5361, extension 309 or email at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Senior Associate, Director of Planning

JEH:hp

cc: Arlen Ledward, Honolulu Board of Water Supply

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Appendix B

Flora and Fauna Study

SWCA

FLORA AND FAUNA SURVEY FOR THE KUNIA EXPLORATORY WELLS SITE OAHU, HAWAII

JULY 2018

PREPARED FOR

Belt Collins Hawaii LLC

PREPARED BY

SWCA Environmental Consultants

FLORA AND FAUNA SURVEY FOR THE KUNIA EXPLORATORY WELLS SITE O‘AHU, HAWAII

Prepared for

Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Prepared by

SWCA Environmental Consultants
Bishop Square ASB Tower
1001 Bishop Street, Suite 2800
Honolulu, Hawaii 96813
(808) 548-7899
www.swca.com

SWCA Project No. 45719

July 2018

EXECUTIVE SUMMARY

Belt Collins Hawai'i requested that SWCA Environmental Consultants (SWCA) conduct a flora and fauna survey for the proposed Kunia Exploratory Wells site located on the island of Oahu, Hawai'i. This report summarizes the results of the biological resources survey.

This report summarizes the findings of the flora and fauna survey conducted on July 3, 2018, from 08:00 to 10:00 a.m. when wildlife species are most likely to be active. All vascular plant species and their relative abundance, as well as vegetation types, were recorded.

The vegetation types and plant species identified during the survey are not considered unique. One possible indigenous plant, uhaloa (*Waltheria indica*), and one Polynesian introduced plant, the yellow wood sorrel (*Oxalis corniculata*), were observed in the project area, are not considered rare (Wagner et al. 1999), and are not federal- or state-listed threatened or endangered species, species proposed for listing, or a candidate species. No federally or state-listed endangered plant species were observed in or around the survey area. Therefore, the proposed project is not expected to have a significant, adverse effect on terrestrial vegetation.

No federally or state-listed endangered birds were observed on the project area. The survey area does not overlap critical habitat for any listed terrestrial faunal species. Therefore, the proposed project is not expected to have a significant, adverse effect on terrestrial wildlife.

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1 INTRODUCTION

Belt Collins Hawaii (BCH) requested that SWCA Environmental Consultants (SWCA) conduct a terrestrial flora and fauna survey at the Kunia Exploratory Wells site on the island of Oahu, Hawai'i. The initial request consisted of two possible sites. This report summarizes the findings of the terrestrial flora and fauna survey conducted at the Kunia Exploratory Wells Alternative site 2 (Figure 1.) by SWCA Botanist Alex Lau and Wildlife Biologist James Breeden on July 3, 2018. The survey focused on the 1.8 acre area just off of Kunia Road and north of the Waipahu-Kunia community.

2 LAWS AND REGULATIONS

2.1 Endangered Species Act

The federal Endangered Species Act (ESA) of 1973, as amended, protects wildlife and plant species that have been listed as threatened or endangered. It is designed to conserve the ecosystem on which species depend. Candidate species, which may be listed in the near future, are not afforded protection under the ESA until they are formally listed as endangered or threatened. Section 9 of the ESA and rules promulgated under Section 4(d) of the ESA prohibit the unauthorized take of any endangered or threatened wildlife listed under the ESA. Under the ESA, the term *take* means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect species listed as endangered or threatened, or to attempt to engage in any such conduct." As defined in regulations, the term *harm* means "an act that actually kills or injures wildlife; it may include significant habitat modification or degradation, which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 Code of Federal Regulations [CFR] 17.3). The rules define *harass* to mean "an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent, as to significantly disrupt normal behavior patterns, which include but are not limited to breeding, feeding, or sheltering" (50 CFR 17.3).

The ESA affords maximum legal protections to species listed as threatened or endangered under the law and also provides authorization for incidental take permits for take that occurs incidental to otherwise legal operations. To comply with federal laws, additional measures must be taken to ensure that take of ESA-listed species does not occur. Any fatality of a listed species should be reported to the U.S. Fish and Wildlife Service (USFWS) and the Hawai'i Division of Forestry and Wildlife (DOFAW) as soon as possible, and an incident report should be filed within 24 hours of detection.

2.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, prohibits the take of migratory birds. A list of birds protected under MBTA-implementing regulations is published under 50 CFR 10.13. Unless permitted by regulations, under the MBTA "it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product" (16 United States Code 703-712). The MBTA provides no process for authorizing incidental take of MBTA-protected birds. As a result, birds that are not covered under the ESA that may be adversely affected cannot be covered by take authorizations. Furthermore, a recent memorandum from the Department of the Interior (M-37050, December 22, 2017) concludes that the MBTA does not prohibit the incidental taking of migratory birds. Regardless, incidental take of individual MBTA-protected species is unlikely to adversely affect the species as a whole; however, any take of MBTA-protected species should be documented and reported in a similar manner to any take of endangered or threatened species of wildlife listed under the ESA.

2.3 Hawai'i Revised Statutes Chapter 195D

The purpose of Hawai'i Revised Statutes (HRS) Chapter 195D is "to insure the continued perpetuation of indigenous aquatic life, wildlife, and land plants, and their habitats for human enjoyment, for scientific purposes, and as members of ecosystems." Section 195D-4 states that any endangered or threatened species of fish or wildlife recognized by the ESA shall be so deemed by the state statute. Like the ESA, the unauthorized take of such endangered or threatened species is prohibited (HRS 195-D-4(e)), but incidental take licenses can be obtained (HRS Section 195D-21). In addition to species protected under the ESA, rules adopted under HRS Section 195D-4 allow for the listing of indigenous species as threatened or endangered due to the following reasons:

- Habitat destruction or alteration (current or predicted)
- Overexploitation
- Disease or predation
- Lack of regulatory mechanisms
- Other factors threatening its continued existence

Determinations are made based on any and all available sources of data (scientific, commercial, other) and consultation with appropriate agencies (federal, state, county) and interested organizations and parties.

3 DESCRIPTION OF THE SURVEY AREA

The project area is located on the north side of Kunia Road (TMK: 94003010:0000) on the island of Oahu (Figure 1, Alternative Site 2). The project site is approximately 1.8 acres with a 20-foot-high, 1.5-million-gallon water tank. The water tank supplies potable water to the Waipahu-Kunia community to the south of the site. The area is also completely enclosed by a 6-foot-high chain link fence, and access to the area is restricted. The surrounding area is currently used for commercial agriculture and it has been in use for several decades. The impact of commercial agriculture has altered the natural state of the area and, as a result, none of the native vegetation remains.

The project area is located in a generally dry part of the island with a mean annual rainfall of approximately 27 inches (697 millimeters [mm]). Rainfall is typically highest in November and lowest in June (Giambelluca et al. 2016).

4 METHODS

SWCA reviewed available scientific and technical literature regarding natural resources in and near the project area. A desktop analysis of the project area was conducted to determine whether habitat for MBTA, ESA, and HRS Chapter 195-D protected species may be present. This analysis consisted of reviewing the following:

- Aerial imagery
- *Draft Revised Recovery Plan for Hawaiian Forest Birds* (USFWS 2006)
- *Hawaii's Comprehensive Wildlife Conservation Strategy* (DLNR 2005)
- The USFWS Information for Planning and Consultation (IPaC)

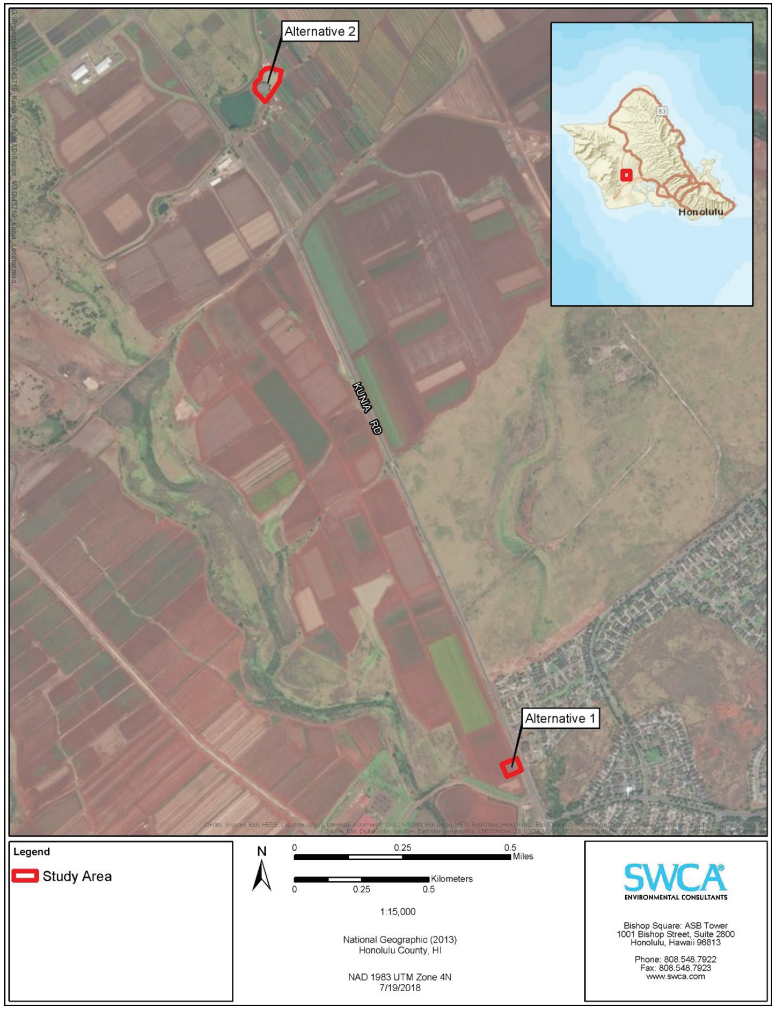

Figure 1. Project area.

During the July 3, 2018, site visit, SWCA conducted a pedestrian field survey to characterize the flora and wildlife present or likely to be present and the potential wetlands and waterways in the project area. This site visit took place from 8:00 to 10:00 a.m. Species recorded during this survey are indicative of current environmental factors at the time of the survey. It is possible that additional surveys conducted at a different time of year or time of day may result in minor variations in the number of species and the abundance of flora and fauna observed. SWCA noted any visual and auditory observations and signs, such as scat or prints, indicating animal presence. Field observations were conducted using 10 × 42 millimeter binoculars. All bird, mammal, reptile, amphibian, and invertebrate species seen or heard in or near the project area were noted. In addition, potential habitat for federally listed or state-listed threatened and endangered species and birds protected under the MBTA was noted. Acoustic surveys for the endangered Hawaiian hoary bat or ʻōpeʻapeʻa (*Lasiurus cinereus semotus*) were not conducted; however, areas of suitable bat foraging and roosting habitat were noted.

5 RESULTS

5.1 Flora

No federally or state-listed threatened, endangered, or candidate plant species or rare native Hawaiian plant species was observed in the project area. In all, 19 plant species were recorded in the project area, of which one—ʻuhaloa (*Waltheria indica*)—is possibly indigenous to the Hawaiian Islands. One of the species found—yellow wood sorrel (*Oxalis corniculata*)—was possibly introduced by the Polynesians prior to European contact (Wagner et al. 1999). Appendix A provides a list of all plant species observed during the July 3, 2018, surveys.

5.1.1 Ruderal Vegetation

Ruderal vegetation (generally non-native herbaceous species adapted to colonizing disturbed areas) is found throughout the project area. Ruderal vegetation is found in areas that are infrequently maintained, if at all, and are often subject to vehicular and pedestrian traffic, mowing, and herbicide use. Within these weedy herbaceous species were several planted trees, which appeared to receive little to no maintenance. The dominant herbaceous species found in the ruderal vegetation type was Guineagrass (*Urochloa maxima*); no other species were common. Some occasional herbaceous species were narrow-leaved plantain (*Plantago lanceolata*), cow pea (*Macroptilium lathyroides*), and creeping indigo (*Indigofera spicata*). The only two trees planted within the ruderal vegetation were autograph tree (*Clusia rosea*) and Mindanao gum (*Eucalyptus deglupta*).

5.2 Fauna

In general, most of the wildlife species expected to occur in the project area include assemblages that are found in low-elevation to mid-elevation areas on Oʻahu between 300 and 1,200 feet. Although not observed during the survey, several federally and state-listed waterbird species can be expected to occasionally occur in the project area. The project area does not encompass any designated or proposed critical habitat for threatened or endangered species.

Figure 2. The ruderal vegetation type, here dominated by Guineagrass, with cultivated Mindanao gum and autograph trees in the background.

5.2.1 Avifauna

In all, 12 non-native bird species were observed in and around the survey area (Table 1). Of these, the cattle egret (*Bubulcus ibis*), house finch (*Haemorhous mexicanus*), and northern cardinal (*Cardinalis cardinalis*) are MBTA protected.

Habitat for the MBTA-protected Pacific golden-plover (*Pluvialis fulva*) occurs in the project area and may use the project area for foraging. In addition, due to the adjacent reservoir, the wandering tattler (*Tringa incana*) may occasionally visit the project area to forage. The Pacific golden-plover and wandering tattler do not nest in Hawaiʻi.

The IPaC resource query for this project listed two MBTA-protected bird species that could occur in the study area: ʻapapane (*Himatione sanguinea*) and Oʻahu ʻamakihi (*Chlorodrepanis flava*) (USFWS 2018). Based on geographic location, available habitat, and SWCA's best professional judgement, these species are unlikely to occur in the project area.

Table 1. Bird Species Observed in and near the Survey Area

Common Name	Scientific Name	Status	Protected under the Migratory Bird Treaty Act
Black francolin	*Francolinus francolinus*	NN	–
Cattle egret	*Bubulcus ibis*	NN	X
Common myna	*Acridotheres tristis*	NN	–
Common waxbill	*Estrilda astrild*	NN	–
Grey francolin	*Francolinus pondicerianus*	NN	–
Japanese white-eye	*Zosterops japonicus*	NN	–
House finch	*Haemorhous mexicanus*	NN	X
Northern cardinal	*Cardinalis cardinalis*	NN	X
Red-vented bulbul	*Pycnonotus cafer*	NN	–
Red-whiskered bulbul	*Pycnonotus jocosus*	NN	–
Spotted dove	*Streptopelia chinensis*	NN	–
Zebra dove	*Geopelia striata*	NN	–
Total		**12**	**3**

Notes: NN = non-native permanent resident.

Although not observed, the adjacent reservoir and canal provide nesting and foraging habitat for the federally and state-listed Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian moorhen (*Gallinula galeata sandvicensis*). These species are known to occur 4.7 miles (7.5 km) to the southeast at Pearl Harbor National Wildlife Refuge (USFWS 2011) and may visit the reservoir or canal when environmental conditions are favorable. Of the three listed waterbirds, the Hawaiian stilt is the only species likely to occur in the project area. The Hawaiian stilt could forage and loaf in the Guineagrass in the ruderal vegetation type.

A single pair of nēnē (*Branta sandvicensis*) took up residence on northern O'ahu in 2014. To the best of SWCA's knowledge, very few nēnē individuals currently reside on O'ahu, but it is possible the nēnē population will grow over time. No nēnē were observed in the project area during the field survey. Because of the low number of nēnē, and because of their non-migratory lifestyle, it is highly unlikely that nēnē will occur in the project area. However, if they are documented in the project area, they would most likely occur in the Guineagrass in the ruderal vegetation type.

Given the Guineagrass and the availability of trees for perching, the state-listed Hawaiian short-eared owl, or pueo (*Asio flammeus sandwichensis*), may be present and could nest, roost, or hunt in the project area. Pueo are most common in open habitats, such as grasslands, shrublands, and montane parklands, including urban areas and those actively managed for conservation (Mitchell et al. 2005).

Three listed seabird species—the endangered band-rumped storm-petrel (*Oceanodroma castro*), Hawaiian petrel (*Pterodroma sandwichensis*), and the threatened Newell's shearwater (*Puffinus newelli*)—could transit over the project area at night while travelling to and from their upland nesting sites and the ocean. However, it is very unlikely they would use the available project area for anything other than flight.

5.2.2 Mammals

The project area is next to a residential area where it is common to see dogs (*Canis familiaris*). No other mammals were observed during the pedestrian surveys, although feral cat (*Felis catus*), rat (*Rattus* spp.), mouse (*Mus musculus*), and mongoose (*Herpestes javanicus*) could be expected to occur.

The potential for the presence of Hawaiian hoary bat was assessed based on the presence of suitable habitat and vegetation types; no acoustic survey was conducted. Hawaiian hoary bats forage and roost in pastures, croplands, orchards, forests, and developed lands such as golf courses, urban areas, and suburban yards. Hawaiian hoary bats are solitary and roost in exotic and native woody vegetation. They could forage throughout the project area and roost in the autograph and Mindanao gum trees. The birthing and pup-rearing season typically occurs between June 1 and September 15. It is common for adult females to leave flightless young unattended in "nursery" trees and shrubs while foraging.

5.2.3 Terrestrial Reptiles and Amphibians

No terrestrial reptiles or amphibians were detected during the survey. There are no terrestrial reptiles and amphibians native to the Hawaiian Islands.

5.2.4 Insects and Other Invertebrates

Native invertebrates were not detected during the surveys. Non-native invertebrate species observed during the surveys include the familiar bluet damselfly honeybee (*Enallagma civile*), cabbage white butterfly (*Artogeia rapae*), praying mantis (*Mantis religiose*), one species of unidentified grasshopper, and various species of ant.

6 DISCUSSION AND RECOMMENDATIONS

6.1 Flora

Overall, the vegetation in the project area is and has been disturbed by land use activities. The vegetation type and species identified are not considered unique. One of the plant species seen is possibly native to the Hawaiian Islands and is commonly found. No plants listed as threatened or endangered were found during the survey, and no designated plant critical habitat occurs in the project area. Therefore, the proposed project is not expected to have a significant adverse effect on flora (botanical) resources.

Weedy, non-native plant species are common in the project area. Most of these weedy species are widespread in Hawai'i, and their control is not expected to result in a significant decrease in their overall number or distribution. However, construction activities are known to spread invasive species to new areas through the movement of vehicles and materials. For this reason, SWCA recommends the following invasive species minimization measures to avoid the unintentional introduction or transport of new terrestrial invasive species to O'ahu:

- All construction equipment and vehicles arriving from outside O'ahu should be washed and inspected before entering the project area.
- Construction materials arriving from outside O'ahu should also be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful non-native species (plants, amphibians, reptiles, and insects).

- Inspection and cleaning activities should be conducted at a designated location. The inspector should be a qualified botanist and/or entomologist who is able to identify invasive species that are of concern relevant to the point of origin of the equipment, vehicle, or material.
- When possible, raw materials (e.g., fill and construction materials) should be purchased from a local supplier on O‘ahu to avoid introducing non-native species not present on the island.

If landscaping occurs as part of the project, native Hawaiian plants or non-invasive plants should be used to the maximum extent possible. If native plants do not meet landscaping objectives, plants with a low risk of becoming invasive could be substituted. Additional information on selecting appropriate plants for landscaping can be obtained from the following online sources:

- Plant Pono: http://www.plantpono.org/
- Native Plants Hawai‘i: http://nativeplants.hawaii.edu/

6.2 Fauna

This section discusses species that may occur in the project area and lists recommended minimization measures.

6.2.1 Migratory Bird Treaty Act

SWCA observed three bird species protected under the MBTA during the survey (Table 1); all are non-native, introduced species. The introduced northern cardinal and house finch may nest within the project area. Construction in the project area may temporarily displace these birds, but long-term impacts are not expected. These bird species (likely limited to a few individuals) are expected to find abundant foraging habitat in nearby areas. The temporary displacement of individuals from the project area is not expected to affect the individuals' survival or overall species' populations.

Direct impacts to MBTA-protected birds could occur if active nests are disturbed or damaged during vegetation removal. To prevent direct impacts to these MBTA-protected birds, the following measures are recommended:

- Nest surveys should be conducted a maximum of 7 days before construction. If no active nests are found during the survey, further monitoring is not needed.
- Active nests of MBTA-protected species should be left in place and undisturbed until chicks have fledged.
- A qualified biologist should monitor active nests during construction activities to reduce the chances of nest abandonment by temporarily shutting down construction activities that disrupt the normal daily patterns of the birds. Once chicks have fledged, monitoring is no longer needed.

Implementation of these guidelines is expected to avoid all direct impacts to birds protected by the MBTA.

6.2.2 Listed Waterbirds

Three listed waterbirds could fly over the project area when moving between nearby water resources. Based on known distribution and habitat requirements, Hawaiian stilt may forage and loaf in the landscaped vegetation type within the project area. Because there are no water resources within the

project area, it is unlikely that Hawaiian coot or Hawaiian moorhen would use the project area, so they are not discussed further in this document.

Statewide, Hawaiian stilt abundance varied between 1,100 and 1,783 individuals between 1997 and 2007, with fewer than 500 occurring on Kaua‘i (USFWS 2011, 2014). The statewide population has been increasing over the past 30 years (Reed et al. 2011; USFWS 2011). Hawaiian stilt uses a variety of aquatic habitats but prefers to loaf in open mudflats, sparsely vegetated pickleweed mats, and open pasturelands. Specific water depths of 12.7 cm (5 inches) are required for optimal foraging. Nest sites are frequently separated from feeding sites, and they are adjacent to or on low islands within bodies of fresh, brackish, or saltwater. In the project area, Hawaiian stilt could be attracted to the landscaped vegetation type for foraging and loafing.

The following best management practices (BMPs) are recommended during construction to avoid impacts to listed waterbirds:

- If an endangered Hawaiian waterbird is present or flies into the area during ongoing activities, then all activities within 30 m (100 feet) of the bird should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord.

6.2.3 Hawaiian Goose

Although unlikely, Hawaiian goose may be present in the project area. The Hawaiian goose is adapted to a terrestrial and largely nonmigratory lifestyle in the Hawaiian Islands, with negligible dependence on freshwater habitat. Hawaiian geese use various habitat types, ranging from beach strand, shrubland, and grassland to lava rock (Banko 1988; Banko et al. 1999). Hydroseeding can attract Hawaiian geese to feed.

The following BMPs are recommended during construction to avoid impacts to Hawaiian goose:

- If the Hawaiian goose is observed within the project area during the breeding season (September through April), a qualified biologist should survey the area for nesting Hawaiian geese before construction continues and after any subsequent delay in work of 3 or more days (during which birds may attempt nesting).
- If a Hawaiian goose is found in the area during ongoing activities, then all activities within 30 m (100 feet) of the bird should cease, and the bird should not be approached. If a nest is discovered, all work within a 46 m (150 foot) radius should be stopped, and the USFWS should be contacted. If a nest is not discovered, work may continue after the bird leaves the area on its own accord.
- In areas where Hawaiian geese are known to occur, reduced speed limit signs of 15 mph should be posted, and project personnel and contractors should be informed of their presence.

6.2.4 Hawaiian Short-eared Owl

The Hawaiian short-eared owl is active during the day and occurs in a variety of habitats, including wet and dry forests, grasslands, and shrublands (Mitchell et al. 2005). Their diet consists of small mammals and birds (Holt and Leasure 2006). Little is known about the breeding biology of the Hawaiian short-eared owl, but nesting occurs throughout the year (USFWS 2013). Nests are made on the ground and are lined with grasses and feathers.

The following BMPs are recommended during construction to avoid impacts to Hawaiian short-eared owl:

- If a Hawaiian short-eared owl nest is discovered, all activities within 150 feet (46 m) of the nest should cease, and the Department of Land and Natural Resources should be contacted. Work should not resume until directed by the Department of Land and Natural Resources.
- The use of barbless top-strand wire is recommended for any fences that are erected as part of the project to prevent entanglements of Hawaiian short-eared owl.

6.2.5 Listed Seabirds

Major threats to endangered band-rumped storm-petrel, endangered Hawaiian petrel, and threatened Newell's shearwater include the attraction of adults and newly fledged juveniles to bright lights while transiting between their nest sites and the ocean. Juvenile birds are particularly vulnerable to light attraction and are sometimes grounded when they become disoriented by lights (Mitchell et al. 2005). Many of these grounded birds are vulnerable to mammalian predators or being struck by vehicles. The following recommendations are provided to avoid and minimize light attraction of the endangered petrels and threatened shearwater to the project area:

- Restrict construction activity to daylight hours as much as practicable during the seabird breeding season (April through November) to avoid the use of nighttime lighting that could attract seabirds.
- Shield all outdoor lights to prevent upward radiation. This has been shown to reduce the potential for seabird attraction (Reed et al. 1985; Telfer et al. 1987).
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Turn off outside lights that are not needed for security and safety from dusk through dawn during the fledgling fallout period (September 15–December 15).

6.2.6 Hawaiian Hoary Bat

Hawaiian hoary bat occurs on O'ahu in native, non-native, agricultural, and developed landscapes (U.S. Department of Agriculture 2009; USFWS 1998). Hawaiian hoary bats forage in open, wooded, and linear habitats with a wide range of vegetation types. These animals are insectivores and are regularly observed foraging over streams, reservoirs, and wetlands up to 100 m (300 feet) offshore (U.S. Department of Agriculture 2009). Hawaiian hoary bats typically roost in trees or shrubs 15 feet (4.5 m) or taller with dense canopy foliage or in the subcanopy when the canopy is sparse and there is open access for launching into flight (Gorresen et al. 2013; U.S. Department of Agriculture 2009).

Direct impacts to bats could occur during vegetation removal if a juvenile bat that is too small to fly but too large to be carried by a parent is present in a tree or branch that is cut down. To prevent direct impacts to Hawaiian hoary bat, the following measures are recommended:

- No trees taller than 4.6 m (15 feet) in the survey area should be trimmed or removed between June 1 and September 15 when flightless juvenile bats may be roosting in the trees.
- The use of barbless top-strand wire is recommended for any fences that are erected as part of the project to prevent entanglements of Hawaiian hoary bats.

Implementation of these measures, which have been promulgated by the USFWS (1998), are expected to avoid all direct impacts to Hawaiian hoary bat.

7 CONCLUSION

No federally or state-endangered wildlife species were observed during the surveys; however, the federally and state-listed Hawaiian stilt, Hawaiian goose, and Hawaiian hoary bat and state-listed Hawaiian short-eared owl may be present. In addition, federally and state-listed seabirds may transit over the project area traveling to and from their breeding grounds to the ocean.

The proposed project is not likely to have any long-term adverse impacts to any federally or state-listed threatened or endangered species if the recommended avoidance and mitigation measures listed above are used.

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APPENDIX A

Checklist of Plants Observed during the Flora and Fauna Surveys for the Kunia Exploratory Wells Site, Island of Oahu, Hawai‘i

Table A-1 provides an inventory checklist of plant species observed by SWCA Environmental Consultants on July 3, 2018, at the Kunia Exploratory Wells project area. 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 and Herbst (2003), Wagner et al. (1999), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012).

Table A-1. Checklist of Plants Observed during the Flora and Fauna Surveys for the Kunia Exploratory Wells Site on July 3, 2018

Family	Scientific Name and Authorship	Status	Hawaiian and/or Common Name
MONOCOTS			
Poaceae	*Melinis repens* (Willd.) Zizka	X	Natal redtop, rose Natal grass
Poaceae	*Urochloa maxima* (Jacq.) R.D. Webster	X	Guineagrass
DICOTS			
Asteraceae	*Bidens pilosa* L.	X	Spanish needle, beggartick, kī, kī nehe, kī pipili, nehe
Asteraceae	*Conyza bonariensis* (L.) Cronquist	X	hairy horseweed, ilioha, ‘awī‘awī, pua mana, lani wela (Ni‘ihau)
Asteraceae	*Tridax procumbens* L.	X	coat buttons
Clusiaceae	*Clusia rosea* Jacq.	X	autograph tree, copey, Scotch attorney
Convolvulaceae	*Ipomoea obscura* (L.) Ker Gawl.	X	morning glory
Euphorbiaceae	*Euphorbia hyssopifolia* L.	X	spurge
Fabaceae	*Chamaecrista nictitans* subsp. *patellaria* var. *glabrata* (Vogel) H.S. Irwin & Barneby	X	partridge pea, laukī
Fabaceae	*Indigofera spicata* Forssk.	X	creeping indigo
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit	X	koa haole, ēkoa, lilikoa
Fabaceae	*Macroptilium atropurpureum* (DC.) Urb.	X	
Fabaceae	*Macroptilium lathyroides* (L.) Urb.	X	wild bean, cow pea
Myrtaceae	*Eucalyptus deglupta* Blume	X	kamarere, Mindanao gum
Nyctaginaceae	*Boerhavia coccinea* Mill.	X	

Family	Scientific Name and Authorship	Status	Hawaiian and/or Common Name
Oxalidaceae	*Oxalis corniculata* L.	P?	yellow wood sorrel, ʻihi ʻai, ʻihi ʻawa, ʻihi maka ʻula, ʻihi mākole
Plantaginaceae	*Plantago lanceolata* L.	X	narrow-leaved plantain, English plantain, buckhorn
Solanaceae	*Solanum torvum* Sw.	X	
Sterculiaceae	*Waltheria indica* L.	I?	ʻuhaloa, ʻalaʻala pū loa, hala ʻuhaloa, hiʻaloa, kanakaloa

Notes: E = endemic; E? = probably endemic but possibly naturalized; I = indigenous; I? = probably indigenous but possibly naturalized; P = Polynesian introduced; P? = probably Polynesian introduced but possibly introduced in historic times; X = non-native; X* = non-native cultivated

Appendix C

Archaeological Literature Review and Field Inspection

Final
Archaeological Literature Review and Field Inspection Report for the Kunia Wells IV Exploratory Wells Project, Hōʻaeʻae Ahupuaʻa, ʻEwa District, Oʻahu TMK: [1] 9-4-003:010

Prepared for
Belt Collins Hawaii LLC
on behalf of
City and County of Honolulu Board of Water Supply

Prepared by
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and
Hallett H. Hammatt, Ph.D.

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Management Summary

Reference	Archaeological Literature Review and Field Inspection Report for the Kunia Wells IV Exploratory Wells Project, Hōʻaeʻae Ahupuaʻa, ʻEwa District, Oʻahu, TMK: [1] 9-4-003:010 (Shideler and Hammatt 2018)
Date	October 2018
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: HOAEAE 4
Investigation Permit Number	CSH completed the fieldwork component of this study under archaeological fieldwork permit number 18-15, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-282.
Agencies	SHPD, City and County of Honolulu Board of Water Supply (BWS)
Land Jurisdiction	BWS
Project Proponent	BWS
Project Funding	BWS
Project Location	The project area is approximately 200 m northeast of Kunia Road at 660 foot (ft) elevation in Hōʻaeʻae Ahupuaʻa, ʻEwa District, south central Oʻahu, TMK: [1] 9-4-003:010. An open reservoir (Reservoir 225) lies between the project area and Kunia Road to the west. The project area is depicted on a portion of the 1998 Schofield Barracks U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.
Project Description	The proposed project involves drilling a series of four exploratory water wells within the project area. This is anticipated to involve a drill rig being moved within the project area.
Project Acreage	81,387 square feet (sq ft) (1.87 acres or 0.76 hectare)
Document Purpose	This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project and, based on findings, consider cultural resource management recommendations. This document is intended to facilitate the project's planning, and to support the project's historic preservation and environmental review compliance as a basis of consultation with the SHPD.
Fieldwork Effort	CSH archaeologist David W. Shideler, M.A., accomplished the fieldwork on 20 June 2018 under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. This work required approximately 3 hours to complete.

Results Summary	A review and evaluation of the cultural history of the project area (including surrounding sugarcane cultivation infrastructure), results of previous archaeological studies in the vicinity, and the results of fieldwork as documented in this study leads to the conclusion that the prospect of historic properties within the project area is very low.
Recommendations	The results of the background research and field inspection for this Kunia Wells IV Exploratory Wells project would be consistent with, and support, a City and County determination (as per HAR §13-275-7[a][1]) of “No historic properties affected.” The project will have no effect on significant historic properties. Thus, no further archaeological work is indicated for this project.

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Section 1 Introduction

1.1 Project Background

At the request of Belt Collins Hawaii LLC, and on behalf of the City and County of Honolulu Board of Water Supply, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this literature review and field inspection report (LRFI) for the Kunia Wells IV Exploratory Wells project, Hō‘ae‘ae Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-4-003:010.

The 81,387-square-foot (sq ft) (1.87-acre or 0.76-hectare) project area is located in the southern central valley of O‘ahu approximately 200 m northeast of Kunia Road at 660 ft elevation. An open reservoir (Reservoir 225) lies between the project area and Kunia Road to the west, and the Waiahole Ditch is located 15 m (50 ft) northwest of the project area. No portion of Reservoir 255 or Waiahole Ditch is within the project area. The project area is depicted on a portion of the 1998 Schofield Barracks U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

The proposed project involves drilling a series of four exploratory water wells within the project area. This is anticipated to involve a drill rig being moved within the project area.

1.2 Document Purpose

This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project and, based on findings, consider cultural resource management recommendations. This document is intended to facilitate the project’s planning and support the project’s historic preservation and environmental review compliance by supporting consultation with the State Historic Preservation Division (SHPD).

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is approximately 6 km inland (northwest) from the West Loch of Pearl Harbor on gently ascending plateau lands of the southern central valley of O‘ahu. Annual rainfall in the immediate project area is estimated at 764 mm or 30.1 inches (at the neighboring “Field 225” rain gauge) (Giambelluca et al. 2013). This rainfall would be marginal at best for non-irrigated agriculture. There are no known natural surface sources of potable water anywhere in the vicinity of the project area. The eastern Honouliuli Stream drainage, which is believed to hold water during rainy periods, is approximately 1.0 km to the west

Temperatures range between 60 degrees to 90 degrees Fahrenheit through the year; the highest temperatures are in August and September (Armstrong 1973).

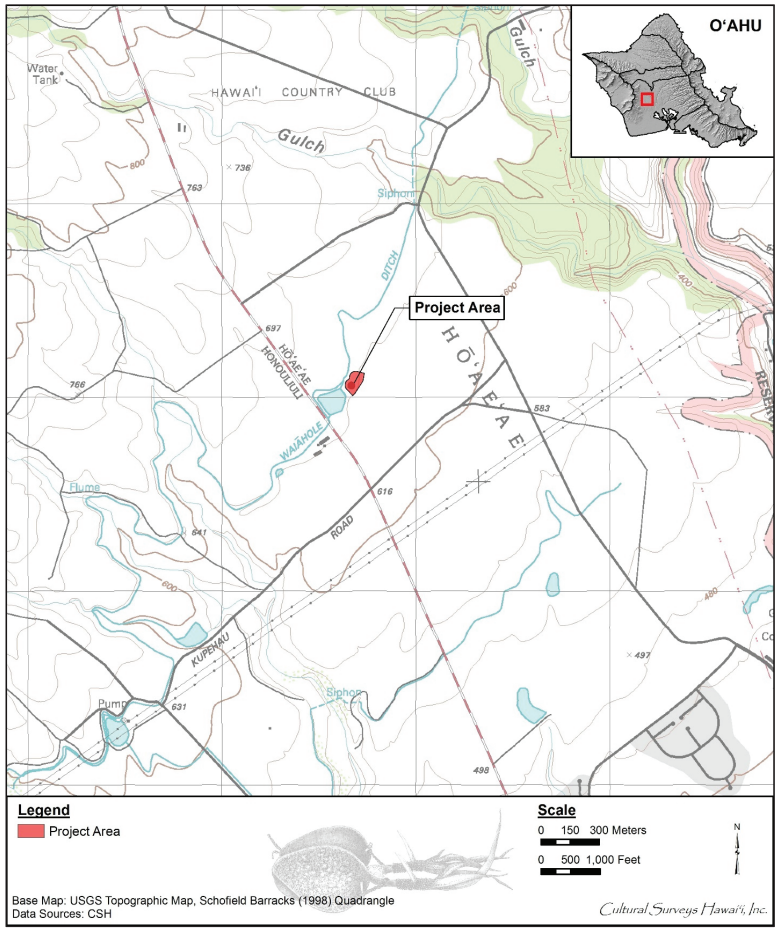

Figure 1. Portion of the 1998 Schofield Barracks USGS 7.5-minute topographic quadrangle showing the location of the project area

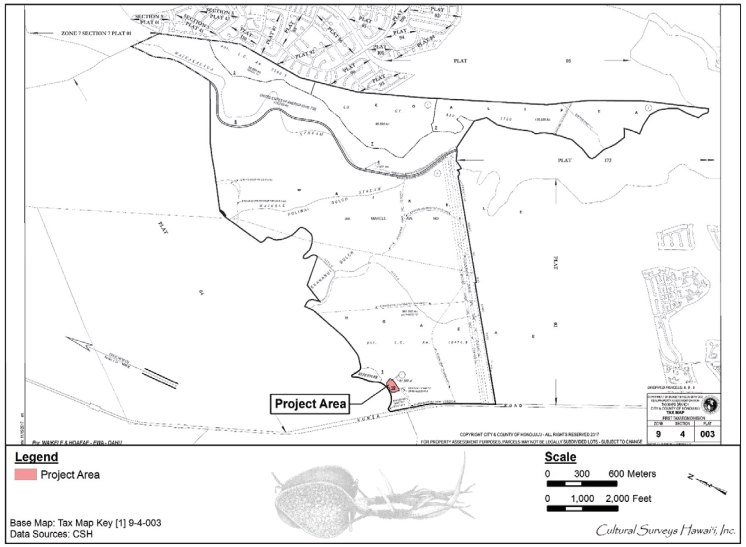

Figure 2. Tax Map Key (TMK) [1] 9-4-003 showing the project area (Hawai‘i TMK Service 2014)

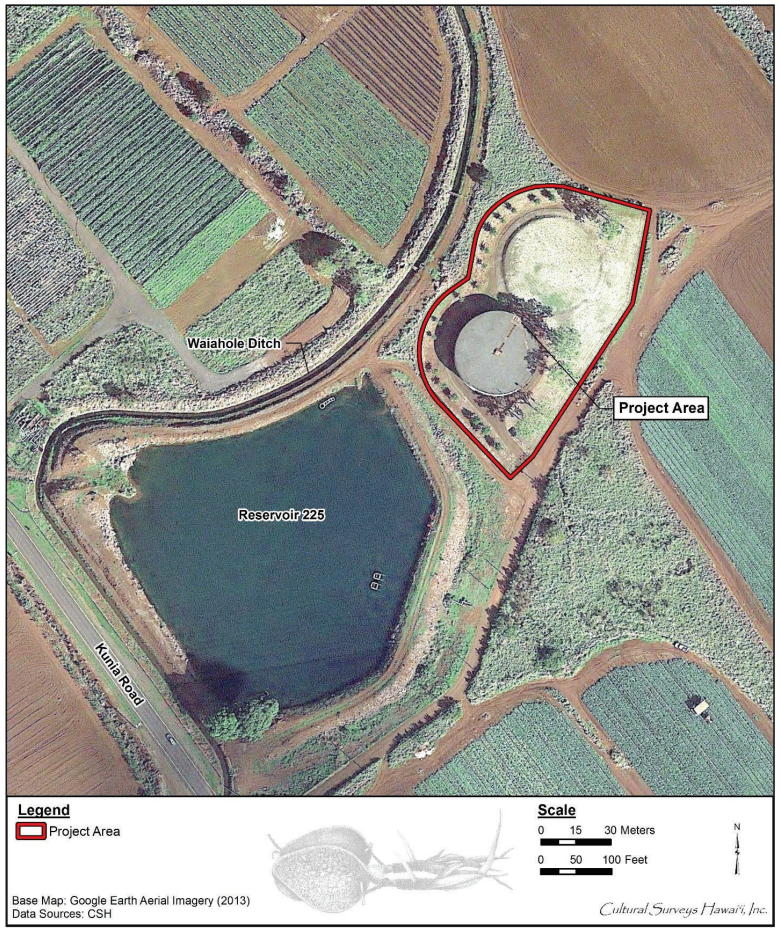

Figure 3. Aerial photograph showing the location of the project area (Google Earth 2013)

Elevation in the project area ranges from approximately 183 m (600 ft) above mean sea level (AMSL) to 195 m (640 ft). The project area land is generally quite flat with the exception of the reservoir and reservoir platform, which are man-made.

In pre-Contact Hawai‘i the project area would have been mostly lowland dry shrub and grassland, dominated by species such as *wiliwili* (*Erythrina sandwicensis*), *lama* (*Diospyros ferrea*), sandalwood (*Santalum* sp.), *‘a‘ali‘i* (*Dodonea eriocarpa*), scrub *‘ōhi‘a* (*Metrosideros collina*), and *pili* grass (*Heteropogon contortus*) (Frierson 1972). The vegetation present within the project area consists of short grass with a few exotic autograph trees (*Clusia rosea*) and eucalypt trees (*Eucalyptus* species) for landscaping.

One soil series, the Kunia Series, is found in the Kunia Wells IV Exploratory Wells project area (Figure 4). The Kunia Series consists of well-drained soils on upland terraces and fans; the soils developed in old alluvium. They are nearly level to moderately sloping. The soils within the project area are all Kunia silty clay, 0 to 3% slopes, (KyA). Permeability is moderate, runoff is slow, and the erosion hazard is no more than slight for these soils which have been used for sugarcane, pineapple, and home sites (Foote et al. 1972:77).

1.3.2 Built Environment

Reservoir 225, an open, earthen reservoir, is located west of the present project area and adjacent to Kunia Road within Robinson Kunia Land LLC agricultural fields within TMK: [1] 9-4-003:001. Access to the present project area is via an unnamed dirt road. The present project area is dominated by a large cylindrical reservoir tank on the southwest side of the project area. A constructed, round platform on the northeast side of the project area was clearly built to support a second similar tank but it appears that second tank was never built. Plans for the presently extant infrastructure are dated 1994

The Waiahole Ditch transporting water from east of the Ko‘olau Mountain Range across the central valley of O‘ahu runs from northeast to southwest approximately 15 m northwest of the project area (see Figure 1 and Figure 3).

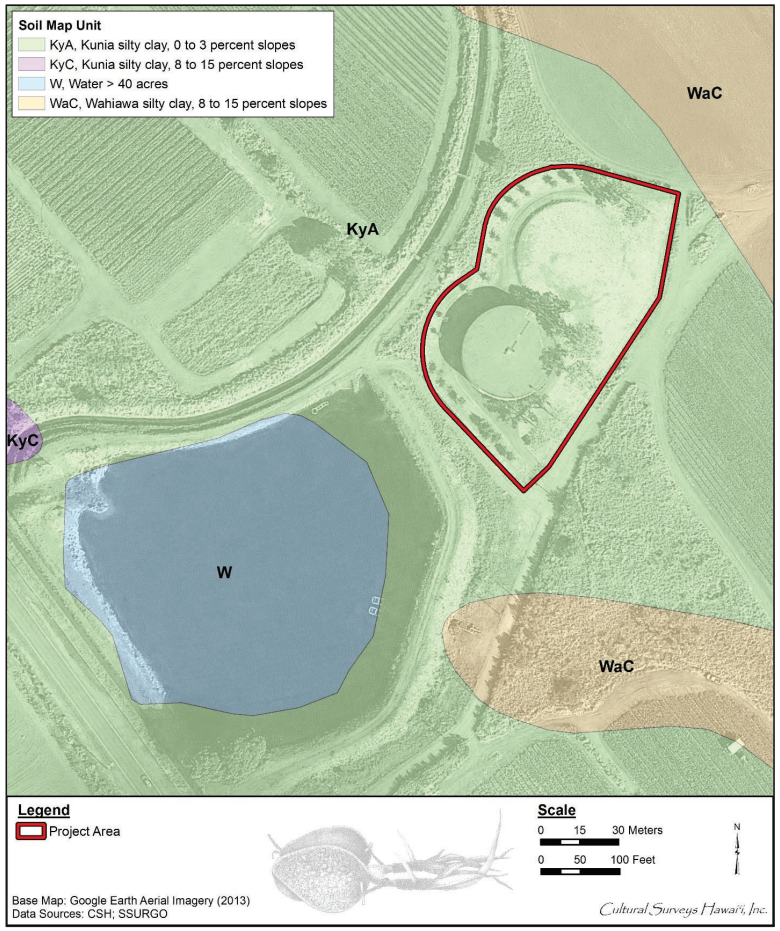

Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (USDA SSURGO 2001)

Section 2 Methods

2.1 Fieldwork Methods

CSH completed the fieldwork component of this LRFI under archaeological fieldwork permit number 18-15, issued by the SHPD pursuant to Hawai‘i Administrative Rules (HAR) §13-282. CSH archaeologist David Shideler, M.A., conducted the fieldwork component of this archaeological investigation on 20 June 2018 under the general supervision of Principal Investigator Hallett Hammatt, Ph.D. This work required approximately 3 hours to complete. In general, fieldwork included a thorough pedestrian inspection of the project area (see Figure 23 for a field inspection track log).

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 2000). This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a prediction regarding the expected types and locations of cultural resources in the project area.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Traditional Place Names and *Mo‘olelo* (Stories) of Hō‘ae‘ae

Hō‘ae‘ae Ahupua‘a has very few recorded place names compared to the much larger Honouliuli Ahupua‘a adjacent to the west and north (Figure 5). Hō‘ae‘ae is bounded on the *makai,* or ocean side, by the north shore of Pearl Harbor’s West Loch, by a trail running along the eastern edge of Honouliuli Gulch on the west side, and by Waikele Gulch and a traditional Hawaiian trail on the east side (Figure 6). Uncharacteristically, the *mauka*, or inland, edge of Hō‘ae‘ae Ahupua‘a does not extend to the mountains, but is “cut off” by Honouliuli to the northwest and Waikele to the east. Hō‘ae‘ae Ahupua‘a was described by Handy in 1940 as follows: “This *ahupua‘a* had a moderate-sized area of terraces watered by springs inland from West Loch of Pearl Harbor” (Handy 1940:82). Pre-Contact and early post-Contact agriculture focused on the spring-fed floodplains adjacent to West Loch.

Hō‘ae‘ae means “to make soft or fine” according to *Place Names of Hawaii* (Pukui et al. 1974:47). Pukui et al. (1974) do not explain why the *ahupua‘a* (traditional land division) was given this name, but do mention there was a famous *pōhaku* (stone) called Pōhaku-Pili on the boundary between Hō‘ae‘ae and Waikele. Another source (Thrum 1922:632) reports that Hō‘ae‘ae means “to pulverize.” Pukui and Elbert’s *Hawaiian Dictionary* (1986) records the possible meanings of Hō‘ae‘ae as “to rise the tide, to make fine, to pulverize, to refine, to soften.” *‘Ae* can also mean to lend, to say yes, to consent, to approve or to denote fine mash or sap from seaweed or leaves of plants such as taro.”

3.1.2 Leeward O‘ahu Trails

Several pre-Contact/early historic trails crossed ‘Ewa: a cross-*ahupua‘a* trail that traversed ‘Ewa and connected Honolulu to Wai‘anae; a *mauka-makai* trail that branched off from the cross-*ahupua‘a* trail and approximated the boundary between Honouliuli and Hō‘ae‘ae to the Pōhākea Pass and Kolekole Pass to Wai‘anae; and a second branching *mauka-makai* trail that generally followed the path of Waikele Stream in Waikele Ahupua‘a to Wahiawā in central O‘ahu (Figure 6 and for greater detail, Figure 8). ‘Ī‘ī (1959:97) noted the following regarding the first *mauka-makai* trail: “From Kunia the trail went to the plain of Keahumoa, on to Maunauna, and along Paupauwela, which met with the trails from Wahiawā and Waialua.” ‘Ī‘ī places the area called Kunia east of Pōhākea Pass in the *ahupua‘a* of Honouliuli and Hō‘ae‘ae, *makai* of the modern town of Kunia, and places the plain of Keahumoa between Kunia and Paupauwela, in the most *mauka* portion of Honouliuli. The trail passed near the peak called Maunauna in upper Honouliuli. To the east of Honouliuli, this trail was just *mauka* of the floodplains near Pearl Harbor, skirting the inland edges of the productive taro fields (see Figure 7).

Kunia Road was effectively developed along a traditional Hawaiian *mauka*/*makai* trail that may have been in use for many centuries. While this trail may have always been somewhat braided, ascending the gentle soil slope of the southern, central valley of O‘ahu, historic maps indicate the alignment was close to Kunia Road approximately 200 m southwest of the present project area.

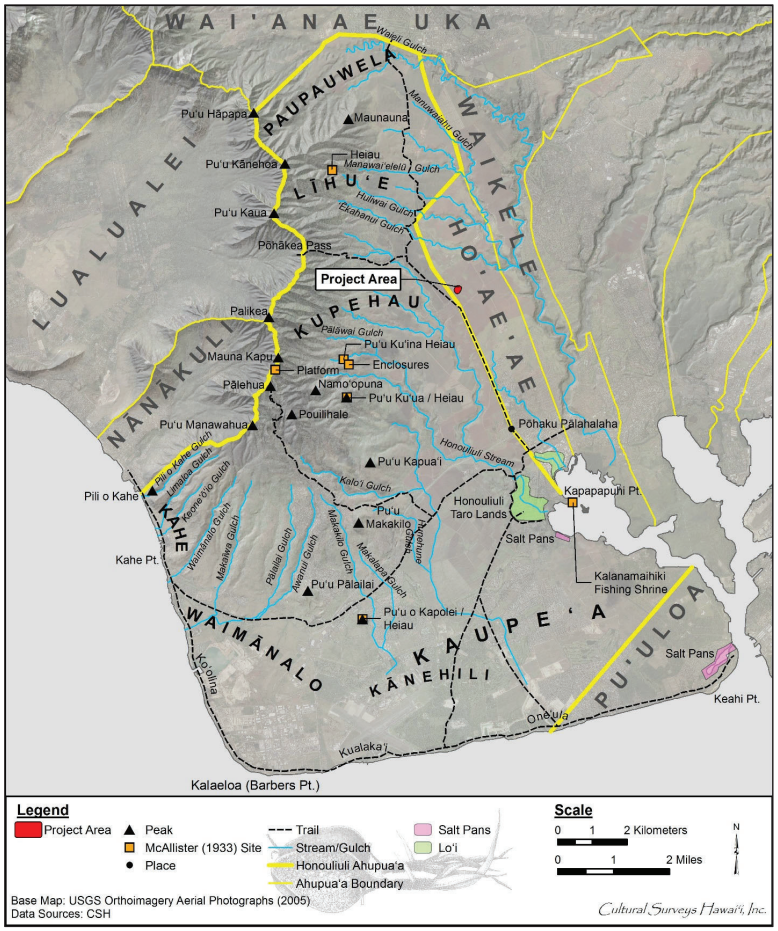

Figure 5. Place names of Honouliuli (base map: 2005 USGS Orthoimagery); note that modern Farrington Highway and Kunia Road generally follow the ancient trails

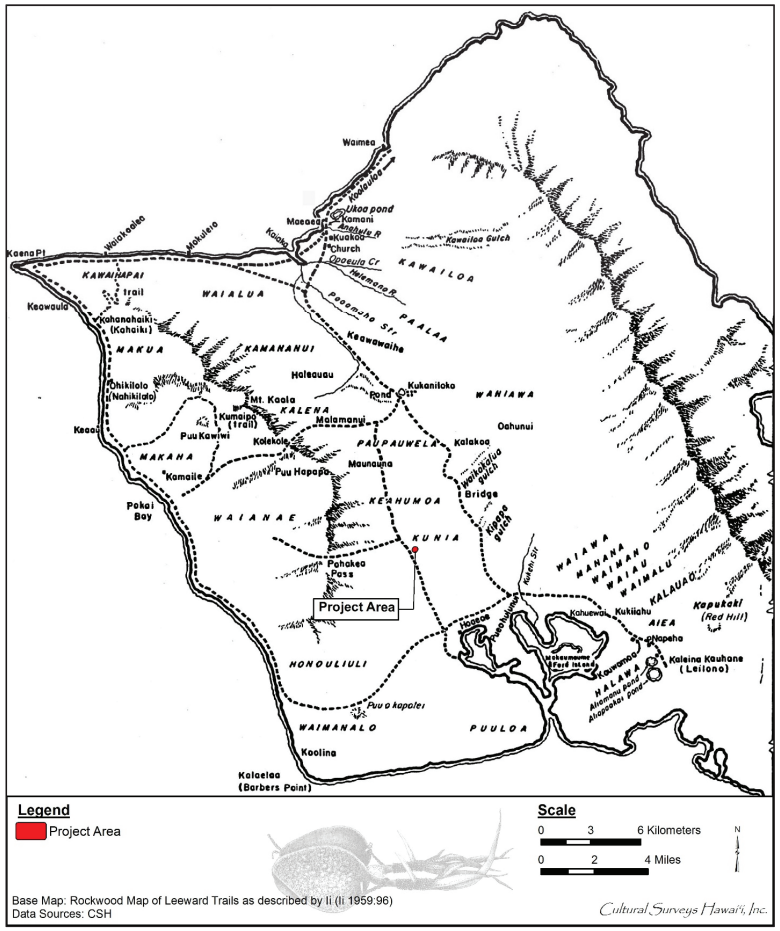

Figure 6. Portion of the Paul Rockwood map of traditional trails of Leeward O'ahu, indicating the project area ('Ī'ī 1959:96)

3.1.3 Pre-Contact and Early Post-Contact ‘Ewa

The rich resources of the Pearl Harbor lochs, the shoreline fishponds, the numerous springs, and the irrigated lands along the streams made central ‘Ewa a prize for competing chiefs. Battles were fought for and on ‘Ewa lands, at times between competing O‘ahu chiefs and other times by invading chiefs from other islands.

By ca. AD 1320 (based on genealogical reckoning), ‘Ewa, Kona, and Ko‘olaupoko were the dominant political districts, ruled by the sons of a chief named Māweke (Cordy 2002:21). Around AD 1400, the entire island was ruled by La‘akona. Chiefs within his line, the Māweke-Kumuhonua line, reigned until about AD 1520-1540, with their major royal center in Līhu‘e in ‘Ewa (Cordy 2002:24). Haka was the last chief of the Māweke-Kumuhonua line. He was slain by his men at the fortress of Waewae near Līhu‘e (Kamakau 1991:54). Power shifted among the chiefs of different districts from the 1500s until the early 1700s, when Kūali‘i achieved control of all of O‘ahu by defeating the Kona chiefs, then the ‘Ewa chiefs, and finally expanding his control to windward Kaua‘i. Peleiholani, the heir of Kūali‘i, gained control of O‘ahu ca. 1740 and later conquered parts of Moloka‘i. He ruled O‘ahu until his death in ca. 1778, when Kahahana of the ‘Ewa line of chiefs was selected as the ruler of O‘ahu (Cordy 2002:24–41).

3.1.4 Early Historic Period

In a study of the resources and population of the *ahupua‘a* in ‘Ewa, Ross Cordy (1996:12) wrote a correlation study of three factors: floodplain size, fishery size, and population size. Hō‘ae‘ae had a small floodplain area, directly adjacent to the north shore of Pearl Harbor’s West Loch, and a fairly small fishery, which took up only a small portion of West Loch. Waiawa had a medium-sized floodplain, shared with the neighboring *ahupua‘a* of Mānana, and a small fishery, again shared with Mānana, on the north shore of Middle Loch. Waikele had a large floodplain and had irrigated fields along the lower Waikele Stream and the inland Waikakalaua Stream, but only a medium-sized fishery along the west shore of West Loch. Waipi‘o had a large floodplain, irrigated fields along Kīpapa Stream, and a large fishery, encompassing most of Middle Loch and the fringes of West Loch along Waipi‘o Peninsula. Cordy found the first two factors were good predictors for pre-Contact and early post-Contact population. Waipi‘o had the largest population, Waikele and Waiawa had medium-sized populations, and Hō‘ae‘ae, where the current project is located, had the smallest population of the four.

Of the four *ahupua‘a* in central ‘Ewa, Waipi‘o was the main focus of Hawaiian settlement and activity during the centuries preceding Western Contact. “The populous dwelling place of the *ali‘i* (chiefly class) was formerly located on an east point of Waipi‘o Peninsula known as Lēpau” (McAllister 1933:106). The *ali‘i* at Waipi‘o were no doubt attracted to the great abundance of resources the region offered. However, the entire *moku* (district) of ‘Ewa was generally prosperous and productive, and the land was heavily populated. ‘Ewa continued to be a political center through the eighteenth century when Kahahana, a Maui chief, was chosen by the O‘ahu chiefs to rule over the island. Kahahana was the son of Elani who died fighting Kahekili and was a chief of O‘ahu (Kamakau 1992:87). After the Maui war chief Kahekili conquered O‘ahu ca. 1785 he ruthlessly suppressed a rebellion of O‘ahu chiefs causing a great loss of life at Hō‘ae‘ae. The forces of Kahekili:

> . . . overran the districts of Kona and Ewa, and a war of extermination ensued. Men, woman and children were killed without discrimination and without mercy. The streams of . . . Hoaeae in Ewa, are said to have been literally choked with the corpses of the slain. [Fornander 1919:6:290]

After Kahekili’s own death it was his son Kalanikūpule who was defeated by Kamehameha.

‘Ewa is depicted as an abundant and populated land where chiefs of distinguished lineages were born and resided. The land was fertile and well fed by mountain streams that helped sustain the agricultural lifestyle needed to support the chiefs, their households, and their people. An examination of the place names reveals that water was a very important factor in this district. Six of the 12 *ahupua‘a* names begin with *wai*, the Hawaiian word for water: Waikele, Waipi‘o, Waiawa, Waimano, Waiau, and Waimalu. The fact that there were so many fishponds in the ‘Ewa District and in the Pu‘uloa area, more than any other district on O‘ahu, indicates agricultural/aquacultural intensification was a direct link to the chiefs who resided there, and also to the increasing needs of the population. Thus, ‘Ewa’s part in the politics and history of O‘ahu is of noteworthy importance.

Early historical accounts indicate ‘Ewa District was once widely inhabited by pre-Contact populations. This probably can also be said of Hō‘ae‘ae, although much less is documented regarding this *ahupua‘a*. Thriving human habitation here is attributable for the most part to the plentiful marine and estuarine resources available at the coast. Other subsistence-related features of this area include irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest resources. 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 sporadic 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 (Hammatt et al. 1991). The lowlands, bisected by ample streams, were ideal terrain for the cultivation of irrigated taro. The hinterland consisted of deep valleys running far back into the Ko‘olau range. Between the valleys were ridges with steep sides but a very gradual increase of altitude. The lower part of the valley sides were excellent for the cultivation of yams (*Dioscorea* spp.) and bananas (*Musa* spp.). Farther inland grew the *‘awa* (kawa, *Piper methysticum*) for which the area was famous.

In addition, breadfruit (*Artocarpus altilis*), coconuts (*Cocos nucifera*), *wauke* (paper mulberry, *Broussonetia papyrifera,* used to make *kapa* for clothing), *olonā* (*Touchardia latifoli*, used to make cordage), and other plants were grown in the interior. ‘Ewa was known as one of the best areas to grow gourds and was famous for its *māmaki* (*Pipterus* spp., used to make *kapa* for clothing). It was also famous for a rare form of taro called the *kāī o ‘Ewa*, which was grown in mounds in

marshy locations (Handy and Handy 1972:471). The cultivation of this prized and delicious taro led to the following saying:

> *Ua ‘ai i ke kāī-koi o ‘Ewa*. He has eaten the Kāī-koi taro of ‘Ewa.
>
> Kāī is O‘ahu’s best eating taro; one who has eaten it will always like it. Said of a youth of a maiden of ‘Ewa, who, like the Kāī taro, is not easily forgotten. [Pukui 1983:305]

Captain Vancouver sailed by Kalaeloa (Barbers Point) in 1792, and recorded his impression of the small coastal village of Kualaka‘i and the arid Honouliuli coast:

> The point is low flat land, with a reef round it . . . Not far from the S.W. point is a small grove of shabby cocoa-nut trees, and along these shores are a few struggling fishermen’s huts. [Vancouver 1798:1:167]
>
> . . . from the commencement of the high land to the westward of Opooroah [Pu‘uloa], was composed of one very barren rocky waste, nearly destitute of verdure, cultivation or inhabitants, with little variation all the way to the west point of the island . . . [Vancouver 1798:2:217]
>
> This tract of land was of some extent but did not seem to be populous, nor to possess any great degree of fertility; although we were told that at a little distance from the sea, the soil is rich, and all necessaries of life are abundantly produced . . . [Vancouver 1798:3:361–363]

Subsequent to Western Contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood forest and the introduction of domesticated animals and new vegetation species. Domesticated animals, including goats, sheep and cattle, were brought to the Hawaiian Islands by Vancouver in the early 1790s and were 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 of specific vegetation introduced to Hawai‘i are given by R. Smith and outlined by Frierson (1972:11):

(1) ‘early’, c. 1790: Prickly pear cactus, *Opuntia tuna*, Haole koa, *Leucaena glauca* and Guava, *Psidium guajava*

(2) 1835-1840: Burmuda [*sic*] grass, *Cynodon dactylon*, Wire grass, *Eleusine indica*

(3) 1858: Lantana, *Lantana camara*, *kiawe* tree (1828 or 1837)

At Contact, the most populous *ahupua‘a* on the island was Honouliuli, with the majority of the population centered on Pearl Harbor. In 1832, a missionary census of Honouliuli recorded the population as 1,026. Within four years, the population was down to 870 (Schmitt 1973:19, 22). In 1835, there were eight to ten deaths for every birth (Kelly 1991:157–158). Between 1848 and 1853, there was a series of epidemics of measles, influenza, and whooping cough that often wiped out whole villages. In 1853, the population of ‘Ewa and Wai‘anae combined was 2,451 people. In 1872, it was 1,671 (Schmitt 1968:71). The inland area of ‘Ewa was probably abandoned by the

mid-nineteenth century due to population decline and consolidation of the remaining people in the town of Honouliuli, near Kapapapūhi Point.

3.1.5 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, the Hawaiian government, and the *ali‘i* received their land titles. The common people (*maka‘āinana*) received their *kuleana* awards (individual land parcels) beginning in 1850. It is through records for Land Commission Awards (LCA) generated during the Māhele that the first specific documentation of life in ‘Ewa as it had evolved up to the mid-nineteenth century comes to light.

By the time of the Māhele, many of the chiefs had run up huge debts to American merchants. A common practice at the time was to lease (or mortgage) large portions of unused land to other high chiefs and foreigners to generate income and pay off these earlier debts. Until the passage of the Act of 3 January 1865, which made Crown Lands inalienable, Kamehameha III and his successors did as they pleased with the Crown Lands, selling, leasing, and mortgaging them at will (Chinen 1958:27).

In 1850, the Privy Council passed resolutions that affirmed the rights of commoners or native tenants. To apply for fee-simple title to their lands, native tenants were required to file their claims with the Land Commission within the specified time period of February 1846 to 14 February 1848. Under the Kuleana Act of 1850, the claimant was required to have two witnesses who could testify they knew the claimant and the boundaries of the land, knew the claimant had lived on the land for a minimum of two years, and knew that no one had challenged the claim. The land also had to be surveyed.

Not everyone who was eligible to apply for *kuleana* lands did so and, likewise, not all claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some failed to have their land surveyed. For whatever reason, out of the potential 2,500,000 acres of Crown and Government lands, “less than 30,000 acres of land were awarded to the native tenants” (Chinen 1958:31).

A total of 23 land claims were made in Hō‘ae‘ae Ahupua‘a, with 20 claims awarded to commoners (Table 1). The bulk of these claims deal with Hō‘ae‘ae fisheries around West Loch to the south of the project area. No *kuleana* LCA claims were near the present project area. The project area is within the 3,453 acres of Māhele Award 193 (Figure 7), surveyed by Metcalf in 1848 and awarded to Lewis Rees, the servant of Manuia. All unclaimed lands in the *ahupua‘a* were awarded to Nueku Nāmau‘u as Māhele Award 63 (LCA 10474). Nāmau‘u was a descendant of Hawai‘i Island chieftains and a cousin (or nephew) to Mataio Kekūanao‘a, the father of two Hawaiian monarchs, Alexander Liholiho (Kamehameha IV) and Lot Kapuāiwa (Kamehameha V) (Day 1984:69).

Table 1. Land Commission Awards in Hō‘ae‘ae Ahupua‘a

LCA	Awardee	***‘Ili* (land division smaller than an *ahupua‘a*)**	Land Use
193	Rees, Lewis		One *‘āpana* (lot or parcel); 3,453 acres Pasture lands
750	Mokumakuaole	Koipu, Kalokoloa	One *‘āpana*; 0.85 acres
887	Kaihikapu	Kalaikea, Kapapapuhi, Kuainihi, Kalokoeli, Pakai	Kalaikea one *‘āpana*; 1.189 acres Kapapapuhi one *‘āpana*; 0.45 acres
889	Puko	Waihi	One *‘āpana*; 2.082 acres
899	Kahooweliweli	Amakeahilalo	One *‘āpana*; 1.45 acres House lot
909	Kaneiahuea	Paniu, Kalahale, Lihue, Kumuhau	Kalahale one *‘āpana*; 0.244 acres Panui one *‘āpana*; 2.374 acres House lot
1533	Kealaiki	Muki, Waihi, Kalokoeli	One *‘āpana*; 2.22 acres Four *lo‘i*
1561	Kaumanu	Amakeahiluna, Kamalokala	One *‘āpana*; 1.73 acres
1562	Kapili	Kaaiiole, Koipuu	Two *‘āpana*; 1.93 acres
1571	Kalihue	Kamalokala	One *‘āpana*; 1.239 acres
1578	Kaihumai	Laekea	Two *‘āpana*; 0.855 acres
1582	Kukahoe	Koipu	Two *‘āpana*; 0.575 acres
1583	Kekapa	Waihi	Two *‘āpana*; 1.77 acres House lot
1601	Kekoamiki	Keahupuaa, Kaaiiiole, Holokoeli	One *‘āpana*; 1.3 acres House lot
1605	Kaualei	Koipuiki, Koipu	Koipuiki one *‘āpana*; 0.73 acres Koipu one *‘āpana*; 0.25 acres
1660	Ewa	Kahuu	Two *‘āpana*; 1.64 acres
1707	I	Kalokoeli	Two *‘āpana*; 3.966 acres House lot
1721	Hinawale	Kuainiho, Kaaiiole	One *‘āpana*; 1.65 acres
5634	Kaiwi	Kalokoeli, Koipuu	One *‘āpana*: 0.567 acres
10474	Namauu	Ahupua‘a	*‘Āpana* 9

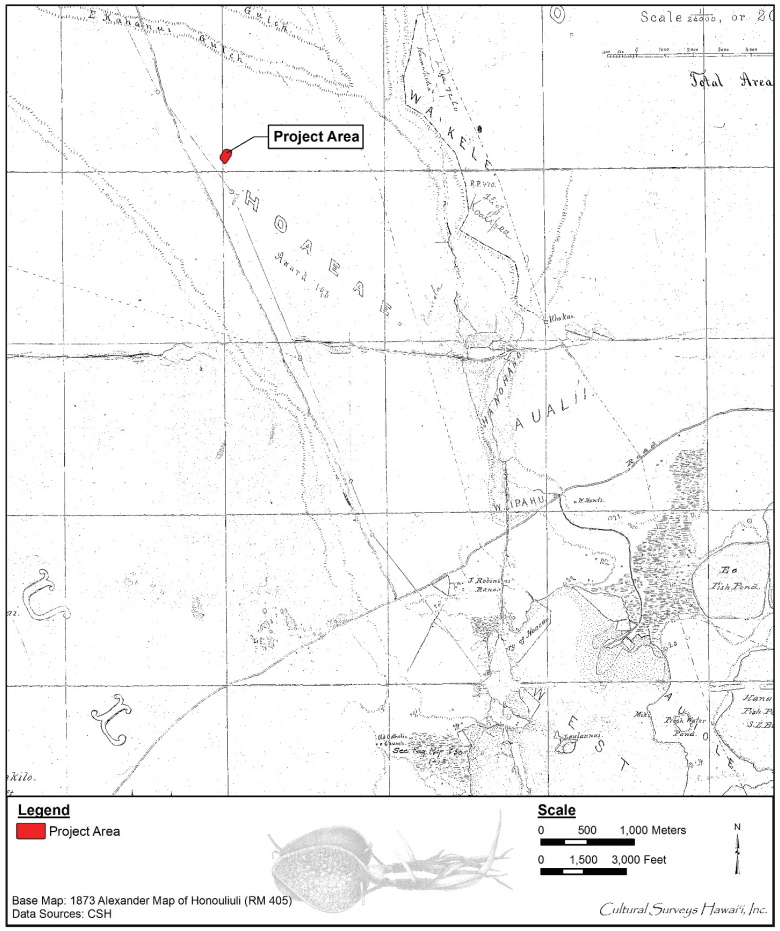

Figure 7. Portion of the 1873 Alexander map of Honouliuli showing the project area within LCA 193

3.1.6 Mid- to Late 1800s

3.1.6.1 Explorer, Missionary, and Military Surveys

The first foreign attempt to survey Pearl Harbor was made in 1840 during the U.S. Exploring Expedition led by Charles Wilkes. He described the area as follows:

> In this district is a large inlet of the sea, into which the river Ewa empties; at the entrance of this inlet is the village of Laeloa (at Kalaeloa Pont): the shore is known by the name of Pearl River or harbour, from the circumstance that the pearl oyster is found here; and it is the only place in these islands where it occurs. The inlet has somewhat the appearance of a lagoon that has been partly filled up by alluvial deposits. At the request of the king, we made a survey of it: the depth of water at its mouth was found to be only fifteen feet; but after passing this coral bar, which is four hundred feet wide, the depth of water becomes ample for large ships, and the basin is sufficiently extensive to accommodate any number of vessels. If the water upon the bar should be deepened, which I doubt not can be effected, it would afford the best and most capacious harbour in the Pacific. [Wilkes 1970:79]

In 1873, General Schofield presented a confidential report to the U.S. Secretary of War, recommending that Pearl Harbor should be available to the U.S. Navy. Schofield wrote the following:

> In case it should become the policy of the Government of the United States to obtain the possession of this harbor for naval purposes, jurisdiction over all the waters of Pearl River with the adjacent shores to the distance of 4 miles from any anchorage should be ceded to the United States by the Hawaiian Government . . .
>
> The cession of Pearl River could probably be obtained by the United States in consideration of the repeal of the duty of Sandwich Island sugar. Indeed, the sugar-planters are so anxious for a reciprocity treaty, or so anxious rather for free trade in sugar with the United States, that many of them openly proclaim themselves in favor of annexation of these islands of the United States. [Sen. Ex. Docs, 52nd Cong. 2nd Sess. No. 77:150–154, reproduced in Judd 1971:Appendix 3]

This reciprocity treaty was concluded in 1876, with the provision that Hawai‘i would not “lease or relinquish sovereignty to another country or any harbor, etc.” In 1887, the treaty was renewed and amended to allow the United States the “exclusive right to enter the harbor of Pearl River, in the Island of Oahu, to establish and to maintain there a coaling and repair station for the use of vessels of the United States” (Judd 1971:128).

3.1.6.2 Plantation Ranching, Agriculture, Irrigation, and the Railroad in the Late 1800s

Benjamin Dillingham envisioned a great land colonization scheme that included a railroad along the west and north coasts of O‘ahu. With Samuel Allen, James Castle, Robert Lewers, John Paty, and Mark Robinson, Dillingham organized the Oahu Railway and Land Company (OR&L), chartered in 1889. The railroad connected the outlying areas of O‘ahu to Honolulu. By 1890, the railroad reached from Honolulu to Pearl City and continued on to Waianae in 1895, to Waialua in 1898, and to Kahuku in 1899 (Kuykendall 1967:99–100). To attract business to his new railroad system, Dillingham subleased all land below 200 ft elevation to William Castle, who in turn sublet

the area to the Ewa Plantation Company for sugarcane cultivation (Frierson 1972:15). Dillingham’s lands above 200 ft elevation that were suitable for sugarcane cultivation, including the project area, were sublet to the Oahu Sugar Company.

The Oahu Sugar Company was incorporated in 1897 and included lands in the foothills and central valley of O‘ahu above the ‘Ewa plain and Pearl Harbor. The 12,000 acres of land were leased from the estates of ‘Ī‘ī, Bishop, and Robinson and had over 900 field workers composed of 44 Hawaiians, 473 Japanese, 399 Chinese, and 57 Portuguese. The sprawling plantation “covered some 20 square miles . . . ranging in elevation from 10 feet at the Waipio Peninsula . . .to 700 feet at the Waiāhole Ditch” (Condé and Best 1973:313). Prior to commercial sugar cultivation, the lands occupied by the Oahu Sugar Company were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiahole Water project” (Condé and Best 1973:313). From 1890 to 1892 the Ranch Department of the OR&L desperately sought water for their herds of cattle by tapping plantation irrigation flumes and searching for alternative sources of water. Water to irrigate the *mauka* cane fields was initially pumped to elevations of 500 ft by some of the “largest steam pumps ever manufactured” (Dorrance and Morgan 2000:49).

3.1.7 1900s

In Hō‘ae‘ae and Honouliuli, the cultivation of sisal (*Agavacea*) for high quality rope fiber was attempted on arid lands, although no evidence suggests this enterprise or similar efforts to grow pineapple affected the project area in any way. Thrum’s *Hawaiian Almanac and Annual* speaks of the prospect of sisal cultivation glowingly from 1904 to 1912, but the greater profits to be made from sugarcane cultivation eventually led to the decline of this industry. Upper Hō‘ae‘ae seems to have been the focus of sisal cultivation by the Hawaiian Fiber Company as shown in excerpts from Thrum’s 1909 (Thrum 1908:167) and 1913 (Thrum 1912:171) annuals.

Further, a Japanese pineapple growers’ enterprise, the Waipio Pineapple Company, was founded in 1908, leasing approximately 808 acres in portions of Kīpapa Gulch (Kimura 1988:103). In 1917, Libby, McNeill & Libby took over Waipio Pineapple Company’s leases and continued to cultivate pineapple in the area (Hawkins 2011:122). By the late 1920s, James Dole’s Hawaiian Pineapple Company, incorporated in 1901, was cultivating pineapple on thousands of acres leased from the ‘Ī‘ī estate in the *mauka* area of Waipi‘o.

Besides sisal, cotton, and pineapple, other crops were grown in central ‘Ewa. One such crop was macadamia nut:

> At Hoaeae, in the Ewa district, is another tract of about six acres on the Robinson estate, reported to be in fine condition . . . Mr. Grant Bailey, manager of the Hoaeae Ranch, kindly furnishes the following data on the infant industry . . . ‘Our planting is about six acres. Apparently one would have to wait about ten years before expecting commercial results on the planting. Our oldest trees are seven years old and they are just now beginning to bear.’ [Thrum 1927:96]

Many irrigated crops such as pineapple, coffee, and macadamia nuts were grown for export markets; however, sugar became the king of crops, and fields of sugarcane dominated the landscapes of Hawai‘i from the 1880s through the 1980s. For much of that century, sugar was the single greatest force at work in Hawai‘i—not only economically and politically but socially and environmentally.

The Donn map of 1906 (Figure 8) shows the project area within the extensive Oahu Plantation sugar cultivation lands. The traditional *mauka-makai* trail on the Honouliuli/Hō‘ae‘ae boundary (see Figure 6) is now shown as an unimproved road, but no other development is indicated in the vicinity.

Sugar production at the Oahu Sugar Company, which included the land within the current project area, increased from 29,983 tons in 1915 to 50,005 tons in 1918. The expense of pumping water to the high elevations of the plantation led to the proposal to transport water from the windward side of the Ko‘olau Mountains. The subsidiary Waiahole Water Company was formed in 1913 to dig a tunnel through the Ko‘olau range to transport runoff from the eastern side of the mountains. The Waiāhole Ditch was built to pass through Hō‘ae‘ae, immediately to the north of the project area, bringing water via an interconnected network of irrigation flumes (Figure 9). Figure 10 and Figure 11 show workers at the Waiāhole Tunnel ca. 1916 and the Oahu Sugar Company ca. 1933. Such teams likely excavated the Waiāhole Ditch immediately north of the present project area.

Subsequent maps show the project area surrounded by sugarcane infrastructure, including roads/trails, ditches, reservoirs, and railroads (Figure 12 through Figure 18). The 1919 U.S. Army fire control map (see Figure 12) indicates sugarcane cultivation south of the current project area, however, it is not clear if the project area itself is yet under cultivation at this point. The 1919 map shows small plantation reservoirs immediately southwest and northeast of the project area but these appear different than the bracketing reservoirs subsequently depicted. It appears a ditch extended straight southeast from the Waiāhole Ditch through the northeast side of the project area to a small reservoir 800 m downslope.

A 1925 map of Oahu Sugar Company lands (see Figure 13) appears to show the project area within the north edge of Field 55, indicating it was a relatively late field (numbers range from 1 through 56), likely due to its proximity to the mill in Waipahu. This map indicates Kunia Road just to the southwest was a major *mauka* access road at the time.

The 1936 map shows the project area bracketed between two similar-sized reservoirs immediately to the southwest and north. Small plantation camps are depicted approximately 500 m to the west and south but otherwise the project area appears to be pretty much just fields and irrigation and transportation infrastructure. The 1943 map (see Figure 15) shows virtually the same scene.

In some ways, the 1953 USGS map (see Figure 16), is very much the same but notably the Oahu Sugar Company train tracks that have been prominent since 1919 (see Figure 12) are now gone and the network of cane haul roads is now more prominent. Another irrigation ditch system has been developed following the contour just downslope of the project area. The reservoir just to the north is no longer shown. It seems probable that the project area has been continuously in sugarcane cultivation for decades.

The 1962 aerial photograph (see Figure 17) shows the project area as completely in cane fields. Even the former reservoir just to the north is completely in cane fields. The 1969 map shows much the same scene (see Figure 18).

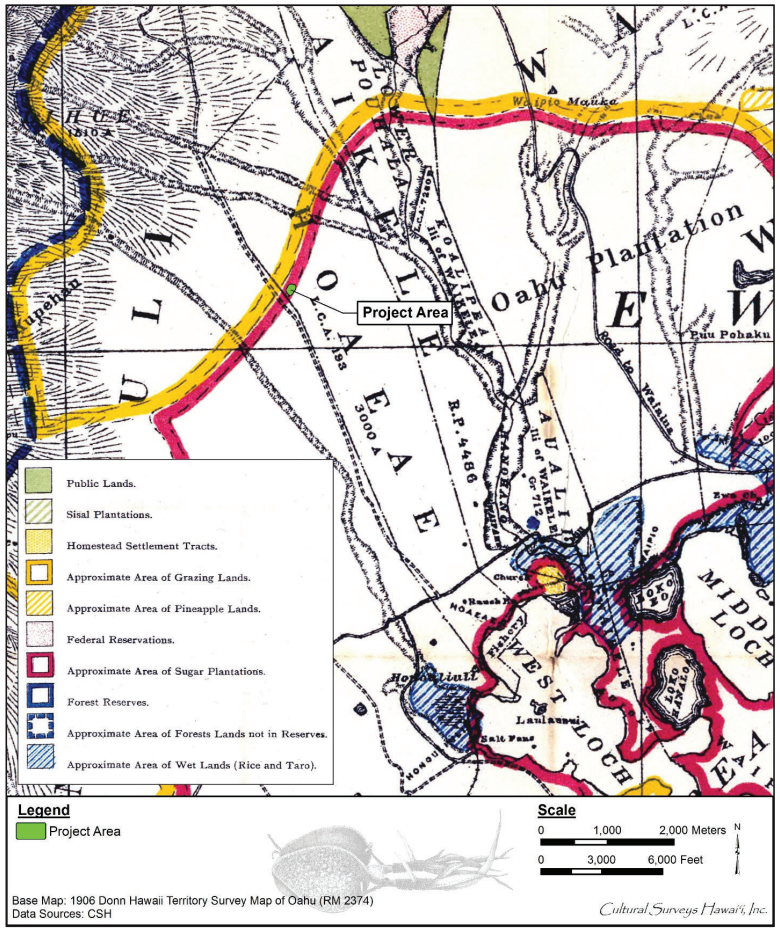

Figure 8. 1906 Donn Hawaii Territory Survey map of O‘ahu showing the project area within the Oahu Sugar Company plantation

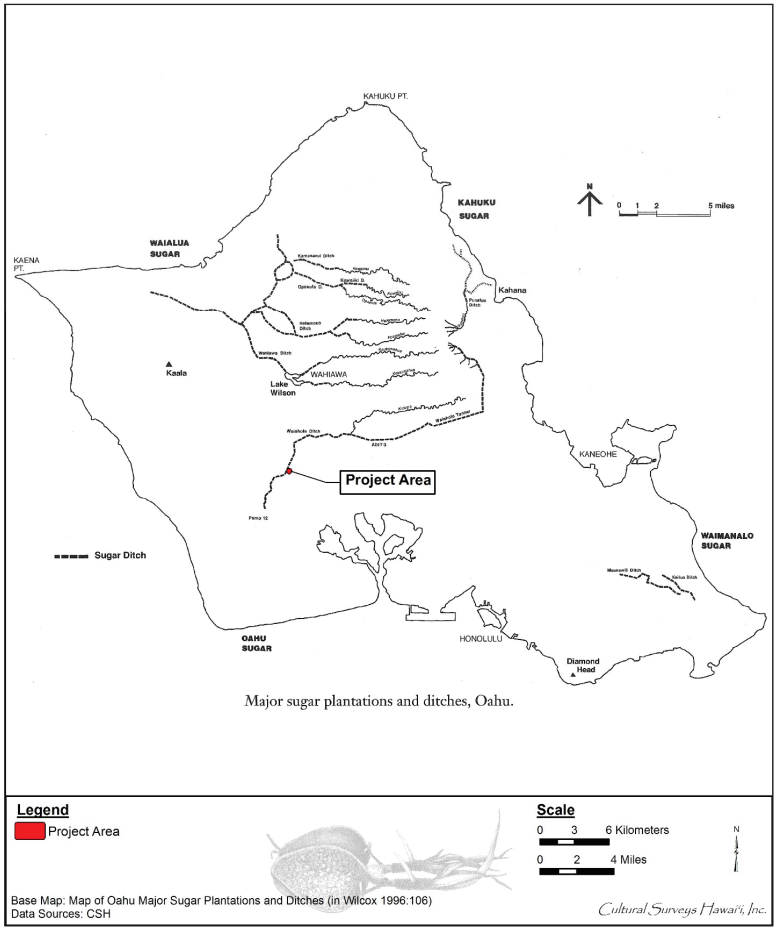

Figure 9. Map of O'ahu major sugar plantations and ditches (in Wilcox 1996:106) showing the location of the project area

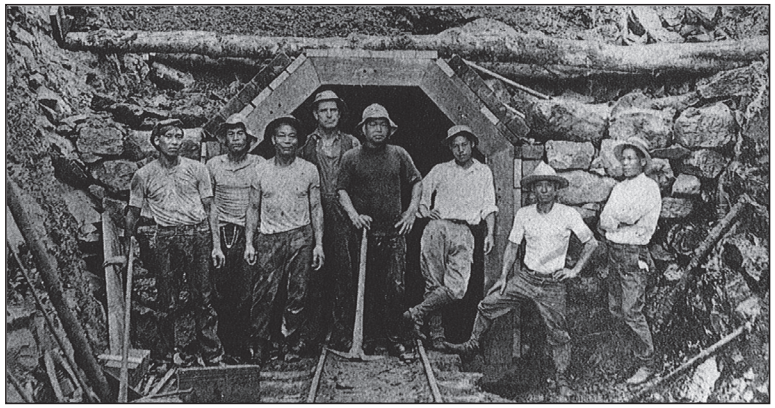

Figure 10. Workers at the Waiāhole Tunnel, ca. 1916 (Wilcox 1996:107)

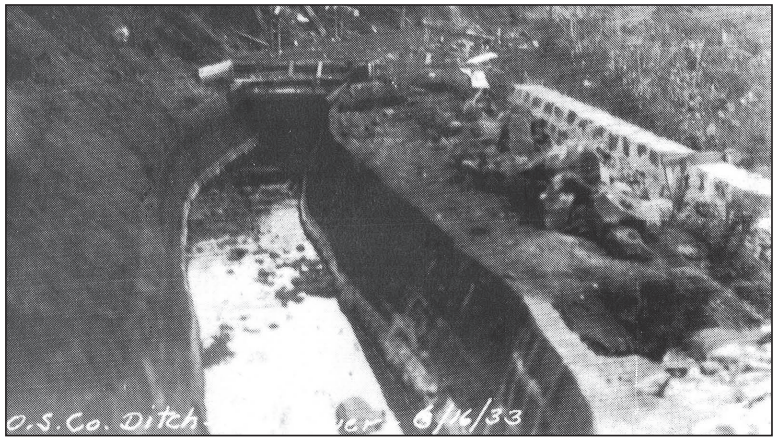

Figure 11. Oahu Sugar Company irrigation ditch under construction in 1933 at Kīpapa Gulch (Bishop Museum)

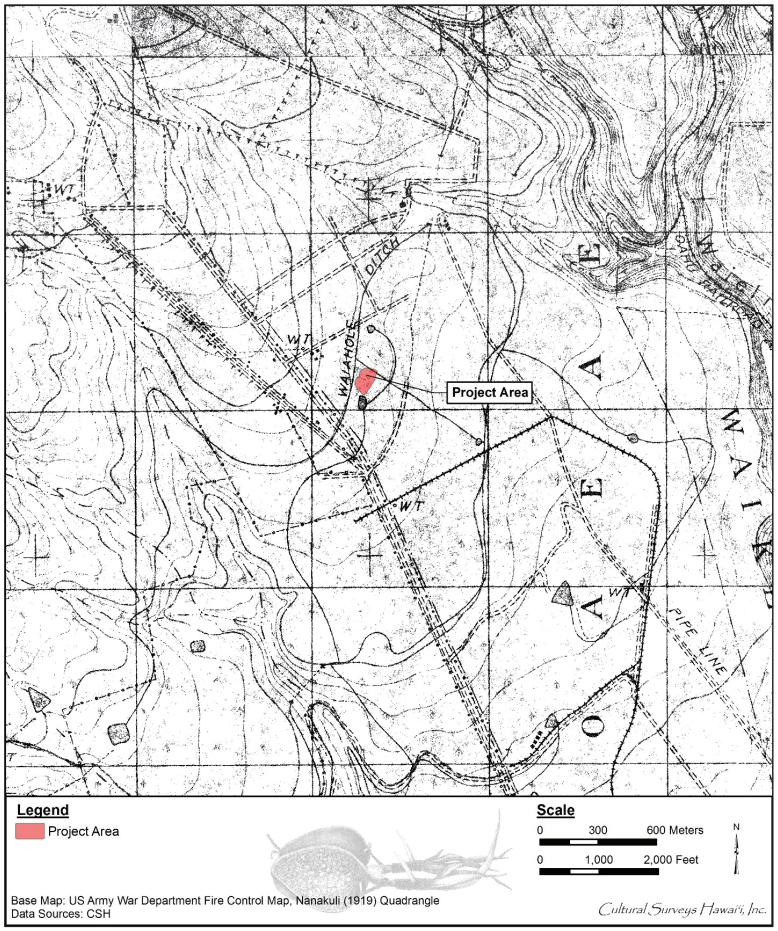

Figure 12. 1919 U.S. Army War Department fire control map indicating the project area surrounded by sugarcane cultivation and associated infrastructure

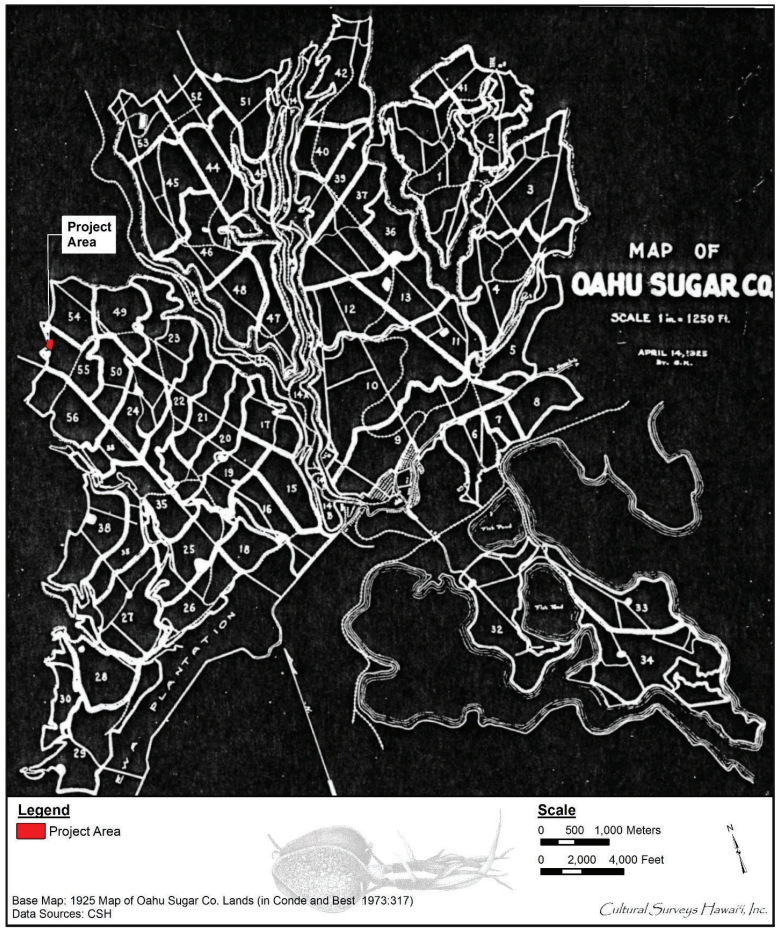

Figure 13. 1925 map of Oahu Sugar Company Lands indicating the project area within Field 55 (Condé and Best 1973:317)

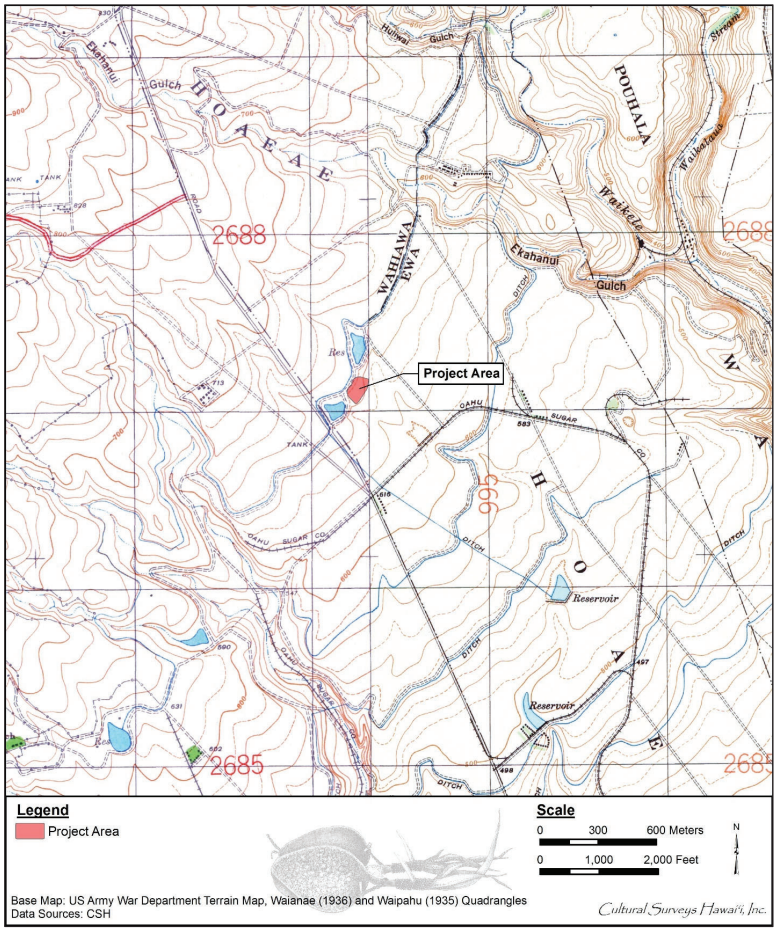

Figure 14. Portion of U.S Army War Department terrain map, Waipahu (1935) and Waianae (1936) Quadrangles, indicating the project area (ditches are depicted as blue lines, and unimproved roads are depicted as two parallel dashed lines)

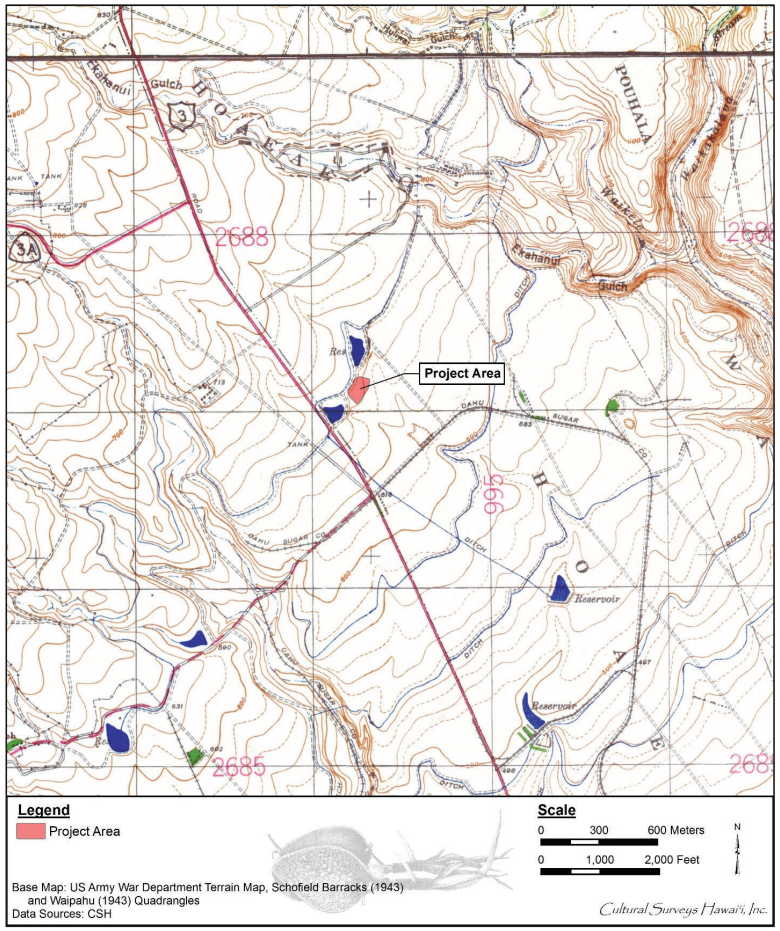

Figure 15. 1943 Portion of U.S Army War Department terrain map, Waipahu and Schofield Barracks Quadrangles, indicating the project area

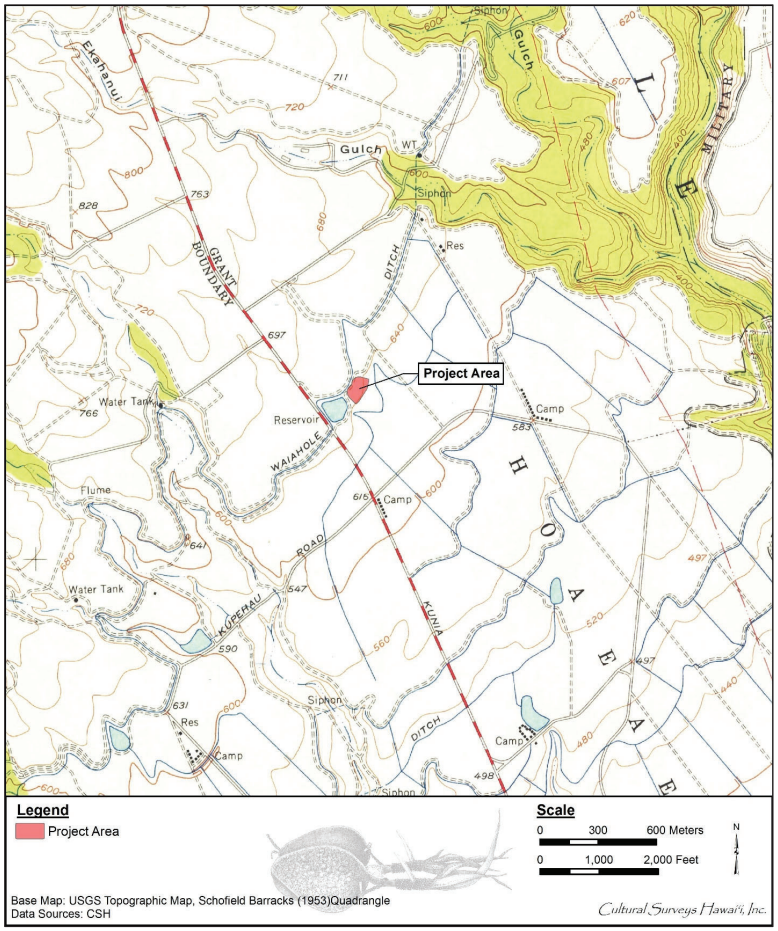

Figure 16. Portion of 1953 Schofield Barracks USGS topographic quadrangle indicating the project area

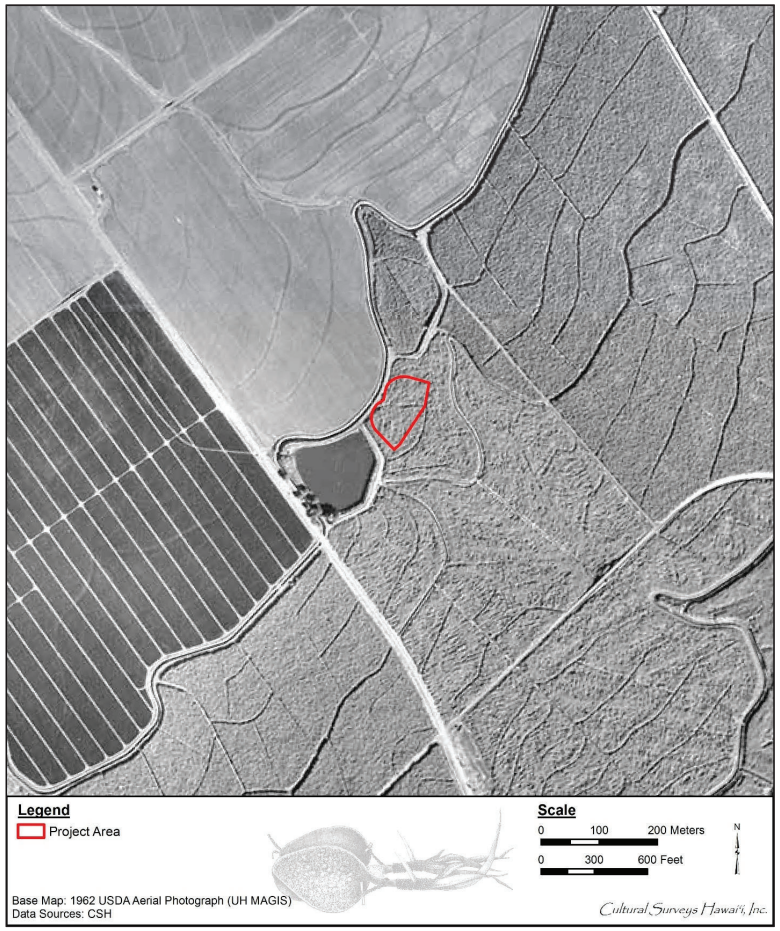

Figure 17. 1962 USDA aerial photograph (UH MAGIS) showing the project area

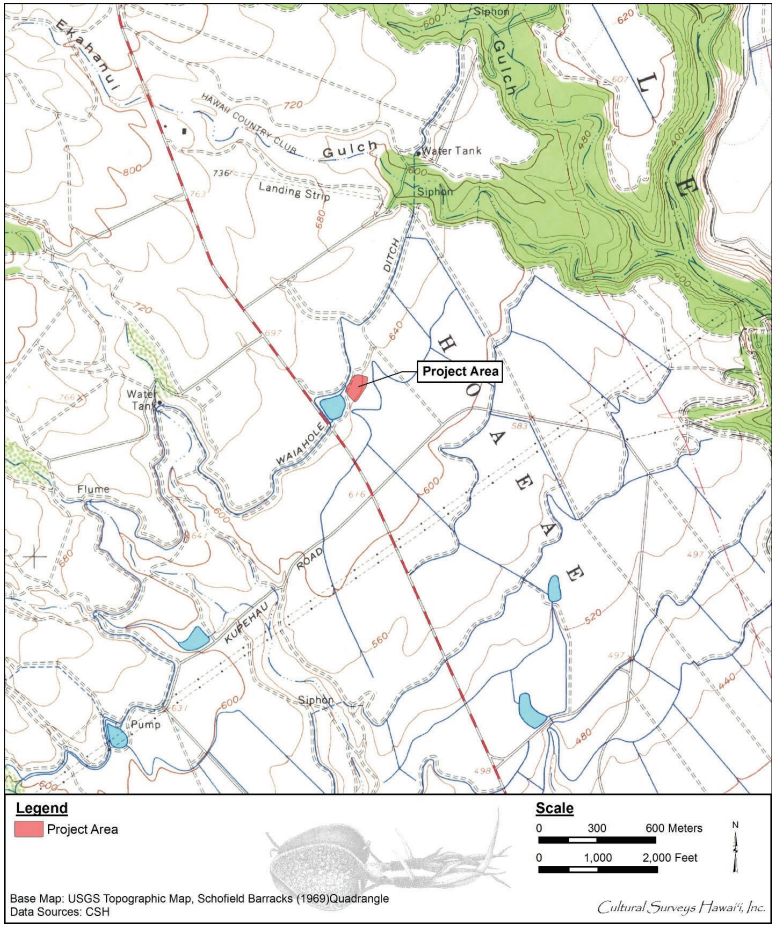

Figure 18. Portion of 1969 Schofield Barracks USGS topographic quadrangle indicating the project area

Innovation was encouraged at the Oahu Sugar Company. Mechanical loading of harvested cane began in 1924, and mechanical harvesting was introduced during World War II. A plantation railroad carried harvests to a mill at Waipahu, and the raw sugar was transported to the Honolulu docks by the OR&L, until the railroad was replaced by trucks in 1950. In 1970, when the Ewa Plantation ceased operations, much of its land was acquired by the Oahu Sugar Company, which produced some 76,925 tons of sugar from 11,526 cultivated acres in 1990. However, by 1993 both the plantation and the mill were surrounded by urban growth, and the Oahu Sugar Company closed after the 1995 harvest.

The plans for the present infrastructure of the project area are dated in early 1994 and the existing infrastructure within the project area including the 1.5 M.G. reservoir, the future 2.0 M.G. reservoir pad, instrument house, access road, perimeter fence and landscaping are all believed to date from 1994/1995. The Reservoir Grading Plan shows virtually the entire project area as within the "Limits of Grading" (Figure 19). A Reservoir Cross Section figure indicates that the "Finished Grade" was planned to typically be well below the "existing grade" (prior to the grading of the project area). This indication of mass grading is consistent with field observations.

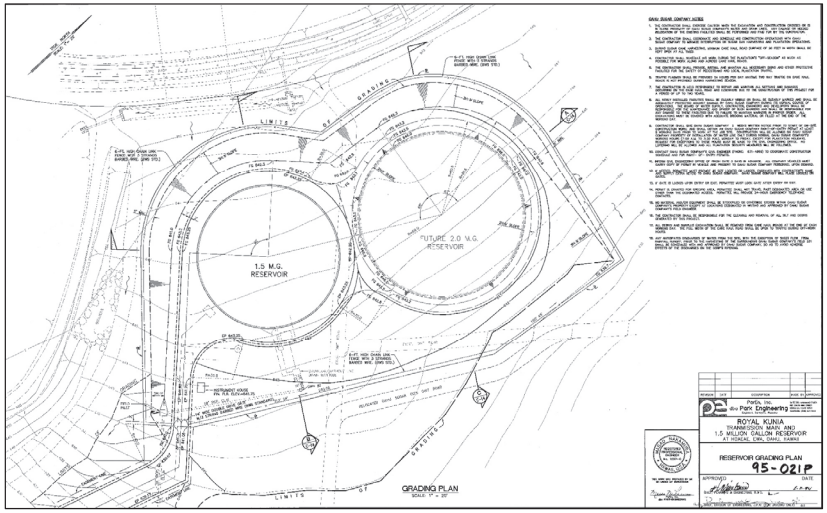

Figure 19. "Reservoir Grading Plan" (supplied by client) for the reservoir development dated 1994 showing that virtually the entire project area was within the "Limits of Grading"

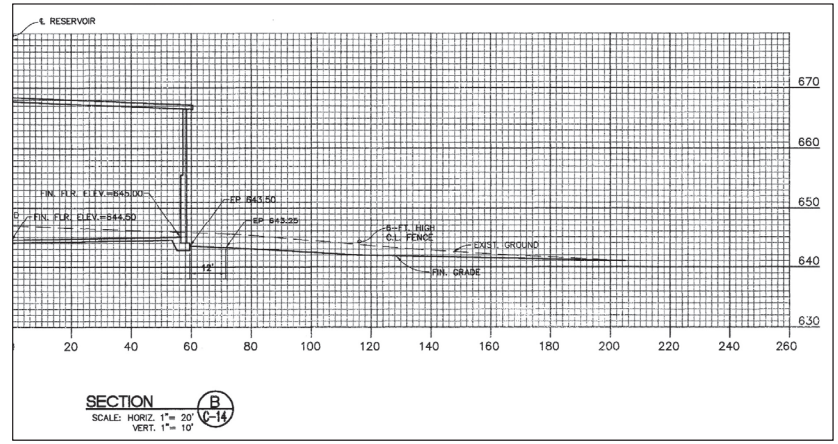

Figure 20. Portion of "Reservoir Cross Sections" figure (figure supplied by client) dated 1994 indicating significant grading (the dashed "EXIST[ING] GROUND" is depicted as well above the lower solid line "FIN.[ISHED] GRADE" surface prior to the grading

Section 4 Previous Archaeological Research

While the southwest corner of the island of O‘ahu has been subjected to many archaeological studies, none have been located within or immediately adjacent to the current project. The following discussion focuses on previous archaeological projects in Hō‘ae‘ae Ahupua‘a and the vicinity of the project area (Figure 21 and Table 2). Historic properties in the vicinity are depicted on Figure 22 and Table 3.

4.1 McAllister’s Survey

In his island-wide survey of 1930, archaeologist J. Gilbert McAllister recorded three sites (Sites 127–129) in the vicinity of the current project, located approximately 1-1.5 km southeast of the project area (see Figure 22 and Table 3). Site 127 is Mokoula Heiau, Site 128 is Waipahu Spring, and Site 129 is Hapupu Heiau. McAllister (1933) described the sites as follows:

> Site 127. Mokoula Heiau, southwest of the main road in the village of Waipahu.
>
> The heiau has been completely destroyed for building purposes of the neighborhood. The site is at the edge of a 50-foot elevation which projects out into the present rice fields and was pointed out by Kaluawai, a *kamaaina* undoubtedly more than 100 years old.
>
> Site 128. Waipahu spring, famous in tradition as the place at which the tapa mallet appeared after having been lost in Kahuku (68, p. 41). A pump has been placed over the site.
>
> Site 129. Heiau, Waipahu, said to have been named Hapupu.
>
> The Waipahu plantation stables on the mountain side of the road across from the schoolhouse west of the town now occupy the site of the former heiau at Waikele. Nothing remains of the heiau. According to Thrum (79, 4), it was a ‘Heiaupookanaka, where the chief Hao was surprised during temple worship and slain with his priest and attendant chiefs by direction of the moi of Oahu, about 1650.’ The site was pointed out by Kapano. [McAllister 1933:106]

4.2 Modern Archaeological Studies

4.2.1 Kennedy (1987)

In 1987, Archaeological Consultants of Hawaii, Inc. reported “no above ground archaeological features [with] little chance of subsurface recovery” (Kennedy 1987:2) on a 20-acre parcel approximately 3.5 km northwest of the project area.

4.2.2 Kennedy (1988)

In 1988, Archaeological Consultants of Hawaii, Inc. (Joe Kennedy) surveyed the land associated with the Royal Kunia Phase II subdivision, located about 1.5 km south of the current project. The 670-acre survey was conducted by “a two man survey team [that] covered the area by automobile along the network of cane haul roads and by foot in the few areas where this was necessary. Visibility was limited by the dense stands of sugarcane” (Kennedy 1988:1). No archaeological sites were identified.

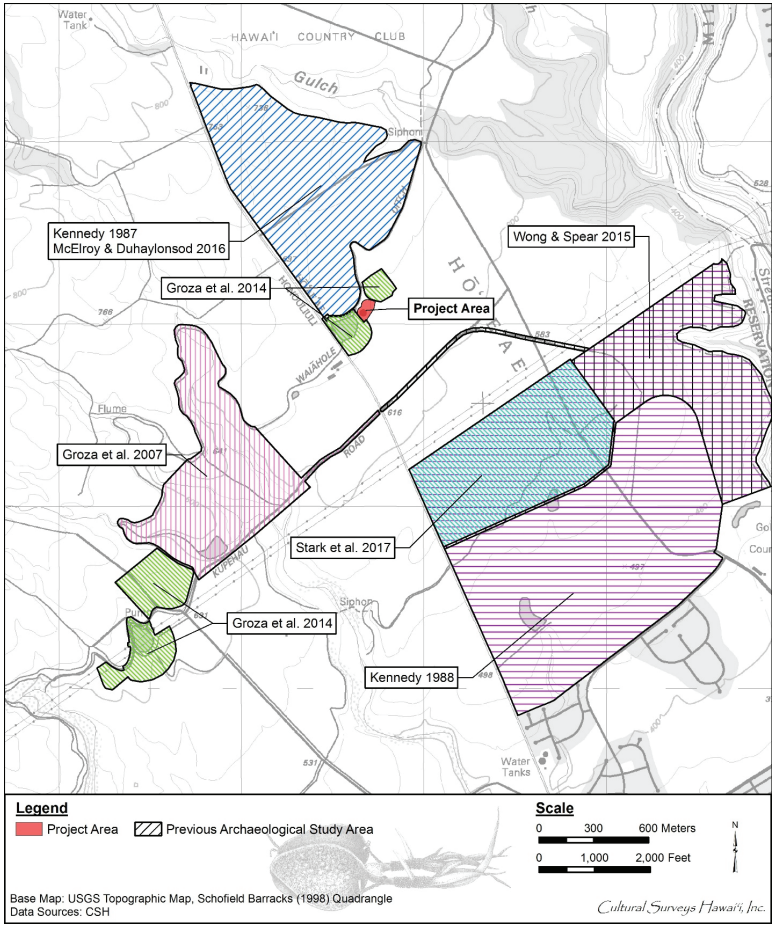

Figure 21. Map showing the locations of previous archaeological studies within the vicinity of the project area

Table 2. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results
McAllister 1933	Archaeological reconnaissance survey	Island of O‘ahu	McAllister Sites 127 (Mokoula Heiau), 128 (Waipahu Spring), and 129 (Hapupu Heiau) in the vicinity of the project area
Kennedy 1987	Archaeological reconnaissance survey	Hō‘ae‘ae, TMK: [1] 9-4-004	No above ground archaeological features noted, “and little chance for subsurface recovery” (Kennedy 1987:2)
Kennedy 1988	Archaeological reconnaissance survey	Royal Kunia, Phase II, TMK: [1] 9-4-002:001	No historic properties were observed.
Groza et al. 2007	Archaeological inventory survey	Mauka Detention Basin located west of Kunia Rd, TMK: [1] 9-2-001:001	All sites identified (SIHP #s 50-80-06-2268, -6892, -6893, and -6894) associated with water control, Waiāhole Ditch, and/or Oahu Sugar Co.
Groza et al. 2014	Archaeological inventory survey	Waiāhole Ditch, Honouliuli and Hō‘ae‘ae Ahupua‘a, TMKs: [1] 9-2-001:001; 9-4-003:001	Identified 25 sub-features of Waiāhole Ditch (SIHP # 50-80-09-2268) within project area
Wong, and Spear 2015	Archaeological inventory survey	For a 161-acre Ho‘ohana Solar Farm Project in Kunia, Hō‘ae‘ae and Waikele *ahupua‘a*, [TMK: (1) 9-4-002:052.	A historic road complex, was newly described (SIHP # 50-80-08-7671) including three features: Feature 1, an alignment, Feature 2, a wall, and Feature 3, paved segments relating to the plantation-era (pre-dating 1927)
McElroy, and Duhaylonsod 2016	Archaeological inventory survey	For **a** 203.2 acre New Hope Network Development in Kunia, Hō‘ae‘ae Ahupua‘a, ‘TMK: (1) 9-4-004:009.	The project area was the same as the Kennedy 1987 study area. No historic properties were observed.
Stark et al. 2017	Archaeological inventory survey	150-acre (60.7- hectare) Kunia Agricultural Park project, Hō‘ae‘ae Ahupua‘a, TMK: [1] 9-4-002:080	Identified SIHP # 50-80-08-7758 including five features pertaining to agricultural activity, specifically related to the Oahu Sugar Co.

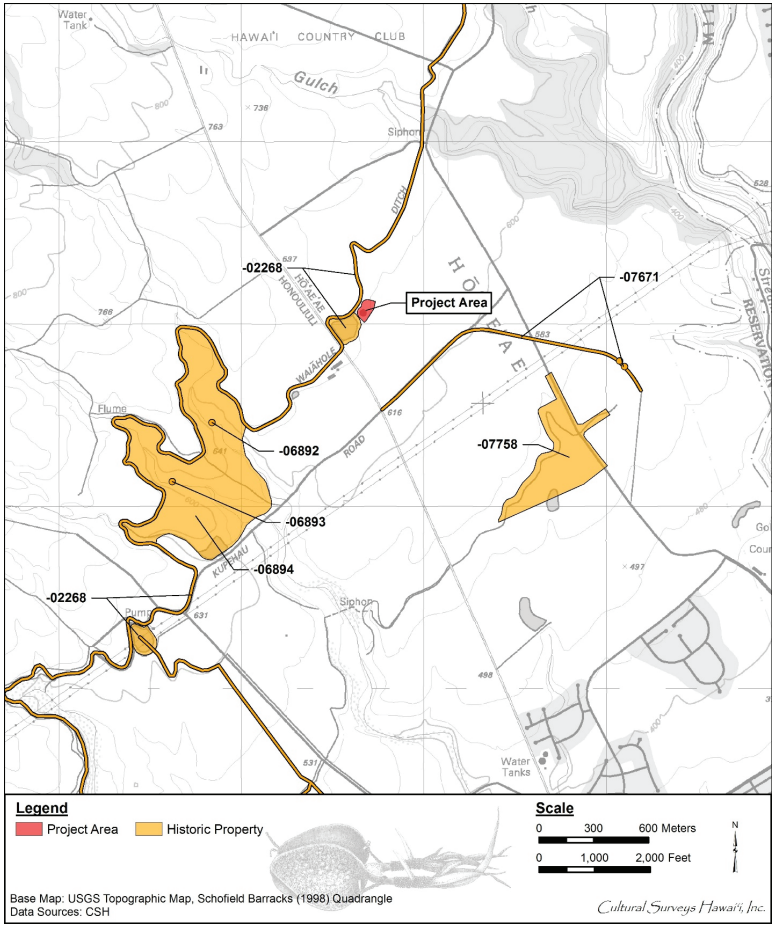

Figure 22. Previously identified archaeological sites located within the vicinity of the project area

Table 3. Previously identified historic properties in the vicinity of the project area

SIHP # (50-80-)	Nature of Site	Source	Comment
06-6892	Historic bridge	Groza et al. 2007	Plantation-era (1929) rectangular bridge with wall that crosses one of the intermittent tributaries of Honouliuli Stream
06-6893	Historic bridge	Groza et al. 2007	Plantation-era (1929) rectangular bridge with wall that crosses one of the intermittent tributaries of Honouliuli Stream
06-6894	Plantation agricultural complex	Groza et al. 2007	Post-Contact
08-7671	A historic road complex, including three features: Feature 1, an alignment, Feature 2, a wall, and Feature 3, paved segments	Wong, and Spear 2015	Plantation-era (pre-dating 1927)
08-7758	Five features of one site pertaining to agricultural activity, specifically related to Oahu Sugar Co.	Stark et al. 2015	Plantation-era
09-2268	Improved irrigation ditch (Waiāhole Ditch)	Dega et al. 1998	Post-Contact

4.2.3 Groza et al. 2007

In 2007, CSH completed an inventory survey for the Ho‘opili project, Mauka Detention Basin, in Honouliuli Ahupua‘a (Groza et al. 2007). During the project, the entirety of the 143-acre Mauka Detention Basin was surveyed on foot. The pedestrian survey revealed several sites (SIHP #s 50-80-09-2268, 50-80-06-6892, -6893, and -6894), one of which consisted of 31 features. All sites identified were associated with water control, the Waiāhole Ditch, and/or the Oahu Sugar Company.

4.2.4 Groza et al. 2014

In 2013, CSH conducted an inventory survey for the Waiāhole Reservoir System, located about 3.5 km northwest of the current project (Groza et al. 2014). Twenty-five sub-features of the Waiāhole Ditch (SIHP # 50-80-09-2268) were identified within the project area. Fifteen of the sub-features are associated with Reservoir 155, and eight of the sub-features are associated with Reservoir 225. Reservoirs 155 and 225 are features of the Waiāhole Ditch Irrigation System.

4.2.5 Wong and Spear 2015

Scientific Consultant Services, Inc. (SCS, Wong, and Spear 2015) reported o*n* an archaeological inventory survey for a Ho‘ohana Solar Farm Project in Kunia, Waikele Ahupua‘a,

[TMK: (1) 9-4-002:052. Their project area was primarily a 161-acre project area in Waikele, on the west side of Waikele Stream gulch, but included two corridors extending west to Kunia Road. One historic property, a historic road complex, was newly described (SIHP # 50-80-08-7671) including three features: Feature 1, an alignment, Feature 2, a wall, and Feature 3, paved segments. The alignment and wall features are 1.2 kilometers to the southeast. The Feature 3, paved segments associated with a plantation road and former railway route predating 1927 are depicted as extending within approximately 400m to the southeast of the present project area along Kupehau Road. Seven railroad spikes were reported along the SIHP # -7671 Feature 3 corridor (from the central portion) and three traditional Hawaiian artifacts (a basalt adze preform and two basalt flakes with polished facets) were reported on the surface of a plantation road in the southern portion of their project area.

4.2.6 McElroy, and Duhaylonsod 2016

Keala Pono Archaeological Consulting LLC (McElroy, and Duhaylonsod 2016) reported on an archaeological inventory survey (called an archaeological assessment in the absence of finds) for a 203.2 acre project area proposed for New Hope Network development of a community center integrated with agricultural use in Kunia, Hō‘ae‘ae Ahupua‘a, ‘TMK: (1) 9-4-004:009. The project area was the same as the Kennedy 1987 study area. Fieldwork included pewdestrian inspection and test excavation of eight trenches. It was noted that the entire project area had been disturbed by previous and current agricultural use. No historic properties were observed and no further work was recommended.

4.2.7 Stark et al. 2017

CSH (Stark et al. 2015) produced an archaeological inventory **s**urvey for a 150-acre (60.7-hectare) Kunia Agricultural Park project, Hō‘ae‘ae Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-4-002:080. The project area is located immediately to the east of Kunia Road, surrounded by large agricultural lots managed by Waileke Farms, with the Royal Kunia residential community to the south and Kupehau Road to the north. One SIHP # was designated. SIHP # 50-80-08-7758 consists of five features of one site pertaining to agricultural activity, specifically related to the Oahu Sugar Company. Each feature (1–5) represents an activity area relating to contemporaneous agricultural activity. Feature 1 is a retaining wall (linear); Feature 2 and Feature 3 are portions of a historic irrigation ditch (linear); Feature 4 is the structural remnant of a headworks feature connecting Feature 2 and Feature 3; Feature 5 is a historic lithic workshop relating to the production of faced basalt boulders observed in Features 1–4.

Section 5 Results of Fieldwork

CSH archaeologist David Shideler, M.A. conducted an archaeological field inspection of the project area on 20 June 2018 under the general supervision of Principal Investigator Hallett Hammatt, Ph.D. First the perimeter of the project area was examined generally from the south corner clockwise. An archaeologist’s track log at the Kunia Wells IV Exploratory Wells project area is shown in Figure 23. General views are presented from the south corner (Figure 24), west corner (Figure 25), near the northwest corner (Figure 26), and from the northeast corner (Figure 27). The project area is quite open with short grass and a few exotic autograph trees (*Clusia rosea*) and eucalypt trees (*Eucalyptus* species) for landscaping.

A matter of interest was the relationship of the project area to the Waiāhole Ditch. The Waiāhole Ditch runs as an open, concrete-lined ditch from northeast to southwest approximately 15 m northwest of the project area (Figure 28). The present project area is separated from the Waiāhole Ditch by (from southeast to northwest) the perimeter fence line around the Kunia 665 Reservoir project area, a pedestrian access path, a strip of tall grass, an unimproved dirt access road, and scrub vegetation on the southeast side of the Waiāhole Ditch (Figure 29). It was concluded that development within the chain link fenced enclosure of the project area would have no adverse impact on the Waiāhole Ditch to the northwest or to Reservoir 225 to the southwest.

A water control and plantation irrigation system feature (Figure 30) composed of concrete and dressed basalt blocks was observed just northwest (outside) of central project area. It was concluded that development within the chain link fenced enclosure of the project area would have no adverse impact on the irrigation system feature outside the project area.

On the northeast side of the short access road within the project area enclosure is a small “instrument house” control building of concrete masonry unit (CMU) construction (Figure 31). The majority of the southwest half of the project area is occupied by a large Kunia 665 1.5 M.G. reservoir tank (Figure 32 through Figure 35). The majority of the northeast half of the project area is taken up with a circular future platform, clearly constructed to potentially support a similar (2.0 M.G.) reservoir tank (see Figure 33 through Figure 35). It appears no tank was ever built on this northeastern pad. There is a slight circular depression around this northeastern tank pad which may have been deliberately constructed or may have been an artifact of the excavation of sediment to create the raised circular tank platform.

The field inspection verified the 1994 plans for the project area that the entire project area was subject to mass grading (see Figure 19 and Figure 20). The field inspection identified no historic properties and concluded none were likely to be present.

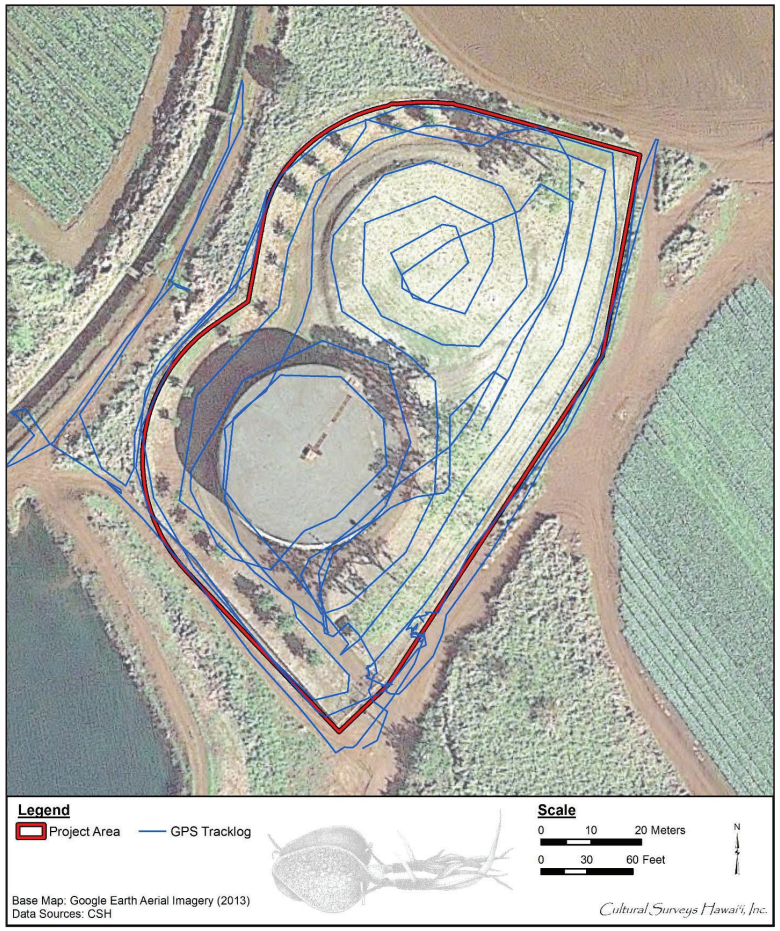

Figure 23. Archaeologist’s track log at the Kunia Wells IV Exploratory Wells project area

Figure 24. General view of project area from near the south corner, view to north

Figure 25. General view of project area from near the west corner, view to east

Figure 26. General view of project area from near the northwest corner, view to south

Figure 27. General view of project area from the northeast corner, view to southwest

Figure 28. General view of Waiāhole Ditch, approximately 15 m northwest of the project area, view to northeast

Figure 29. General view of unimproved road on northwest side of the project area, Waiāhole Ditch is at left with project area at upper right, view to northeast

Figure 30. Water control feature just northwest (outside) of central project area, view to southeast

Figure 31. Small cinder block “instrument house” control building in south corner of project area on northeast side of the access driveway, view to southeast

Figure 32. General view of Kunia 665 1.5 M.G. reservoir tank from access driveway, view to north

Figure 33. View of 2.0 M.G reservoir tank pad and northeast portion of the project area, view to northeast

Figure 34. View of *mauka* (northwest) side of 2.0 M.G reservoir pad and central project area, Kunia 665 reservoir tank in background, view to southwest

Figure 35. View of northeast portion of project area, 2.0 M.G reservoir pad at center, view to southwest

Section 6 Summary and Recommendations

6.1 Summary

A review and evaluation of the cultural history of the project area (including surrounding sugarcane cultivation infrastructure), results of previous archaeological studies in the vicinity, and results of fieldwork as documented in this study leads to the conclusion that the prospect of historic properties within the project area is very low.

The project area is far from the coast (6 km inland, northwest from the West Loch of Pearl Harbor), and far from any known traditional sources of potable water. The eastern Honouliuli Stream drainage, which is believed to hold water during rainy periods, is approximately 1.0 km to the west. Rainfall is low on gently ascending plateau lands of the southern central valley of O‘ahu. Annual rainfall in the immediate project area is estimated at 764 mm or 30.1 inches (Giambelluca et al. 2013). This rainfall would be marginal at best for non-irrigated agriculture.

There was a major traditional Hawaiian trail (close to today’s Kunia Road) approximately 200 m southwest of the present project area but travelers would have had little reason to pause in this vicinity. There were no unique landforms or storied places (*wahi pana*) as would have invited travelers to linger.

Throughout the nineteenth century the project vicinity is believed to have been low intensity ranching lands. The Oahu Plantation and subsequent Oahu Sugar Company (incorporated in 1897) transformed the landscape in the vicinity of the project area with seas of sugarcane fields being expanded inland. It is unclear if the project area was in sugarcane cultivation in 1906 (see Figure 8) but it almost certainly was by 1919, by which time the Waiāhole Ditch was established 15 m northwest of the present project area carrying windward water across the central valley (see Figure 12). By 1925, the project area was part of Field 55 (see Figure 13). While sugarcane infrastructure—including reservoirs, ditches, roads, railroads, and plantation camps—was developed within a kilometer of the project area, none of these were developed in the project area. There is reason to believe the project area was in cultivation from roughly 1919 to 1969 (see Figure 13 through Figure 18). The 1962 aerial (see Figure 17) clearly shows the project area in a sea of sugarcane.

Prior archaeological studies in the vicinity have identified no traditional Hawaiian historic properties. Some historic properties relating to twentieth century commercial sugar cultivation have been identified.

The field inspection identified no historic properties and concluded none were likely to be present.

6.2 Recommendations

The results of the background research and field inspection for this Kunia Wells IV Exploratory Wells project would be consistent with and support a City and County determination (as per HAR §13-275-7[a][1]) of “No historic properties affected.” The project will have no effect on significant historic properties. Thus, no further archaeological work is indicated for this project.

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Appendix D

Cultural Assessment for the Kunia Wells IV Exploratory Project

Final

Cultural Assessment for the Kunia Wells IV Exploratory Wells Project, Hōʻaeʻae Ahupuaʻa, ʻEwa District, Oʻahu TMK: [1] 9-4-003:010

Prepared for
Belt Collins Hawaii LLC
on behalf of the
City and County of Honolulu Board of Water Supply

Prepared by
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Management Summary

Reference	Cultural Assessment for the Kunia Wells IV Exploratory Wells Project, Hōʻaeʻae Ahupuaʻa, ʻEwa District, Oʻahu, TMK: [1] 9-4-003:010 (Nielsen and Hammatt 2018)
Date	October 2018
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: HOAEAE 5
Agencies	City and County of Honolulu Board of Water Supply (BWS), SHPD
Land Jurisdiction	BWS
Project Proponent	BWS
Project Funding	BWS
Project Location	The project area is approximately 200 m northeast of Kunia Road at 660 feet (ft) elevation in Hōʻaeʻae Ahupuaʻa, ʻEwa District, south central Oʻahu, TMK: [1] 9-4-003:010. An open reservoir (Reservoir 225) lies between the project area and Kunia Road to the west. The project area is depicted on a portion of the 1998 Schofield Barracks U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.
Project Description	The proposed project involves drilling a series of exploratory water wells (approximately four) within the project area. This is anticipated to involve a drill rig being moved within the project area.
Project Acreage	81,387 square (sq) ft (1.87 acres or 0.76 hectare)
Document Purpose	This document is intended to facilitate the project's planning and support the project's environmental review compliance. This investigation does not fulfill the requirements of a cultural impact assessment, per the Office of Environmental Quality Control's *Guidelines for Assessing Cultural Impacts*; that is, this report does not identify or assess ongoing cultural practices within the project area. This cultural assessment was designed—through detailed historical, cultural, and archaeological background research—to determine the likelihood that cultural resources may be affected by the project and, based on findings, consider cultural resource management recommendations. Through document research only, this report provides information compiled to date of the pre- and post-Contact human environment within and around the project area. The human environment shall be interpreted comprehensively to include the natural and physical (built) environment and the relationship of people with that environment (40 CFR 1508.14). Cultural resources identified within this report may also constitute significant historic properties under State of Hawaiʻi 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). Because this study does not assess current cultural practices occurring within the project area, determination of the presence of cultural resources or cultural sites will be informed by document research only.
Results of Background Research	Background research for this project yielded the following results (presented in approximate chronological order): 1. The project area is approximately 6 km inland (northwest) from the West Loch of Pearl Harbor on gently ascending plateau lands of the southern central valley of O‘ahu. In pre-Contact Hawai‘i, the project area would have been mostly lowland dry shrub and grassland; however, natural vegetation patterns within the project area have been severely altered by at least 100 years of intensive sugarcane agriculture. 2. The project area is within the 124.8-sq-km (48-sq-mile) Waikele Stream watershed. Waikele Stream is a perennial stream with a total aggregate stream length (including nine tributary streams) of 216.8 km (134.7 miles). Waikele is translated by Pukui et al. as “muddy water” (Pukui et al. 1974:223). The non-perennial Hō‘ae‘ae Stream bounds Kalei‘opu‘u Elementary School on its west side. Hō‘ae‘ae Stream is a relatively short stream of approximately 2.5 km length that debouches into the north end of the West Loch of Pearl Harbor. 3. The Legend of Kalei‘ōpu‘u tells of how *kahuna lā‘au lapa‘au* (medicinal healers) came to Hō‘ae‘ae by canoe to harvest their medicines. Legend says that they disembarked from their canoes and sent up a chant in the style called “*ho‘āeae*.” When they chanted, a rainbow appeared allowing the plants on the hillsides to take on the colors of the rainbow. Hence the name Kalei‘opu‘u, literally translates as “lei on the hillside” (Kalei‘opu‘u Elementary School 2016). 4. Pikoi was a legendary hero, the son of a crow (*‘alalā*) and brother to five sister-*akua* (gods) who took the form of rats. He was famous for his ability to shoot arrows and often made bets that he could hit rats from a long distance (Fornander 1917:450–463). Pikoi’s skill was commemorated in a saying

	that mentions the plain of Keahumoa—a plain stretching over the uplands of Hō‘ae‘ae. 5. Hō‘ae‘ae means “to make soft or fine” (Pukui et al. 1974:47). Pukui et al. (1974) do not explain why the *ahupua‘a* (traditional land division) was given this name, but do mention there was a famous *pōhaku* (stone) called Pōhaku-Pili. Pōhaku-Pili, meaning “clinging rock,” is located on a cliff at the boundary between Hō‘ae‘ae and Waikele and is said to have belonged to the gods Kāne and Kanaloa (Pukui et. al 1974:47). Thrum (1922:632) reports that Hō‘ae‘ae means “to pulverize.” Pukui and Elbert (1986) recorded the possible meanings of Hō‘ae‘ae as “to rise the tide, to make fine, to pulverize, to refine, to soften.” ‘Ae can also mean to lend, to say yes, to consent, to approve or can also be the sap wrung from seaweed or leaves of plants such as *kalo* (taro) (Pukui and Elbert 1986). 6. In several legends of ‘Ewa, there is mention of the “plain of Keahumoa.” John Papa ‘Ī‘ī (1959:96) locates this plain opposite the trail to Pohakea Pass, stretching across the *ahupua‘a* of Honouliuli and Hō‘ae‘ae. McAllister (1933:107) states that the plain was west of Kīpapa Gulch in Waikele. The plain of Keahumoa is also mentioned in legends of Waipi‘o. Thus, this is probably a general name for the flat plain *mauka* (inland) of the productive floodplain area directly adjacent to Pearl Harbor. 7. The rich resources of the Pearl Harbor lochs, the shoreline fishponds, the numerous springs, and the irrigated lands along the streams allowed central ‘Ewa to flourish as a lively population center and were often taken by competing chiefs in pre-Contact times. Handy (1940:82) noted that Hō‘ae‘ae had “a moderate-sized area of terraces watered by springs inland from West Loch of Pearl Harbor.” 8. Several pre-Contact/early historic trails crossed ‘Ewa: a cross-*ahupua‘a* trail that traversed ‘Ewa and connected Honolulu to Wai‘anae; a *mauka-makai* (inland-seaward) trail that branched off from the cross-*ahupua‘a* trail and approximated the boundary between Honouliuli and Hō‘ae‘ae to the Pōhākea Pass and Kolekole Pass to Wai‘anae; and a second branching *mauka-makai* trail that generally followed the path of Waikele Stream in Waikele Ahupua‘a to Wahiawā in central O‘ahu (‘Ī‘ī 1959). 9. In a study of the resources and population of the *ahupua‘a* in ‘Ewa, Ross Cordy (1996:12) wrote a correlation study of three factors: floodplain size, fishery size, and population size. Hō‘ae‘ae had a small floodplain area, directly adjacent

	to the north shore of Pearl Harbor’s West Loch, and a fairly small fishery, which took up only a small portion of West Loch. Hō‘ae‘ae had the smallest population of the four *ahupua‘a* in central ‘Ewa. 10. It is through records for Land Commission Awards (LCAs) generated during the Māhele that the first specific documentation of life in Hawai‘i as it had evolved up to the mid-nineteenth century comes to light. Twenty-three land claims were made in the Hō‘ae‘ae Ahupua‘a, with 20 claims awarded to *maka‘āinana* (commoners). The bulk of these claims deal with Hō‘ae‘ae fisheries around West Loch to the south of the project area. No *kuleana* (Native land rights) LCA claims were near the present project area. 11. In Hō‘ae‘ae and Honouliuli, the cultivation of sisal (*Agavacea*) for high quality rope fiber was attempted on arid lands, although no evidence suggests this enterprise or similar efforts to grow pineapple affected the project area in any way. Thrum’s *Hawaiian Almanac and Annual* speaks of the prospect of sisal cultivation from 1904 to 1912, but the greater profits to be made from sugarcane cultivation eventually led to the decline of this industry. 12. The relatively recent advent of searchable archives such as the Library of Congress “Chronicling America” website has offered a time-efficient research tool to further explore the land use, social history, and the practices of ethnic communities at Hō‘ae‘ae Ahupua‘a. A total of 352 newspaper articles were reviewed that included the key word “Hoaeae” spanning the timeframe from January 1853 through June 1918. References to Hō‘ae‘ae were identified in 12 newspapers yielding articles related to control of access to Hō‘ae‘ae lands, hunting at Hō‘ae‘ae, diversified agriculture, the rise of the Oahu Sugar Company, and ethnicity in Hō‘ae‘ae. 13. The earliest archaeological survey of the project area and its environs was undertaken in 1930 by J. Gilbert McAllister. McAllister recorded Mokoula Heiau (Site 127), Waipahu Spring (Site 128), and Hapupu Heiau (Site 129). These sites are located approximately 1-1.5 km southeast of the project area. 14. Two modern-era archaeological studies were conducted in the vicinity of the project area. During the Kennedy (1987) archaeological reconnaissance survey, no surface archaeological features were observed. An inventory survey for the Waiāhole Reservoir System (Groza et al. 2014) identified 25 sub-features of the Waiāhole Ditch Irrigation

	System (State Inventory of Historic Places [SIHP] # 50-80-09-2268). 15. Previous oral history accounts collected by University of Hawai‘i Center for Oral History also provide key insights into land use during the early to mid-twentieth century. According to Ruth Yamaguchi, by the mid-twentieth century large portions of land around Pu‘uloa had been opened for farming. Once heavily forested with *kiawe*, many Japanese families purchased and cleared these lands for crop cultivation. Mr. Mao Asada also recalled that the Oahu Railway and Land (OR&L) railway tracks were once a prominent feature within the coastal region of Pu‘uloa. Mr. George ‘Ī‘ī Brown III recalled that sugarcane cultivation, and dairy and pig farming were mostly pursued further inland, near Waipahu.
Impacts and Recommendations	Based on the information gathered from the cultural and historic background detailed in this cultural component report, the proposed project should not have any impacts to cultural resources. Although highly unlikely, in the event that any cultural resources are encountered during construction, we recommend the following: 1. Should burials, subsurface cultural deposits, or pit caves (sinkholes) with openings greater than 1 m in diameter 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, Hawai‘i Revised Statutes (HRS) §6E. 2. In the event that *iwi kūpuna* (ancestral remains) are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the State Historic Preservation Division (SHPD) and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended. 3. In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinternment plan and/or preservation plan.

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Section 1 Introduction

1.1 Project Background

At the request of Belt Collins Hawaii LLC, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared a cultural assessment (CA) for the proposed Kunia Wells IV Exploratory Wells project, Hō‘ae‘ae Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-4-003:010. The project area is depicted on a portion of the 1998 Schofield Barracks 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 1.87-acre or 81,387-square-foot (sq ft) project area is located in the southern central valley of O‘ahu approximately 200 m northeast of Kunia Road at 660 ft elevation. An open reservoir (Reservoir 225) lies between the project area and Kunia Road to the west, and the Waiahole Ditch is located 15 m (50 ft) northwest of the project area. No portion of Reservoir 255 or Waiahole Ditch is within the project area.

The proposed project involves drilling a series of exploratory water wells (approximately four) within the project area. This is anticipated to involve a drill rig being moved within the project area.

1.2 Document Purpose

This document is intended to facilitate the project’s planning and support the project’s environmental review compliance. This investigation does not fulfill the requirements of a cultural impact assessment, per the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*; that is, this report does not identify nor assess ongoing cultural practices within the project area.

This cultural assessment was designed—through detailed historical, cultural, and archaeological background research—to determine the likelihood that cultural resources may be affected by the project and, based on findings, consider cultural resource management recommendations. Through document research only, this report provides information compiled to date of the pre- and post-Contact human environment within and around the project area. The human environment shall be interpreted comprehensively to include the natural and physical (built) environment and the relationship of people with that environment (40 CFR 1508.14).

Cultural resources identified within this report may also constitute 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). Because this study does not assess current cultural practices occurring within the project area, determination of the presence of cultural resources or cultural sites will be informed by document research only.

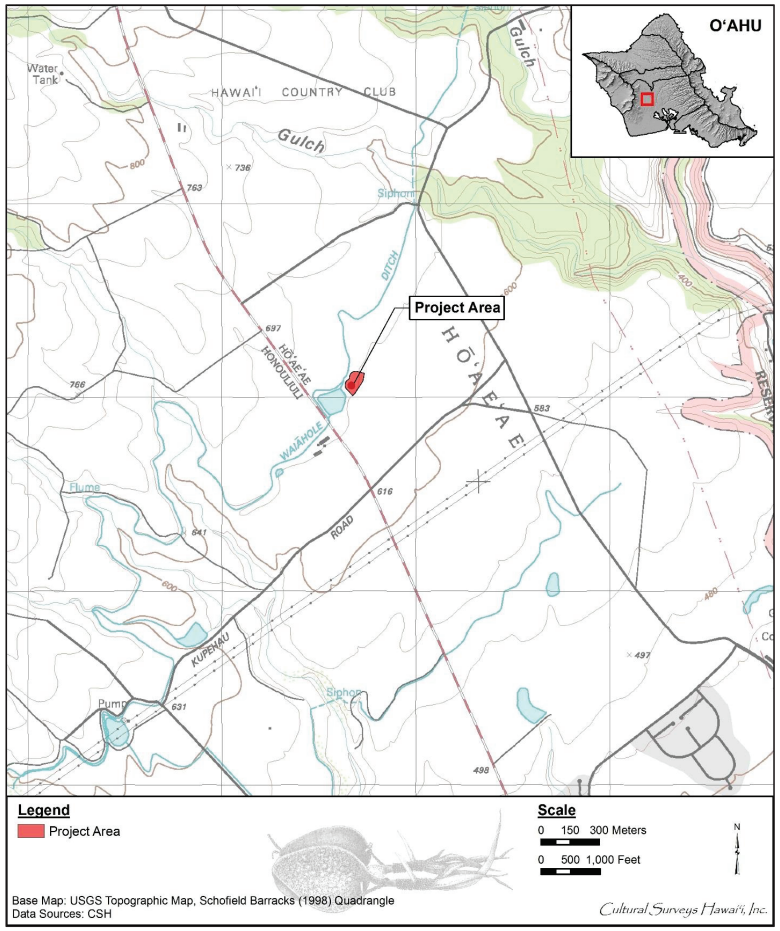

Figure 1. Portion of the 1998 Schofield Barracks USGS 7.5-minute topographic quadrangle showing the location of the project area

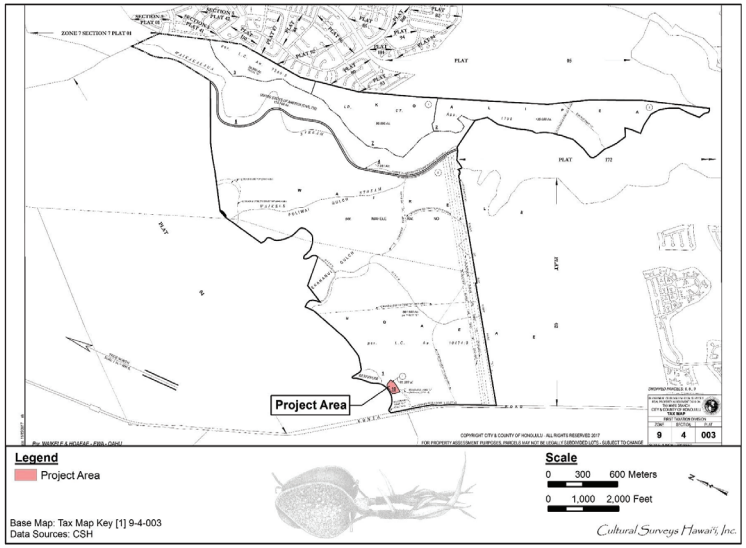

Figure 2. Tax Map Key (TMK) [1] 9-4-003 showing the project area (Hawai‘i TMK Service 2014)

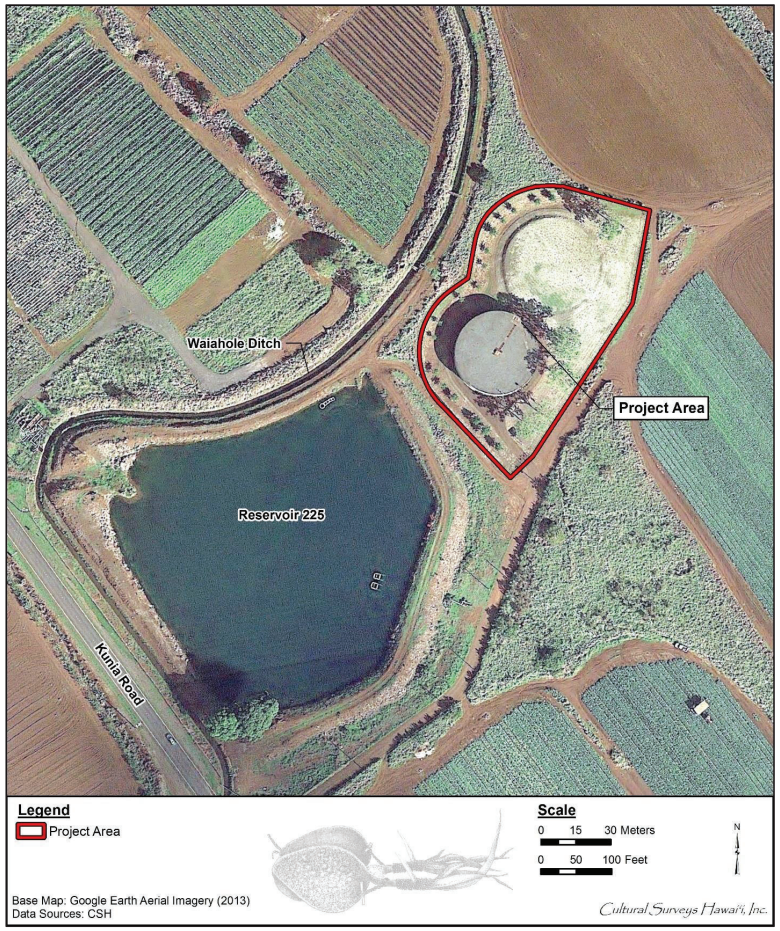

Figure 3. Aerial photograph showing the location of the project area (Google Earth 2013)

1.3 Scope of Work

The scope of work for this cultural assessment 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. 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 Natural Environment

The project area is approximately 6 km inland (northwest) from the West Loch of Pearl Harbor on gently ascending plateau lands of the southern central valley of O‘ahu. The Hō‘ae‘ae Ahupua‘a of the ‘Ewa District experiences temperatures that range between 60° to 90° F through the year; the highest temperatures are in August and September (Armstrong 1973).

Elevation in the project area ranges from approximately 183 m (600 ft) above mean sea level (AMSL) to 195 m (640 ft). The project area land is generally quite flat with the exception of the reservoir and reservoir platform, which are man-made.

In pre-Contact Hawai‘i, the project area would have been mostly lowland dry shrub and grassland, dominated by species such as *wiliwili* (*Erythrina sandwicensis*), *lama* (*Diospyros ferrea*), sandalwood (*Santalum* sp.), *‘a‘ali‘i* (*Dodonea eriocarpa*), scrub *‘ōhi‘a* (*Metrosideros collina*), and *pili* grass (*Heteropogon contortus*) (Frierson 1972). Natural vegetation patterns within the project area have been severely altered by at least 100 years of intensive sugarcane agriculture.

1.4.2 *Ka Lepo* (Soils)

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), soils within the project area consists of Kunia silty clay, 0 to 3% slopes (KyA) (Figure 4). Kunia soils are described as follows:

> This series consists of well-drained soils on upland terraces and fans on the island of Oahu. These soils developed in old alluvium. They are nearly level to moderately sloping. Elevations range from 700 to 1,000 feet. The mean annual rainfall amounts to 30 to 40 inches, most of which occurs from November to April. The mean annual soil temperature is 71° F. Kunia soils occur on the foot slopes of the Waianae Range, near Schofield Barracks. They are geographically associated with Kolekole, Lahaina, and Wahiawa soils. These soils are used for sugarcane, pineapple, homesites, and military reservations. Most areas are cultivated, and the natural vegetation is not significant. [Foote et al. 1972:77]

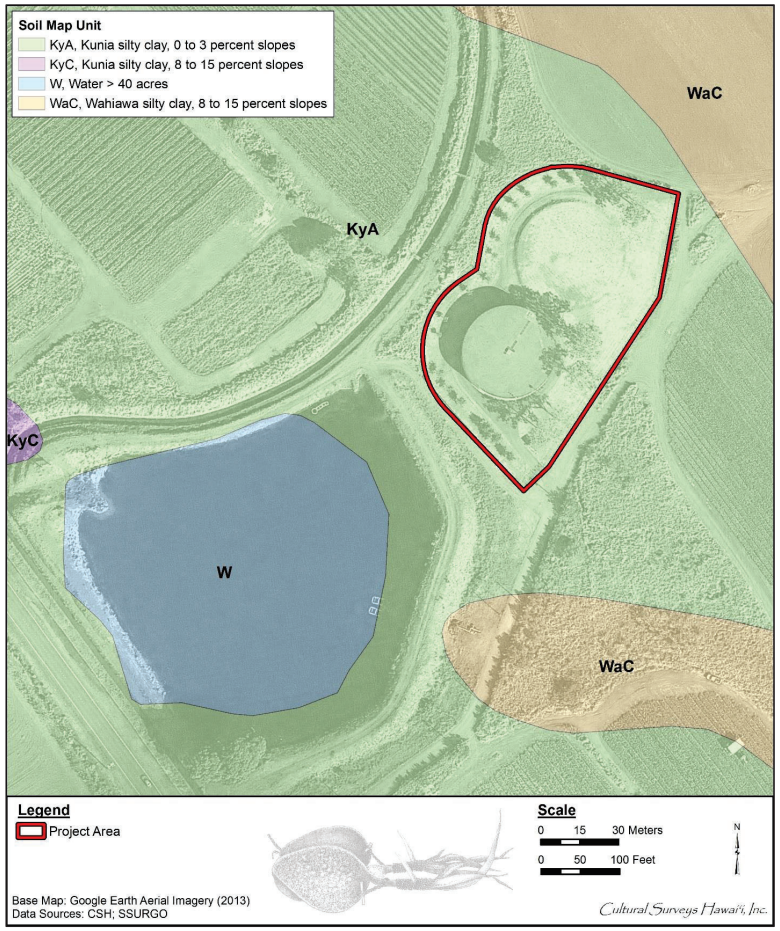

Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (USDA SSURGO 2001)

1.4.3 *Ka Makani* (Wind)

Makani is the general Hawaiian term for wind. A‘e Loa is a name given to the prevailing northeasterly trade winds (Nakuina 1992:138) along with A‘e (Pukui and Elbert 1986:3), Moa‘e, and Moa‘e Lehua (Pukui and Elbert 1986:249). The traditional story, *The Wind Gourd of La‘amaomao,* speaks of Pāka‘a and his son Kuāpāka‘a, descendants of the wind goddess La‘amaomao. They are able to control all the winds of Hawai‘i which are contained in a gourd and may be called forth by chanting their names. Pāka‘a’s chant traces the winds of O‘ahu in the *moku* (district) of ‘Ewa. Five winds are identified throughout the *moku* and are presented in Pāka‘a‘s chant as follows:

He Moae-ku ko Ewaloa,	Moa‘e-ku is of Ewaloa,
He Kehau ko Waiopua,	Kēhau is of Waiopua,
He Waikoloa ko Lihue,	Waikōloa is of Līhu‘e,
He Kona ko Puukapolei,	Kona is of Pu‘ukapolei,
He Maunuunu ko Puuloa . . .	Māunuunu is of Pu‘uloa . . .
[Nakuina 1902:57]	[Nakuina 1992:51]

An account in the Hawaiian newspaper *Ka Nupepa Kuokoa* reports a storm in which strong winds and rains within Hō‘ae‘ae and Honouliuli demolish several homes. The article details the winds’ characteristics and poses a debate of this particle wind’s name:

> [...] *Aole no i liuliu ka pa ana a keia makani, iloko nae paha la o na minute elima. Ina paha he hapalua hora ka pa ana, manao au paa loa na hale i ka hina. He 9 hale i hina ma Honouliuli, 2 ma Hoaeae.*
>
> *Hoopaapaa nui na ‘kamaaina no keia wahi makani, olelo kekahi, he Kona Kalaeloa, olelo hoi kekahi ke Kona Puukuua, o kekahi hoi he Kona Kalaenihi, kekahi poe hoi, olelo lakou, he Kona Anuha olelo hoi kahi, he Kona Kuo, na kona paha keia i oleloia e Kamapuaa;— Me ka mahalo. J.W.P. Keolanui. Apua, Honouliuli, Ewa, Oahu. Feb 8. 1866.* [*Ka Nupepa Kuokoa,* 17 February 1866:n.p.]

Translation:

> This wind did not blow long, possibly lasting just five minutes. If indeed the wind did blow for half an hour, I think the houses were very secure against toppling. There were nine houses at Honouliuli and two at Hō‘ae‘ae (that toppled over).
>
> The people of this location argued a lot concerning the name of this place wind. One said that the name is Kona Kalaeloa, another Kona Puukuua, another said Kona Kalaenihi, they said the name is Kona Anuhea, and another yet said Kona Kuo. These are possible the *kona* winds, as it was said by Kamapua‘a;— With gratitude, J.W.P. Keolanui. Apua, Honouliuli, Ewa, Oahu. Feb. 8, 1866. [*Ka Nupepa Kuokoa,* 17 February 1866:n.p.]

1.4.4 *Ka Ua* (Rain)

The project area, contained within the ‘Ewa District on the leeward side of O‘ahu, is typically very hot and dry. The mean annual rainfall is approximately 764 mm (30.1 inches) (Giambelluca et al. 2013) based on measurements at Oahu Sugar Field 225 rain gauge from 1948 through 1969.

Precipitation remains a major component of the Hawaiian water cycle. The life-giving waters or *wai*, helped to sustain pre-Contact populations. Traditionally, the year was divided by two distinct annual seasons. The first, known as *kau* (period of time, especially summer), typically lasted from May to October and is marked by a high-sun period corresponding to warmer temperatures and steady trade winds. The second season, *ho‘oilo* (winter, rainy season), continued through the end of the year from November to April and represented a much cooler period. Trade winds were less frequent, and widespread storms and rainfall were common (Giambelluca et al. 1986:17). Typically, the maximum rainfall occurs in January and the minimum in June (Giambelluca et al. 1986:17).

It was a customary and necessary tradition to grant a name for each type of rain. Rains were named to show their action toward plants or the supposed effects on people or their possessions (Pukui and Elbert 1986:361). Though there is no rain directly associated with Hō‘ae‘ae, the Nāulu rain is known to be associated with the area just above the lochs of Pearl Harbor.

1.4.4.1 Ka Ua Nāulu

This rain can be found on Hawai‘i and Ni‘ihau and is also associated with Kaupe‘a, O‘ahu, an area above the lochs of Pearl Harbor. The following *mele* (song) is taken from *Ka Mo‘olelo o Hi‘iakaikapoliopele* and was presented by Hi‘iaka as she traveled across the plain near Pu‘uloa (Akana and Gonzalez 2015:195):

> *‘A‘ole au e hele i ke kaha o Kaupe‘a*
>
> *Kēlā kaha kūpā koili a ka lā i ke kula*
>
> *Ua kūpono a‘ela ka lā i ka piko o Wākea*
>
> *Ola i ke ahe a ka makani Māunuunu*
>
> *I ka hapahapai mai a ka makani ‘Ao‘aoa*
>
> *Ke koi lā i ke ao o ka Nāulu e hanini i ka wai*
>
> *Ola ihola nā kupa kama‘āina i ka wai a ka ‘ōpua*
>
> *Ke halihali a‘ela nā ‘ōpua i ke awa lau*

Translation:

> I shall not tread Kaupe‘a’s expanse
>
> That stretch where the sun beats down on the plain
>
> The sun is right overhead, at the navel of Wākea
>
> I am spared by the Māunuunu wind
>
> By the uplifting ‘Ao‘aoa breeze
>
> Urging the Nāulu storm clouds to pour down their waters

> The natives here survive on water from the clouds
>
> Which billowing clouds carry along to the branching lochs
>
> [Akana and Gonzalez 2015:195]

1.4.5 *Ke Kahawai* (Streams)

The project area is within the 124.8-sq-km (48-sq-mile) Waikele Stream watershed. Waikele Stream is a perennial stream with a total aggregate stream length (including nine tributary streams) of 216.8 km (134.7 miles). Waikele is translated by Pukui et al. as “muddy water” (Pukui et al. 1974:223). The “muddy water” naming of Waikele Stream is reflected in Hammatt et al.’s observation that, “As the Waikele and Kipapa streams drain a large expanse of lateritic soils of fine particle size the water would have appeared muddy in prehistoric times even during periods of normal flow” (Hammatt et al. 1988:9).

The non-perennial Hō‘ae‘ae Stream bounds Kalei‘opu‘u Elementary School on its west side. Hō‘ae‘ae Stream is a relatively short stream of approximately 2.5 km length that debouches into the north end of the West Loch of Pearl Harbor. Pre-Contact and early post-Contact agriculture focused on the spring-fed floodplains adjacent to West Loch for the cultivation of the traditional Hawaiian staple crop of *kalo* (taro; *Colocasia esculenta*).

1.4.6 *Nā Kai* (The Lowlands; Seashore, Bay, and Estuarine Zone)

The *makai* portion of Hō‘ae‘ae Ahupua‘a is bound by the West Loch of Pearl Harbor. Clark (1977) gives the following account of the past and present features of Pearl Harbor:

> The Hawaiian name of the land west of the harbor was Pu‘uloa. The harbor itself took its English name from Waimomi, ‘water of the pearl,’ a river that ran into the lochs. In the 1830s, pearl oysters were reported there in abundance, and small pearls were found frequently when the oysters were harvested for food and for mother-of-pearl. A species of speckled clam also grew in the harbor that, in addition to being good eating, contained milk-white pearls of an exquisite luster.
>
> The original beds of mollusks were destroyed by pollution of the waters in the harbor. With the introduction of cattle to the uplands, the watersheds were denuded of vegetation and vast quantities of earth were washed into the lagoons. Later, sewage and oil spills from Navy ships added to the spoiling. Only recently have attempts been made to reduce pollution . . .
>
> Most of the shoreline of Pearl Harbor, which once accommodated more fishponds than any other single district in the islands, has been altered completely to provide berthing and shipyard facilities. The other shore areas within the harbor are either mud flats or gravel beaches. They are not used at all for recreational swimming because the water is too polluted. [Clark 1977:70]

The Hō‘ae‘ae portion of the present-day West Loch shoreline is largely developed with commercial and residential infrastructure. Prior to large-scale development along the Hō‘ae‘ae shoreline, the natural vegetation consisted of

> . . . thick patches of pickleweed along the shore of West Loch growing among *Sesuvium portulacastrum*, and a bulrush, *Bulboschoenus maritimus* subsp.

> *paludosus*, (as *Scirpus maritimus*) above the high tide level. This bulrush was conspicuous because prior to the introduction of mangroves it was the tallest plant species at the mouth of Waikele Stream. [Englund et al. 2000:9]

1.4.7 Built Environment

Reservoir 225, an open, earthen reservoir, is located east of the project area and adjacent to Kunia Road within Robinson Kunia Land LLC agricultural fields in TMK: [1] 9-4-003:001. Access to the present project area is via an unnamed dirt road. The present project area is dominated by a large cylindrical reservoir tank on the southwest side of the project area. A constructed, round platform on the northeast side of the project area was clearly built to support a second similar tank but it appears that second tank was never built.

The Waiahole Ditch transporting water from east of the Ko‘olau Mountain Range across the central valley of O‘ahu runs from northeast to southwest approximately 15 m northwest of the project area.

Section 2 Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli* (oli), *mele* (songs), traditional *mo‘olelo* (stories), traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH library. Other archives and libraries including the Hawai‘i State Archives, the Bishop Museum Archives, the University of Hawai‘i at Mānoa’s Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau 2014), the State Historic Preservation Division (SHPD) Library, the State of Hawai‘i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives are also repositories where CSH cultural researchers gather information. Information on Land Commission Awards (LCAs) were accessed via Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2015).

Section 3 *Ka‘ao* and *Mo‘olelo* (Legends and Stories)

Hawaiian storytellers of old were greatly honored; they were a major source of entertainment and their stories contained lessons 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 than read for much becomes lost in the transfer from the spoken to the written word and *ka‘ao* (legend) are often full of *kaona* or double meanings.

Ka‘ao are defined by Pukui and Elbert (1986:108) as a “legend, tale […], romance, [and/or], fiction.” *Ka‘ao* may be thought of as oral literature or legends, often fictional or mythic in origin, and have been “consciously composed to tickle the fancy rather than to inform the mind as to supposed events” (Beckwith 1970:1). Conversely, Pukui and Elbert (1986:254) define *mo‘olelo* as a “story, tale, myth, history, [and/or] tradition.” The *mo‘olelo* are generally traditional stories about the gods, historic figures or stories which cover historic events and locate the events with known places. *Mo‘olelo* are often intimately connected to a tangible place or space (*wahi pana*).

In differentiating *ka‘ao* and *mo‘olelo* it may be useful to think of *ka‘ao* as expressly delving into the *wao akua* (realm of the gods), discussing the exploits of *akua* in a primordial time. However, it is also important to note that not all *ka‘ao* explicitly deal with the exploits of either gods, goddesses, or the supernatural. *Mo‘olelo* on the other hand, reference a host of characters from *ali‘i* (chief) to *akua* and *kupua* (supernatural beings), to finally *maka‘āinana*; and discuss their varied and complex interactions within the *wao kānaka* (realm of man). Beckwith elaborates, “In reality, the distinction between *ka‘ao* as fiction and *mo‘olelo* as fact cannot be pressed too closely. It is rather in the intention than in the fact” (Beckwith 1970:1). Thus a so-called *mo‘olelo*, which may be enlivened by fantastic adventures of *kupua*, “nevertheless corresponds with the Hawaiian view of the relation between nature and man” (Beckwith 1970:1).

Both *ka‘ao* and *mo‘olelo* provide important insight into a specific geographical area, adding to a rich fabric of traditional knowledge. The preservation and passing on of these stories through oration remains a highly valued tradition. Additionally, oral traditions associated with the study area communicate the intrinsic value and meaning of a place, specifically its meaning to both *kama‘āina* (Native-born) as well as others who also value that place.

The following section presents traditional accounts of ancient Hawaiians living in the vicinity of the project area. Many relate an age of mythical characters whose epic adventures inadvertently led to the Hawaiian race of *ali‘i* and *maka‘āinana*. The *ka‘ao* in and around the project area shared below are some of the oldest Hawaiian stories that have survived; they still speak to the characteristics and environment of the area and its people.

3.1.1 Legend of Kalei‘ōpu‘u

Kalei‘ōpu‘u Elementary School recorded the Legend of Kalei‘ōpu‘u. The legend was told by the Kamaki Kanahele Family as follows:

> In the ancient times, this spot, where Kalei‘opu‘u Elementary sits today, was the place where Kahuna La‘au Lapa‘au (medicinal healers), came to fetch their herbs. During a certain time of the seasons (just before Makahiki), Kahuna came into the bay (Pearl Harbor), by canoe to gather their medicines. Legend says that they disembarked from their canoes and sent up a chant in the style called ‘Ho‘ae‘ae.’

When they chanted, a rainbow appeared. The rainbow's colors were so bright that it reflected its colors onto this hill lighting it up full with its colors. Where the colors fell on the land was located the special healing herbs that they came to fetch. The legend says that when the rainbow disappeared, the flowers from the same herbs took on the colors of the rainbow and left this hill or pu‘u looking like a beautiful lei with rainbow colors. Hence the name Kalei‘opu‘u, literally translated as ‘Lei on the hillside.' [Kalei‘opu‘u Elementary School 2016]

3.1.2 The Hawaiian Legend of Keli‘ikau o Ka‘ū

The following *mo‘olelo* recounted on 15 March 1902 in the Hawaiian newspaper *Home Rule Republika*, tells how Keli‘ikau o Ka‘ū, a shark god of Hawai‘i Island, defeated the O‘ahu shark chieftess Ka‘ahupāhau and slaughtered all the ‘Ewa sharks.

A story about the hero shark of Hawai‘i who boldly tossed the chieftess Ka‘ahupahau from the battle grounds at the mountain pass Pu‘uloa of Ewa, O‘ahu, hence the famed saying: ‘Solitary Pu‘uloa, Ka‘ahupahau has passed.'

When the chieftess was whirling her large body, striking her tail fin upon the surface of the water, the foundation below the ocean was rocking back and forth, the coral heads were slightly cracking, and the fins between the gill plate were in movement, all the things below slightly leapt and there was darkness because of the dirt. This was a terrifying thing for all the sharks watching. Also, this is the time that Keliikau O Kau went softly and noiselessly and joined with the belly and the rightward gill fins of his opponent. This was his time when he revealed his power and his multitude of pointed teeth that penetrated within the muscle of the chieftess, precisely locating the stomach, the liver, and all things that spilled outward. This was the time that the fullness spilled over and laid out toward the shore, where the chieftess was still thrashing her body and turning to the side, *aole nae he wahi mea a mahuheu iho o kahi ulu iki o Kau,* he was connected deeply to the chieftess from within her belly.

During that time Keliikau O Kau observed the chieftess causing him trouble on top of their battle grounds, he nibbled gently upon her fins and dipped his mouth into the ocean, then saw that the chieftess was dying with the final trembles of her body.

And so, during this time, Keliikau O Kau rested with the observance of the shark body of his opponent making love with the chief of Maui, Olepau.

During the time that the sand and the ocean was murky, and the blood caused the water to be murky upon the surface of the ocean, then cleared, behold, the shark body of the chieftess was seen laying there dead. During that time her spirit body returned with her rightful mother Koihala.

At that time, he said to the family, ‘I have done wrong!' Seen there was the disgrace of the streaked blood with the sudden wrongdoing being shown upon the body of his mother, and this was a time of deep sadness for the chieftess that passed because of his actions.

When the shark body of the chieftess Ka‘ahupahau passed, Keliikau O Kau saw all the shark chiefs of both sides (of the war between sharks) circling around with great pride of the success. It was also a time of great delight for all the sharks behind him.

That was when Kaliikau O Kau responded to the attendants of the chieftess who he killed, Kamoaana me Kahiuka:

‘The possessor of the mountain passes Pu‘uloa and Kaikuono of Ewa, has passed. Who's next?'

The commoners responded: ‘The multitude!'

When this was finished being said, this was the time when the sharks of Ewa descended to Keliikau O Kau and worked in unison against him. Furthermore, the dust of Kau that the foreigners stirred up like a whirlwind was of no consequence and this was a time when the expert Kau singularly went full force with his strength. There is no likeness to him. He began to bite the sharks and tossed them toward the uplands upon the dry grounds of Kalaekao, Kapuaikaula, Keanapua‘a, Kamokuumeume, Aiea, Kalauao, Waimalu, Waiau, Waimano, Manana (two of them), Waiawa, Hanapouli, Waipi‘o, Waikele, Hō‘ae‘ae, Honouliuli, Kalaeokahukua, Kanahunaopapio, Kepookala and Pu‘uloa.

This was Kaliikau O Kau's major slaughter of the total of the sharks of Ewa. The decomposition appeared in the uplands upon the land and because of this war, that famous expression was said, ‘Solitary Pu‘uloa, Ka‘ahupahau has passed…' [*Home Rule Republika* 1902:n.p.]

3.1.3 Legend of Nāmakaokapao‘o

Nāmakaokapao‘o was a Hawaiian hero of legendary strength. Nāmakaokapao‘o's mother was Pokai and his father was Kaulukahai, a great chief of Kahiki, the ancestral home of the Hawaiians. The two met in Hō‘ae‘ae and conceived their child there. The father returned to his home in Kahiki before the birth of his son, leaving his O‘ahu family destitute. A man named Puali‘i saw Pokai and married her. The couple then resided on the plains of Keahumoa, planting sweet potatoes. Nāmakaokapao‘o was a small, brave child who took a dislike to his stepfather, and pulled up the sweet potatoes Puali‘i had planted at their home in Keahumoa. When Puali‘i came after Nāmakaokapao‘o with an axe, Nāmakaokapao‘o delivered a death prayer against him, and slew Puali‘i, hurling his head into a cave in Waipouli, near the beach at Honouliuli (Fornander 1919:274–276).

3.1.4 Legend of Pikoi

Pikoi was a legendary hero, the son of a crow and brother to five sister-*akua* who took the form of rats. He was famous for his ability to shoot arrows, and often made bets that he could hit rats from a long distance (Fornander 1917:450–463). Pikoi's skill was commemorated in a saying which mentions the plain of Keahumoa—a plain stretching over the uplands of Hō‘ae‘ae:

Ku aku la i ka pana a	Shot by the arrow of Pikoi-[son]
Pikoi-a-ka-‘alalā, keiki pana	of-the-crow, the expert rat-shooter
‘iole o ke kula o Keahumoa.	Of the plain of Keahumoa.
[Pukui 1983:200]	

3.1.5 The Demi-god Māui

In the stories of the demi-god Māui, Keahumoa is the home of Māui‘s grandfather, Kuolokele. One day, Māui’s wife, Kumulama, was stolen by the chief Peapeamakawalu, eight-eyed-Pea-Pea, who is identified in the creation chant, Kumulipo, as the octopus god (Beckwith 1951:136). The chief disappeared with Kumulama in the sky beyond the sea and escaped so quickly that Māui could not catch him. To recover his wife, Māui’s mother advised him to visit the hut of his grandfather at Keahumoa:

> Maui went as directed until he arrived at the hut; he peeped in but there was no one inside. He looked at the potato field on the other side of Poha-kea, toward Hono-uli-uli, but could see no one. He then ascended a hill, and while he stood there looking, he saw a man coming toward Waipahu with a load of potato leaves one pack of which, it is said, would cover the whole land of Keahumoa. [Thrum 1923:253–254]

Kuolokele made a *moku-manu* (“bird-ship”) for Māui, who entered the body of the bird and flew to Moanaliha, the land of the chief Peapeamakawalu. This chief claimed the bird as his own when it landed on a sacred box and took it with him into the house he shared with Māui’s wife. When Peapeamakawalu fell asleep, Māui killed him, cut off his head, and flew away back to O‘ahu with his wife and the chief’s head (Thrum 1923:252–259).

3.2 *Wahi Pana* (Storied Places)

Wahi pana are legendary or storied places of an area. These legendary or storied places may include a variety of natural or human-made structures. Oftentimes dating to the pre-Contact period, most *wahi pana* are in some way connected to a particular *mo‘olelo*, however, a *wahi pana* may exist without a connection to any particular story. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

> Natural places have mana, and are sacred because of the presence of the gods, the akua, and the ancestral guardian spirits, the ‘aumakua. Human-made structures for the Hawaiian religion and family religious practices are also sacred. These structures and places include temples, and shrines, or heiau, for war, peace, agriculture, fishing, healing, and the like; pu‘uhonua, places of refuge and sanctuaries for healing and rebirth; agricultural sites and sites of food production such as the lo‘i pond fields and terraces slopes, ‘auwai irrigation ditches, and the fishponds; and special function sites such as trails, salt pans, holua slides, quarries, petroglyphs, gaming sites, and canoe landings. [McGregor 1996:22]

As McGregor makes clear, *wahi pana* can refer to natural geographic locations such as streams, peaks, rock formations, ridges, offshore islands, and reefs, or they can refer to Hawaiian land divisions such as *ahupua‘a* or *‘ili* (land section or subdivision of an *ahupua‘a*), and man-made structures such as fishponds. In this way, the *wahi pana* of Hō‘ae‘ae tangibly link the *kama‘āina* of Hō‘ae‘ae to their past. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* (family) or even certain individuals within an *‘ohana*, and many have been lost, forgotten or kept secret through time. Place names also convey *kaona* and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the Hawaiian Islands, cultural information was exclusively

preserved and perpetuated orally. Hawaiians gave names to literally everything in their environment, including individual garden plots and *‘auwai* (water courses), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku*, *pūnāwai* (freshwater springs), and many others. According to Landgraf (1994), Hawaiian *wahi pana* “physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v).

3.2.1 Hō‘ae‘ae Place Names

Hō‘ae‘ae Ahupua‘a has very few recorded place names compared to the much larger Honouliuli Ahupua‘a adjacent to the west and north, which is highlighted in Figure 5. The southern edge of Hō‘ae‘ae is bound at the shoreline by the north shore of Pearl Harbor’s West Loch; its western edge by a trail running along the eastern edge of Honouliuli Gulch; and its eastern edge by the western side of Waikele Gulch. The *mauka* edge does not extend to the Ko‘olau Mountains, but is “cut off” by Honouliuli to the west and Waikele to the east. The boundary between Hō‘ae‘ae and Honouliuli at the shore was at a place called Ka‘ulu (Soehren 2009; Hawai‘i Boundary Commission 1:537) and the boundary along the trail was marked by a *pōhaku* called Pōhaku Pālahalaha. There are references to a Hō‘ae‘ae Stream in traditional literature. Pre-Contact and early post-Contact agriculture focused on the spring-fed floodplains adjacent to West Loch. Hō‘ae‘ae means “to make soft or fine” (Pukui et al. 1974:47). Pukui et al. (1974) do not explain why the *ahupua‘a* was given this name, but do mention there was a famous *pōhaku* called Pōhaku-Pili, meaning “clinging rock,” located on a cliff at the boundary between Hō‘ae‘ae and Waikele. It is said to have belonged to the gods Kāne and Kanaloa (Pukui et al. 1974:47).

Another source (Thrum 1922:632) reports that Hō‘ae‘ae means “to pulverize.” Pukui and Elbert’s *Hawaiian Dictionary* (1986) records the possible meanings of Hō‘ae‘ae as “to rise the tide, to make fine, to pulverize, to refine, to soften.” *‘Ae* can also mean to lend, to say yes, to consent, to approve or can also be the sap wrung from seaweed or leaves of plants such as taro.

The coastal point, Ka‘ulu, was named for a Puna chief named Ka‘uluhuaikahapapa, whose name means “the breadfruit bearing fruit on the flats” (Pukui et al. 1974:93). Hō‘ae‘ae and Waikele at the shore was marked with a “pile of stones by Kalahina Bay” (Soehren 2009; Hawai‘i Boundary Commission AB 1:536), and the boundary on the trail between the two *ahupua‘a* was marked by Pōhaku Pili. There were at least seven *‘ili ‘āina* (smaller land division within an *ahupua‘a)* in Hō‘ae‘ae; Ka‘ai‘iole, Kahui, Kaloko‘eli, Kamolokala, Koipu (also called Koipuiki), and Waihi.

3.2.2 The Inland Plain of Keahumoa

In several legends of ‘Ewa, there is mention of the “plain of Keahumoa.” John Papa ‘Ī‘ī (1959:96) locates this plain opposite the trail to Pohakea Pass, stretching across the *ahupua‘a* of Honouliuli and Hō‘ae‘ae. McAllister (1933:107) states that the plain was west of Kīpapa Gulch in Waikele. It is also mentioned in legends of Waipi‘o. Thus, this is probably a general name for the flat plain *mauka* of the productive floodplain area directly adjacent to Pearl Harbor.

3.2.3 Waipahu Spring

The most famous location in Waikele is Waipahu Spring (“bursting water”). The waters of this spring were used to irrigate many of the ancient taro patches on the Waikele flood plain and later the rice and sugarcane crops. As a town and sugar mill expanded around it, the entire *makai*

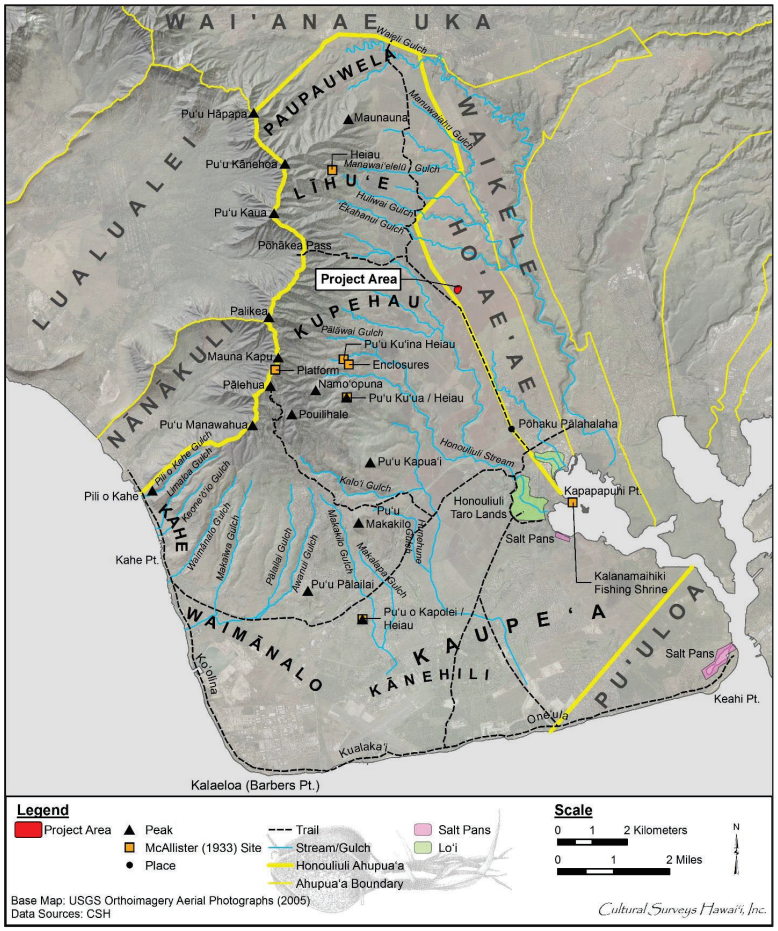

Figure 5. Place names of Honouliuli (base map: 2005 USGS Orthoimagery); note that modern Farrington Highway and Kunia Road generally follow the ancient trails

area of Hō‘ae‘ae and Waikele became known as Waipahu, and the older names were no longer used. A resident clarified this change in names:

> ‘Waipahu’. . . is not a tract of land, but only a spring located in Waikele. The Oahu Railway Company is the culprit responsible for misuse and confusion, when it built its station at Kaohai and called [it] ‘Waipahu Station.’ The Oahu [Sugar Plantation] Mill is situated on the plateau of ‘Keonekuilimalaulaoewa’ (the arm-in-arm-plateau of ewa), Waikele. [Simeon Nawaa in *Honolulu Star-Bulletin* 16 October 1956, cited in Sterling and Summers 1978:1]

McAllister (1933) also provides an account of Waipahu Spring, listing this *wahi pana* as Site 128: “Waipahu spring, famous in tradition as the place at which the tapa mallet appeared after having been lost in Kahuku (68, p. 41). A pump has been placed over the site” (McAllister 1933:106).

3.3 *‘Ōlelo No‘eau* (Proverbs)

Hawaiian knowledge was shared by way of oral histories. Indeed, one’s *leo* (voice) is oftentimes presented as *ho‘okupu* (“to cause growth,” a gift given to convey appreciation, to strengthen bonds); the high valuation of the spoken word underscores the importance of the oral tradition (in this case, Hawaiian sayings or expressions), and its ability to impart traditional Hawaiian “aesthetic, historic, and educational values” (Pukui 1983:vii). Thus, in many ways these expressions may be understood as inspiring growth within the reader or between speaker and listener:

> They reveal with each new reading ever deeper layers of meaning, giving understanding not only of Hawai‘i and its people but of all humanity. Since the sayings carry the immediacy of the spoken word, considered to be the highest form of cultural expression in old Hawai‘i, they bring us closer to the everyday thoughts and lives of the Hawaiians who created them. Taken together, the sayings offer a basis for an understanding of the essence and origins of traditional Hawaiian values. The sayings may be categorized, in Western terms, as proverbs, aphorisms, didactic adages, jokes, riddles, epithets, lines from chants, etc., and they present a variety of literary techniques such as metaphor, analogy, allegory, personification, irony, pun, and repetition. It is worth noting, however, that the sayings were spoken, and that their meanings and purposes should not be assessed by the Western concepts of literary types and techniques. [Pukui 1983:vii]

Simply, *‘ōlelo no‘eau* may be understood as proverbs. The Webster dictionary notes it as “a phrase which is often repeated; especially, a sentence which briefly and forcibly expresses some practical truth, or the result of experience and observation.” It is a pithy or short form of folk wisdom. Pukui equates proverbs as a treasury of Hawaiian expressions (Pukui and Green 1995:xii). Oftentimes within these Hawaiian expressions or proverbs are references to places. This section draws from the collection of author and historian Mary Kawena Pukui and her knowledge of Hawaiian proverbs describing *‘āina* (land), chiefs, plants, and places. Only a few *‘ōlelo no‘eau* mention Hō‘ae‘ae but more are referenced to include the entire ‘Ewa district. The following *‘ōlelo no‘eau* are from Mary Kawena Pukui’s *‘Ōlelo No‘eau* (Pukui 1983).

3.3.1 *‘Ōlelo No‘eau* #80

The following *‘ōlelo no‘eau* references the *moku* of ‘Ewa.

‘Āina koi ‘ula i ka lepo.

Land reddened by the rising dust.

Said of ‘Ewa, O‘ahu. [Pukui 1983:11]

3.3.2 *‘Ōlelo No‘eau* #123

The following *‘ōlelo no‘eau* was spoken by Hi‘iaka while she and her entourage were traveling near ‘Ewa.

Anu o ‘Ewa i ka i‘a hāmau leo e. E hāmau!

‘Ewa is made cold by the fish that silences the voice. Hush!

A warning to keep still. First uttered by Hi‘iaka to her friend Wahine‘oma‘o to warn her not to speak to Lohi‘au while they were in a canoe near ‘Ewa. [Pukui 1983:16]

3.3.3 *‘Ōlelo No‘eau* #385

The following *‘ōlelo no‘eau* mentions sacrificial preparation of *kauwā* (slaves) in ‘Ewa.

‘Ewa kai lumaluma‘i.

‘Ewa of the drowning sea.

An epithet applied to ‘Ewa, where kauwā were drowned prior to offering their bodies in sacrifice. [Pukui 1983:47]

3.3.4 *‘Ōlelo No‘eau* #386

The following *‘ōlelo no‘eau* speaks of La‘akona, a chief of ‘Ewa.

‘Ewa nui a La‘akona.

Great ‘Ewa of La‘akona.

La‘akona was a chief of ‘Ewa, which was prosperous in his day. [Pukui 1983:47]

3.3.5 *‘Ōlelo No‘eau* #493

The following *‘ōlelo no‘eau* explains the effect the Moa‘e wind had on the famous pearl oysters of ‘Ewa.

Haunāele ‘Ewa i ka Moa‘e.

‘Ewa is disturbed by the Moa‘e wind.

Used about something disturbing, like a violent argument. When the people of ‘Ewa went to gather the *pipi* (pearl oyster), they did so in silence, for if they spoke, a Moa‘e breeze would suddenly blow across the water, rippling it, and the oysters would disappear. [Pukui 1983:59]

3.3.6 *‘Ōlelo No‘eau* #1357

The following *‘ōlelo no‘eau* also mentions the pearl oyster of ‘Ewa.

Ka i‘a kuhi lima o ‘Ewa.

The gesturing fish of ‘Ewa.

The *pipi*, or pearl oyster. Fishermen did not speak when fishing for them but gestured to each other like deaf-mutes. [Pukui 1983:148]

3.3.7 *‘Ōlelo No‘eau* #1855

The following *‘ōlelo no‘eau* references two stones that were once used as markers.

Ku a‘e ‘Ewa; Noho iho ‘Ewa.

Stand-up ‘Ewa; Sit-down ‘Ewa.

The names of two stones, now destroyed, that once marked the boundary between the chiefs’ land (*Kua‘e ‘Ewa*) and that of the commoners (*Noho iho ‘Ewa*) in ‘Ewa, O‘ahu. [Pukui 1983:200]

3.3.8 *‘Ōlelo No‘eau* #1858

The following *‘ōlelo no‘eau* makes reference to the plain of Keahumoa, which stretches along the upland portion of Hō‘ae‘ae Ahupua‘a.

Ku aku la i ka pana a Pikoi-a-ka-‘alalā, keiki pana ‘iole o ke kula o Keahumoa.

Shot by the arrow of Pikoi-[son]of -the-crow, the expert rat-shooter of the plain of Keahumoa.

Got his just deserts. [Pukui 1983:200]

3.3.9 *‘Ōlelo No‘eau* #2731

This *‘ōlelo no‘eau* speaks of an extensive stream that flowed to Waipahu, Hō‘ae‘ae.

Pukana wai o Kahuku.

The water outlet of Kahuku.

Refers to the outlet of an underground stream that once flowed from Kahuku to Waipahu, O‘ahu. [Pukui 1983:299]

3.4 *Oli* (Chants)

Oli, according to Mary Kawena Pukui (Pukui 1995:xvi–xvii) are often grouped according to content. Chants often were imbued with *mana* (spiritual power); such *mana* was manifested through the use of themes and *kaona*. According to Pukui, chants for the gods (prayers) came first, and chants for the *ali‘i*, “the descendants of the gods,” came second in significance. Chants “concerning the activities of the earth peopled by common humans,” were last in this hierarchy (Pukui 1995:xvi–xvii). Emerson conversely states the following:

> In its most familiar form the Hawaiians—many of whom [were lyrical masters]—used the oli not only for the songful expression of joy and affection, but as the

> vehicle of humorous or sarcastic narrative in the entertainment of their comrades. The dividing line, then, between the oli and those other weightier forms of the mele, the inoa, the kanikau (threnody), the pule, and that unnamed variety of mele in which the poet dealt with historic or mythologic subjects, is to be found almost wholly in the mood of the singer. [Emerson 1965:254]

While *oli* may vary thematically, subject to the perspective of the *ho‘opa‘a* (chanter), it was undoubtedly a valued art form used to preserve oral histories, genealogies, and traditions, to recall special places and events, and to offer prayers to *akua* and *‘aumākua* (family gods) alike. Perhaps most importantly, as Alameida (1993:26) writes, “chants . . . created a mystic beauty . . . confirming the special feeling for the environment among Hawaiians: their one *hānau* (birthplace), their *kula iwi* (land of their ancestors).”

3.4.1 Hi‘iaka and the Plains of Keahumoa

The goddess, Hi‘iaka, sister of the volcano goddess Pele, passed through the plains of Keahumoa and met women stringing *ma‘o* (*Gossypium tomentosum*) flowers to make *lei* (garland). Hi‘iaka offered a chant, making known her wish for a *lei* around her own neck.

E lei ana ke kula o Ke‘ahumoa i ka ma‘o	The plains of Keahumoa are garlanded with ma‘o
‘Ohu‘ohu wale nā wāhine kui lei o	The lei-stringing women of the forest
ka nahele	are festively adorned
Ua like nō a like me nā lehua o Hōpoe	Just like the lehua blossoms of Hōpoe
Me he pua koili lehua ala i ka lā	Like lehua blossoms ensconced in the sun
Ka ‘ohi pua koai‘a i ka pali	Gathering koai‘a flowers on the cliffs
I nā kaupaku hale o ‘Āpuku	Those roof tops of ‘Āpuku
Ke kū nō‘o ke alo o ka pali o Pu‘uku‘ua	The cliff face of Pu‘uku‘ua rises up
He ali‘i nō na‘e ka ‘āina	Yet the land is the chief
He kauā nō na‘e ke kanaka	Man is but a servant
I kauā nō na‘e au i ke aloha	As I am a servant to love
Na ke aloha nō i kono e haele nō māua	It was love that invited the two of us to go
E hele nō wau ē.	I must, indeed, go on.

[Ho‘oumāhiehiemalie 2008a:287; Ho‘oumāhiehiemalie 2008b:268]

During Hi‘iaka’s travels, a chant is recited on the plains of Kaupe‘a—an area above the lochs of Pu‘uloa (present day Pearl Harbor). It is possible that the hot stretch of land Hi‘iaka traversed passes through the *ahupua‘a* of Hō‘ae‘ae. The following *mele* mentions the Māunuunu wind, ‘Ao‘aoa breeze, and Nāulu rain clouds that Hi‘iaka observed on the plains of Pu‘uloa:

‘A‘ole au e hele i ke kaha o Kaupe‘a	I shall not tread Kaupe‘a’s expanse
Kēlā kaha kūpā koili a ka lā i ke kula	That stretch where the sun beats down on the plain
Ua kūpono a‘ela ka lā i ka piko o Wākea	The sun is right overhead, at the navel of Wākea
Ola i ke ahe aka makani Māunuunu	I am spared by the Māunuunu wind
I ka hapahapai mai aka makani ‘Ao‘aoa	By the uplifting ‘Ao‘aoa breeze
Ke koi lā i ke ao o ka Nāulu e hanini i ka wai	Urging the Nāulu storm clouds to pour down their waters
Ola ihola na kupa kama‘āina i ka wai	The natives here survive on water
aka ‘ōpua	from the clouds
Ke halihali a‘ela na ‘ōpua i ke awa lau	Which billowing clouds carry along to the branching lochs
E koi mai ana iā Hi‘iaka e kūo‘e hele i ke kula	Compelling Hi‘iaka to trudge that open stretch
I kuleana i lāhui ai ka moe i Laila	Duty making rest forbidden there
I laila au lohe i ke kani leo le‘a a ka	There I heard the happy trill of the
‘ō‘ō i ke kula	‘ō‘ō bird on the plain
Ho‘āikāne ana lāua me ke kai o Wāwaemoku	Befriending the sea of Wāwaemoku
Mokumokuāhua loko, kupākupā koili i ka ‘ino	My heart grieves, thrashed by harm
I ‘ino ho‘i au i kēia kanaka i ka hiki ‘ana mai	I may be harmed by this person upon arrival
I kāhela a‘ela ka ‘ai a ka manu	Leaving the birds to feed expansively
I ka pua o ka wiliwili	On the blossoms of the wiliwili trees
Wili a‘ela nā ‘ōpua i luna	The clouds spin above
No luna wau	I am from above
Wili a‘ela ka ‘ōpua i lalo	The clouds spin below
Lalo ē!	Below indeed!
Lilo i lalo ka hele ‘ana a ke kanaka	The movement of mankind is cast down
Kalakala ke ao no Hawai‘i	Craggy are the clouds from Hawai‘i
I ka pā ‘ia mai e kēia makani	Blown here by this wind
‘A‘ole a‘u makana i ka lā o ka hilahila	I have no gift to offer on this day of shame
E hili hewa paha auane‘i au	I shall perhaps end up astray
Wilia i na‘e, wilia i lalo	Spiraling windward, or to the lee

Wilia i kai, wilia i uka	Spinning toward the sea, toward the highlands
‘O kauhale aka ‘ōlelo	O house made of words
Ho‘ohiki ihola i kānāwai	Utter as an edict
Kau ihola i kānāwai	Place as a law
He kānāwai ‘okia	An order of separation
‘Ālina ihola kā ‘o Pu‘uloa	Thus Pu‘uloa is branded by epithet
He ‘āina kauā.	A land of outcasts and slaves.

[Ho‘oulumāhiehie 2008a:294–295; Ho‘oulumāhiehie 2008b:275–276]

3.4.2 Lanakila Ke Ka‘a Ahi

The following three *oli* were written for Lili‘uokalani and describe *ke ka‘a ahi ali‘i,* the royal train, named Lanakila. In 1889, Benjamin Dillingham organized the Oahu Railway and Land Company (OR&L) which connected the outlying areas of O‘ahu to Honolulu. By 1890, the railroad reached from Honolulu to Pearl City and continued on to Wai‘anae in 1895, to Waialua in 1898, and to Kahuku in 1899 (Kuykendall 1967:100) (See Section 4.4.2). The following chants paint a historical picture of this time and the stops along the railway.

‘O Lanakila ke ka‘a ahi ali‘i	*Lanakila* was the Royal Train
Nāna i lawe mai kahu aupuni	The bore hither the crown princess.
A hiki ‘o Kalani i Moanalua	Bearing the Princess through Moanalua
Ka uwapo holuholu a‘o Hālawa	And over the swaying bridge of Hālawa.
‘Alawa iho ‘oe me ka ‘ao‘ao	A glance out the side
Ka nome ka huila i ke alahao	Showed the wheels rolling over the track.
‘A‘ohe ou loa a‘e Mānana	Pearly City did not seem far
I ke ku‘upau a nā wilikī	When the engineers did their work.
Ho‘okahi nō leo a‘o ke kuhina	The minister spoke just once
Ho‘opa‘a ‘ia mai nā mikini	‘Make the engines stop here.’
Kūnou welo pāpale ke aloha	(She was) greeted by bows and waving hats
Nā kupa, nā kini ou e Kalani	By her subjects, the people.
A kau ‘o Kalani i ke ka‘api‘o	The Princess boarded a carriage
Huli aku (a noho) ho‘ola‘ila‘i	There she turned and sat calmly.
Kiani ka uwepa ha‘a nā lio	The whip was snapped, the horses pranced

Kili‘opu ke kula o Leilehua	Over the plain of Leilehua.
Hea aku mākou ō mai ‘oe	We call to you, O answer us.
‘O Lili‘uokalani lā he inoa.	Lili‘uokalani is your name.

[de Silva 2003]

3.4.3 Eia Mai Au ‘o Makalapua

Eia mai au ‘o Makalapua	Here I am, Makalapua
Hō‘alo i ka ihu o ka Lanakila.	Traveling where the *Lanakila goes.*
‘O ke ku‘e a ka hao a i Kūwili	The piston works at Kūwili
Ka hiona ‘olu a‘o Hālawa.	And down the pleasant descent of Hālawa.
Ua lawa ka ‘ikena i ke awalau	Satisfying is the view of the lochs
Iā ‘Ewa ka i‘a hāmau leo	Of ‘Ewa, ‘land of the silent fish.’
Ua poha ka uahi a i Mānana	The smoke rises at Mānana
Aweawe i ke kula o Waipi‘o.	And streams along at Waipi‘o.
I kai ho‘i au a Honouliuli	Then I reached the lowlands of Honouliuli
Ahuwale ke ko‘a o Pōlea	Where the corals of Pōlea lie exposed.
Ha‘ina ‘ia mai ana ka puana	This is the conclusion of the song
Hō‘alo i ka ihu a ka Lanakila.	Of traveling where the *Lanakila* goes.

[de Silva 2003]

3.4.4 Ku‘e Hao o ka Lanikala

Hanohano Lanakila i ka‘u ‘ike,	The *Lanakila,* to me, is exalted
Ka niniu poahi a na kue,	For the blurred spinning of its pistons
Ua kohu naia no ka moana,	It resembles a porpoise of the deep
Ka pakika, ka pahee i ke alahao	Slipping and sliding along the iron track
Kilohi iho au ma ka ‘ao‘ao	I glance to the side
Moanalua kai ha‘i ke au	At Moanalua who broke the shaft
A ke kula mākou a‘o Pu‘uloa	When we reach the plain of Pu‘uloa
Laule‘a pū ‘ana me nā hoa	We enjoy the company of friends
Kau aku ka mana‘o no ‘Aiea	The mind is fixed on ‘Aiea
Ka pā a ka makani a he Moa‘e	And the work of the Moa‘e wind

Aia ka ‘i‘ini i Pualehua	Desire is there at Pualehua
I ka hale hulahula malu ‘ōhai	At the *‘ōhai* sheltered dance hall
A hiki mākou a i Mānana	When we reach Mānana
Ano ka‘uka‘u lua e ka Lanakila	The *Lanakila* hesistates somewhat
Ike i ka nani kai o Pōlea	We see the beautiful one seaward of Pōlea
I ka hapa-ilikini ‘ili ‘ula‘ula	The red-skinned part-indian
Hanohano Waikele i ka ‘ulu niu	Waikele is honored for its coconut grove
I ke kai o ka i‘a hāmau leo	And for its lagoon of silent fish
A Honouliuli ‘ike i ka nani	At Honouliuli we encounter the beauty
I ka luhe a nā lau o ke kumu kō	Of the down-turned leave of *kō*
A ke kula wela a‘o Waimānalo	On the humid flatlands of Waimānalo
Malu ana e ka lau o ke kiawe	We are shaded by the leaves of *kiawe*
‘Alawa a‘e au Pu‘u o Hulu	I glance out at Pu‘u o Hulu
‘O ka pu‘u kaulana o Wai‘anae	The famous hill of Wai‘anae
Ku‘upau Lanakila i ke oeoe	*Lanakila* forges ahead in response to the whistle
E ‘ī mai ana ‘o Wai‘anae	Wai‘anae is calling
‘Ike i ka nani o ia wahi	We recognize the beauty of this place
Me ke kai holu mai i ka pu‘eone	With the sea playing over the sand dunes
Hā‘ina ka puana no Wai‘anae	The story is told of Wai‘anae
Ka makani aheahe he Kaiāulu	And its gentle breeze, the Kaiāulu.
[Pinao in Testa 2003:98]	[de Silva 2003]

3.4.5 *He Mele no Kuali‘i* (A Chant for Kuali‘i)

The following *oli* was chanted as a peace offering at the battle of Honouliuli on the plains of Keahumoa. As the chanting ended, the armies of Ko‘olauloa ceded its districts of Ko‘olauloa, Ko‘olaupoko, Waialua, and Wai‘anae to Chief Kuali‘i. Upon hearing of his victory, the king of Kaua‘i gave over his rule and Kuali‘i possessed all of the islands from Hawai‘i to Ni‘ihau. (Fornander 1917:400)

O Kaweloiki puu oioi,	Kaweloiki, the shap-pointed hill
Puu o Kapolei e –	Hill of Kapolei
Uliuli ka poi e piha nei – o Honouliuli;	Blue is the poi which appeases [the hunger] of Honouliuli;
Aeae ka paakai o Kahuaiki – Hoaeae,	Fine is the salt of Kahuaiki – Hoaeae
Pikele ka ia e Waikele – o Waikele;	Slippery is the fish of Waikele – Waikele;

Ka hale pio i Kauamoa – o Waipio;	The arched house at Kauamoa – Waipio
E kuu kaua i ka loko awa – o Waiawa;	Let us cast the net in the awa-pond – of Waiawa
Mai hoomanana ia oe – o Manana.	Do not stretch yourself at – Manana
He kini kahawai,	Many are the ravines
He lau kamano – o Waimano;	Numerous the sharks, at Waimano
Ko ia kaua e ke au – o Waiau;	We are drawn by the current of Waiau;
Kukui malumalu kaua – Waimalu;	In the kukui grove we are sheltered – in Waimalu;
E ala kaua ua ao-e –o Kalauao;	Let us arise, it is daylight – at Kalauao;
E kipi kaua e ai – o Aiea;	Let us enter and dine – at Aiea;
Mai hoohalawa ia oe – o Halawa;	Do not pass by – Halawa;
[Fornander 1917:400]	

3.5 *Mele* (Song)

3.5.1 Pūpū o ‘Ewa

The following *mele* pays tribute to the ‘Ewa District and makes reference to the discovery of *pipi*, or pearl oysters, in Pearl Harbor. Although this *mele* does not make direct reference to Hō‘ae‘ae; the waters of Pearl Harbor, the Wai‘anae Mountain Range and the broader lands of ‘Ewa are all tangible place markers undoubtedly observed or experienced by the people of Hō‘ae‘ae. The composer of this *mele* is unknown although it is said that the song was created in a fund-raising effort for Ka-hiku-o-ka-lani Church (the seventh of the kings) in Pearl City.

Hui:	Chorus:
Pūpū (a‘o ‘Ewa), i ka nu‘a (nā kānaka)	Shells (of ‘Ewa), throngs (of people)
E naue mai (e ‘ike) i ka meahou (o ka ‘āina),	Coming (to learn) the news (of the land),
A he ‘āina (ua kaulana), mai nā (kūpuna mai).	A land (famous) from the (ancients on).
Alahula Pu‘u-loa, he ala hele nō Ka-‘ahu-pahau (Ka-‘ahu-pāhau).	In the seas of Pearl Harbor, the path trod upon by Ka-‘ahupahau (Ka-‘ahu-pāhau).
Alahula Pu‘u-loa, he ala hele nō Ka-‘ahu-pahau (Ka-‘ahu-pāhau).	In the seas of Pearl Harbor, the path trod upon by Ka-‘ahupahau (Ka-‘ahu-pāhau).
Nani Ka‘ala, hemolele i ka mālie,	Beautiful Ka‘ala, sublime in the calm,
Kuahiwi kaulana a‘o ‘Ewa,	Famous mountain of ‘Ewa

E ki‘i ana i ka makani o ka ‘āina.	That fetches the wind of the land.
Hea ka Moa‘e, eia au, e ke aloha.	The tradewind calls, here I am, beloved.
Kilakila ‘o Polea noho i ka ‘olu,	Majestic Polea in the coolness,
Ia home ho‘ohihi a ka malihini,	Home delightful to visitors,
E walea ana i ka ‘olu o ke kiawe	Relaxing in the coolness of *kiawe*
I ka pā kolonahe a ke Kiu.	And the soft blowing of the Kiu wind.
[Elbert and Mahoe 1970:88]	

3.5.2 Waipi‘o

This *mele* was co-composed by Mekia (Major) Kealaka‘i, alongside George Allen and Charles Hopkins for the daughter of John Papa ‘Ī‘ī, Irene Kahalelauokekoa Holloway and their family home at Waipi‘o, ‘Ewa, O‘ahu (Huapala n.d.).

‘O kāu hana mau nō ia	It has always been your way
‘O ka ho‘okipa i ke aloha	To be hospitable and welcoming
A na‘u i ho‘oheno mua	I found favor once before
Ka makani ‘o Laulani	With the wind of Laulani
He inoa kēia nō Waipi‘o	This song is for Waipi‘o
‘O Kahalelauokekoa	A tribute to Kahalelauokekoa
I pū ‘ia i ke ‘ala	Fragrance fills the air
Onaona i ka ihu	So sweet and pleasing
E ka i‘a hāmau leo	The pearl oysters
E hi‘ipoi mālie nei	Held so dear
I ka mea kameha‘i	Are wonderous creatures
O ua ‘āina nei	From this region
[Huapala n.d.]	

Section 4 Traditional and Historical Accounts of Waimea

4.1 Pre-Contact to Early Historic Period

The rich resources of the shoreline fishponds, the numerous springs, and the irrigated lands along the streams allowed central ‘Ewa to flourish as a lively population center and was often taken by competing chiefs in pre-Contact times. Handy (1940:82) noted that Hō‘ae‘ae had “a moderate-sized area of terraces watered by springs inland from West Loch of Pearl Harbor.” Handy (1940) was most impressed by the resources of Waipi‘o:

> Between West Loch of Pearl Harbor and Loko Eo, the lowlands were filled with terraces which extended for over a mile up into the flats along Waikele Stream. The lower terraces were formerly irrigated partly from Waipahu Spring, which Hawaiians believe came all the way through the mountains from Kahuku. It is said that terraces formerly existed on the flats in Kipapa Gulch at least 2 miles upstream above its junction with Waikele. Wild taros grow in abundance in upper Kipapa Gulch. [Handy 1940:82]

Thriving human habitation here is attributable, for the most part, to the plentiful marine and estuarine resources available at the coast. Other subsistence-related features of this area include irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest resources. 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 sporadic 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 (Hammatt et al. 1991). The lowlands, bisected by ample streams, were ideal terrain for the cultivation of irrigated taro. The hinterland consisted of deep valleys running far back into the Ko‘olau Range. Between the valleys were ridges with steep sides but a very gradual increase of altitude. The lower part of the valley sides were excellent for the cultivation of yams (*Dioscorea* spp.) and bananas (*Musa* spp.). Farther inland grew the *‘awa* (kawa; *Piper methysticum*) for which the area was famous.

In addition, breadfruit (*Artocarpus altilis*), coconuts (*Cocos nucifera*), *wauke* (paper mulberry; *Broussonetia papyrifera,* used to make *kapa* for clothing), *olonā* (*Touchardia latifoli*, used to make cordage), and other plants were grown in the interior. ‘Ewa was known as one of the best areas to grow gourds and was famous for its *māmaki* (*Pipterus* spp.), used as a medicinal herb and to make *kapa* for clothing. It was also famous for a rare form of taro called the *kāī o ‘Ewa*, which was grown in mounds in marshy locations (Handy and Handy 1972:471). The cultivation of this prized and delicious taro led to the following saying:

Ua ‘ai i ke kāī-koi o ‘Ewa. He has eaten the Kāī-koi taro of ‘Ewa.

Kāī is O‘ahu’s best eating taro; one who has eaten it will always like it. Said of a youth of a maiden of ‘Ewa, who, like the Kāī taro, is not easily forgotten. [Pukui 1983:305]

Battles were fought for and on ‘Ewa lands, at times between competing O‘ahu chiefs and other times by invading chiefs from other islands. By ca. AD 1320 (based on genealogical reckoning), ‘Ewa, Kona, and Ko‘olaupoko were the dominant political districts, ruled by the sons of a chief named Māweke (Cordy 2002:21). Around AD 1400, the entire island was ruled by La‘akona. Chiefs within his line, the Māweke-Kumuhonua line, reigned until about AD 1520-1540, with their major royal center in Līhu‘e in ‘Ewa (Cordy 2002:24). Haka was the last chief of the Māweke-Kumuhonua line. He was slain by his men at the fortress of Waewae near Līhu‘e (Kamakau 1991:54). Power shifted among the chiefs of different districts from the 1500s until the early 1700s, when Kūali‘i achieved control of all of O‘ahu by defeating the Kona chiefs, then the ‘Ewa chiefs, and finally expanding his control to windward Kaua‘i. Peleiholani, the heir of Kūali‘i, gained control of O‘ahu ca. 1740 and later conquered parts of Moloka‘i. He ruled O‘ahu until his death in ca. 1778, when Kahahana of the ‘Ewa line of chiefs was selected as the ruler of O‘ahu (Cordy 2002:24–41).

4.1.1 Leeward O‘ahu Trails

Several pre-Contact/early historic trails crossed ‘Ewa: a cross-*ahupua‘a* trail that traversed ‘Ewa and connected Honolulu to Wai‘anae; a *mauka-makai* trail that branched off from the cross-*ahupua‘a* trail and approximated the boundary between Honouliuli and Hō‘ae‘ae to the Pōhākea Pass and Kolekole Pass to Wai‘anae; and a second branching *mauka-makai* trail that generally followed the path of Waikele Stream in Waikele Ahupua‘a to Wahiawā in central O‘ahu (Figure 6). The current project area is in close proximity to the former *mauka-makai* trail that delineated the approximate boundary between Honouliuli and Hō‘ae‘ae, as well as the cross-*ahupua‘a* trail that traversed Pōhākea Pass.

‘Ī‘ī (1959:97) noted the following regarding the first *mauka-makai* trail: “From Kunia the trail went to the plain of Keahumoa, on to Maunauna, and along Paupauwela, which met with the trails from Wahiawā and Waialua.” ‘Ī‘ī places the area called Kunia east of Pōhākea Pass in the *ahupua‘a* of Honouliuli and Hō‘ae‘ae, *makai* of the modern town of Kunia, and places the plain of Keahumoa between Kunia and Paupauwela, in the most *mauka* portion of Honouliuli. The trail passed near the peak called Maunauna in upper Honouliuli. To the east of Honouliuli, this trail was just *mauka* of the floodplains near Pearl Harbor, skirting the inland edges of the productive taro fields.

Kunia Road was effectively developed along a traditional Hawaiian *mauka/makai* trail that may have been in use for many centuries. While this trail may have always been somewhat braided, ascending the gentle soil slope of the southern, central valley of O‘ahu, historic maps indicate the alignment was close to Kunia Road approximately 200 m southwest of the present project area.

4.2 Early Historic Period

In a study of the resources and population of the *ahupua‘a* in ‘Ewa, Ross Cordy (1996:12) wrote a correlation study of three factors: floodplain size, fishery size, and population size.

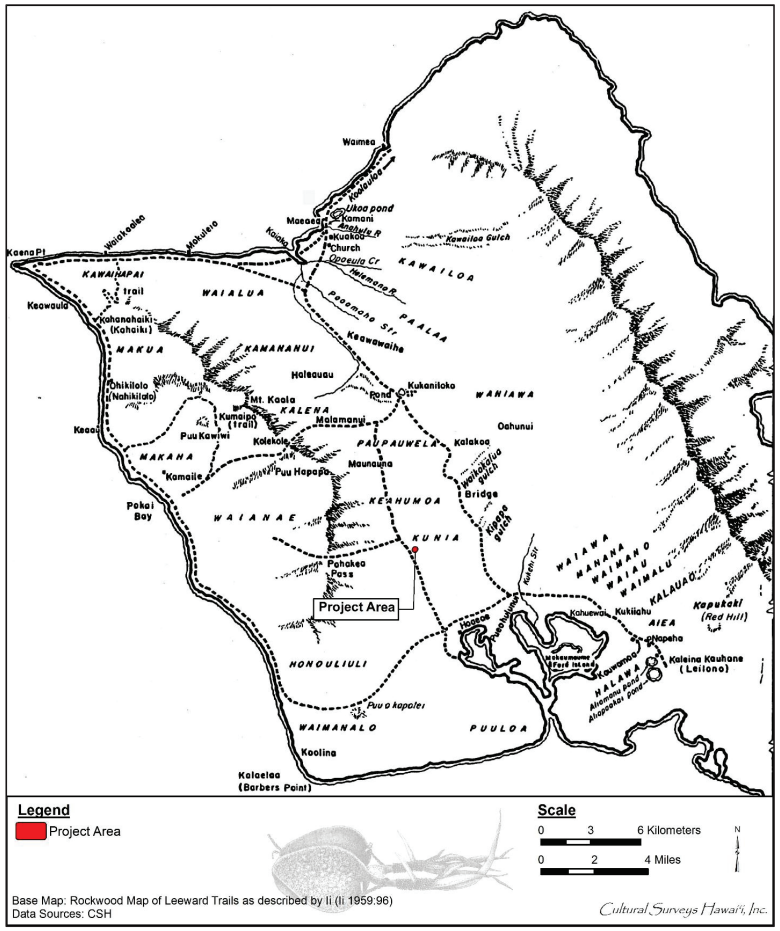

Figure 6. Portion of the Paul Rockwood map of traditional trails of Leeward O‘ahu, indicating the project area (‘Ī‘ī 1959:96)

Hō‘ae‘ae had a small floodplain area, directly adjacent to the north shore of Pearl Harbor’s West Loch, and a fairly small fishery, which took up only a small portion of West Loch. Hō‘ae‘ae had the smallest population of the four *ahupua‘a* in central ‘Ewa. However, the entire *moku* of ‘Ewa was generally prosperous and productive, and the land was heavily populated. ‘Ewa continued to be a political center through the eighteenth century when Kahahana, a Maui chief, was chosen by the O‘ahu chiefs to rule over the island. Kahahana was the son of Elani who died fighting Kahekili and was a chief of O‘ahu (Kamakau 1992:87). After the Maui war chief Kahekili conquered O‘ahu ca. 1785, he ruthlessly suppressed a rebellion of O‘ahu chiefs causing a great loss of life at Hō‘ae‘ae.

4.2.1 The Overthrow of Kahahana and his death in Hō‘ae‘ae

Kahekili, the king of Maui, sent his foster son Kahahana to rule O‘ahu, around the year AD 1779 (Cordy 2002:42). Kahahana set up his royal compound in Waikīkī, and commanded the priest Ka‘ōpulupulu to attend him there. At first Kahahana valued the *‘ike* (knowledge) of this wise priest, but after several years, Kahahana began to be cruel to the people and in protest, Ka‘ōpulupulu left Waikīkī to return to his home in Waimea. This angered the king, who sent messengers to order Ka‘ōpulupulu and his son Kahulupue to come to Wai‘anae, where Kahahana then resided.

At Wai‘anae, the two men were placed into a special grass hut, one tied to the end post and one tied to the corner post of the house. The next day, Kahahana ordered his men to torture the son of Ka‘ōpulupulu, stabbing his eyes and stoning him while his father watched. When Ka‘ōpulupulu saw this, he commanded his son to flee into the sea, saying these words, which contained a prophecy.

E nui ke aho, e ku‘u keiki,	Take a deep breath, my son,
a moe i ke kai,	and lay yourself in the sea,
no ke kai la ho‘i ka ‘āina.	for then the land shall belong to the sea.

[Pukui 1983:44]

When Kahekili heard of this outrage, he sent an army to O‘ahu to depose Kahahana. The O‘ahu force was defeated around the year 1795 (Cordy 2002:19) and Kahahana, his wife Kekuapoi, and his friend Alapai, fled westward, hiding at many places in ‘Ewa including Līhu‘e, an upper plain of Honouliuli, Hō‘ae‘ae, and Waipi‘o. Through treachery, Kahahana was induced to leave Pō‘ohilo, Honouliuli and was killed on the plains of Hō‘ae‘ae [Thrum 1998:213–214]. While hiding in Pō‘ohilo, an *‘ili* of Honouliuli:

> . . . report thereof was made to Kahekili, the king, who thereupon sent. Kekuamanoha, elder brother of Kekuapoi, the wife of Kahahana, with men in double canoes from Waikiki, landing first at Kupahu, Hanapouli, Waipio, and had instructions to capture and. put to death Kahahana, as also his friend Alapai, but to save alive Kekuapoi. When the canoes touched at Hanapouli, they proceeded thence to Waikele and Hoaeae, and from there to Poohilo, Honouliuli, where they met with Kahahana and party in conference. At the close of the day Kekuamanoha sought by enticing words to induce his brother-in-law to go on with him and see the father king and be assured of no death condemnation, and by skilled flattery he induced

> Kahahana to consent to his proposition, whereupon preparation was made for the return. On the following morning, coming along and reaching the plains of Hoaeae, they fell upon and slew Kahahana and Alapai there, and bore their lifeless bodies to Halaulani, Waipio, where they were placed in the canoes and brought up to Waikiki and placed up in the coconut trees by King Kahekili and his priests from Maui, as Kaopulupulu had been. Thus was fulfilled the famous saying of the Oahu priest in ‘all its truthfulness.’ [Manu 1904:112–113]

This slaughter became known as the Waipi‘o Kīmopō or the Waipi‘o assassination because it originated there. Kahekili avenged the death of Hū‘eu as described in detail by Fornander, who states,

> Fearfully did Kahekili avenge the death of Hueu on the revolted Oahu chiefs. Gathering his forces together, he overran the districts of Kona and Ewa, and a war of extermination ensued. Men, women, and children were killed without discrimination and without mercy. The streams of Makaho and Niuhelewai in Kona, and that of Hoaeae in Ewa, are said to have been literally choked with the corpses of the slain. The native Oahu aristocracy were almost entirely extirpated. It is related that . . . Kekelaokalani, the cousin of Kahahana’s mother and of Kahekili, made her escape to Kauai. [Sterling and Summers 1976:31]

4.2.2 Early Historical Accounts

Early historical accounts indicate ‘Ewa District was once widely inhabited by pre-Contact populations. This probably can also be said of Hō‘ae‘ae, although much less is documented regarding this *ahupua‘a*.

Captain Vancouver sailed by Kalaeloa (Barbers Point) in 1792, and recorded his impression of the small coastal village of Kualaka‘i and the arid ‘Ewa coast:

> The point is low flat land, with a reef round it . . . Not far from the S.W. point is a small grove of shabby cocoa-nut trees, and along these shores are a few struggling fishermen’s huts. [Vancouver 1798:1:167]

> . . . from the commencement of the high land to the westward of Opooroah [Pu‘uloa], was composed of one very barren rocky waste, nearly destitute of verdure, cultivation or inhabitants, with little variation all the way to the west point of the island . . . [Vancouver 1798:2:217]

> This tract of land was of some extent but did not seem to be populous, nor to possess any great degree of fertility; although we were told that at a little distance from the sea, the soil is rich, and all necessaries of life are abundantly produced . . . [Vancouver 1798:3:361–363]

Subsequent to Western Contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood forest and the introduction of domesticated animals and new vegetation species. Domesticated animals, including goats, sheep and cattle, were brought to the Hawaiian Islands by Vancouver in the early 1790s and were 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 of specific vegetation introduced to Hawai‘i are given by R. Smith and outlined by Frierson (1972:11):

(1) ‘early’, c. 1790: Prickly pear cactus, *Opuntia tuna*, Haole koa, *Leucaena glauca* and Guava, *Psidium guajava*

(2) 1835-1840: Burmuda [*sic*] grass, *Cynodon dactylon*, Wire grass, *Eleusine indica*

(3) 1858: Lantana, *Lantana camara*, *kiawe* tree (1828 or 1837)

4.2.3 Missionary Accounts

In 1828, the missionary Levi Chamberlain (1956:39–40) made a circuit of O‘ahu Island, stopping wherever there was a large enough population to warrant a sermon or to visit a school. In his trek through the ‘Ewa District, coming from Wai‘anae, he stopped in the Waimānalo ‘Ili in Honouliuli, on the western border of ‘Ewa. At around 11 o’clock the next day, on a Saturday, Chamberlain and his companions set out toward the east, reaching Waikele at 3 or 4 o’clock. The group did not stop in Hō‘ae‘ae, suggesting the population was too small for a school. Waikele had two schools, however, and obviously contained a larger population than Hō‘ae‘ae. Chamberlain decided to stay in Waikele until the next day, on the Sabbath, and preach to the Hawaiians who lived there. A crowd of 150 to 200 gathered for the sermon (Chamberlain 1956).

At Contact, the most populous *ahupua‘a* on O‘ahu was Honouliuli, with the majority of the population centered around Pu‘uloa (Pearl Harbor). In 1832, a missionary census of Honouliuli recorded the population as 1,026. Within four years, the population was down to 870 (Schmitt 1973:19, 22). The less populous *ahupua‘a* of Hō‘ae‘ae was included in a 1835 missionary census reported in the Hawaiian language newspaper *Ke Kumu Hawaii*. On 2 September 1835 *Ke Kumu Hawaii* reported that, “As of July 1835, there are 61 men, 51 women, 23 boys, and 19 girls, forming a total of 154 people in Hō‘ae‘ae” (*Ke Kumu Hawaii* 1835:n.p.).

It was also reported in 1835 that there were eight to ten deaths for every birth (Kelly 1991:157–158). Between 1848 and 1853, there was a series of epidemics of measles, influenza, and whooping cough that often wiped out whole villages. In 1853, the population of ‘Ewa and Wai‘anae combined was 2,451 people. In 1872, it was 1,671 (Schmitt 1968:71). The inland area of ‘Ewa was probably abandoned by the mid-nineteenth century due to population decline and consolidation of the remaining people in the town of Honouliuli, near Kapapapūhi Point.

4.3 **The Māhele and the Kuleana Act**

The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—that introduced private property into Hawaiian society. On 27 January 1848, the Crown and the *ali‘i* began to receive their land titles as *Konohiki* (land manager) awards. For *konohiki* lands, a claim first had to be approved by the Land Commissioners. Upon confirmation of the claim, a certificate was awarded to the claimant. This certificate was called a Land Commission Award (LCA), which confirmed the claim of an individual for a parcel. The awardee could then obtain from the Minister of the Interior a Royal Patent (RP), which indicated the government’s interest in the land had been settled by the payment of a commutation fee.

Commutation means “an exchange, or replacement.” The commutation fee was usually set at a maximum of one-third of the value of the unimproved land. The fee could be settled by the exchange of cash but was usually settled by the return of one-third of the lands (or cumulative value of the lands) originally awarded to the claimant (Chinen 1958:13).

On 19 October 1849, the Hawaiian Privy Council adopted resolutions to protect the rights of native tenants, the *maka‘āinana*, or the “common” people. The Kuleana Act of 1850 confirmed these rights. Under this act, the claimant was required to produce two witnesses who knew the claimant and the boundaries of the land, knew that the claimant had lived on the land for a minimum of two years, and knew that no one had challenged the claim. The land also had to be surveyed. Native tenants or naturalized foreigners who could prove occupancy on the parcels before 1845 could be awarded lands they occupied or that they cultivated as *kuleana* (land holding of a tenant or *hoa‘āina* residing in the *ahupua‘a*) awards. No commutation fee was necessary to apply for a Royal Patent for a *kuleana* award, as the commutation fee had presumably already been paid by the *ali‘i* / *konohiki* who had been awarded the entire *ahupua‘a*, or *‘ili* in which the native tenant claimed his own small parcels (Chinen 1958:29–30).

It is through records for Land Commission Awards generated during the Māhele that the first specific documentation of life in Hawai‘i, as it had evolved up to the mid-nineteenth century, comes to light. Although many Hawaiians did not submit or follow through on claims, or simply were not granted the claims for their lands, the distribution of LCAs can provide insight into patterns of residence and agriculture; many of these patterns probably had existed for centuries past. Examination of the patterns of *kuleana* LCA parcels in the vicinity of the project area can provide insight into the likely intensity and nature of Hawaiian activity in the area.

A total of 23 land claims were made in the Hō‘ae‘ae Ahupua‘a, with 20 claims awarded to *maka‘āinana* (Table 1). The bulk of these claims deal with Hō‘ae‘ae fisheries around West Loch to the south of the project area. No *kuleana* LCA claims were near the present project area. The project area is within the 3,453 acres of Māhele Award 193 (Figure 7), surveyed by Metcalf in 1848 and awarded to Lewis Rees, the servant of Manuia. All unclaimed lands in the *ahupua‘a* were awarded to Nueku Nāmau‘u as Māhele Award 63 (LCA 10474). Nāmau‘u was a descendant of Hawai‘i island chieftains and a cousin (or nephew) to Mataio Kekūanao‘a, the father of two Hawaiian monarchs, Alexander Liholiho (Kamehameha IV) and Lot Kapuāiwa (Kamehameha V) (Day 1984:69).

Table 1. Land Commission Awards in Hō‘ae‘ae Ahupua‘a

LCA	Awardee	*‘Ili*	Land Use
193	Rees, Lewis		One *‘āpana* (lot or parcel); 3,453 acres Pasture lands
750	Mokumakuaole	Koipu, Kalokoloa	One *‘āpana*; 0.85 acres
887	Kaihikapu	Kalaikea, Kapapapuhi, Kuainihi, Kalokoeli, Pakai	Kalaikea one *‘āpana*; 1.189 acres Kapapapuhi one *‘āpana*; 0.45 acres
889	Puko	Waihi	One *‘āpana*; 2.082 acres
899	Kahooweliweli	Amakeahilalo	One *‘āpana*; 1.45 acres House lot
909	Kaneiahuea	Paniu, Kalahale, Lihue, Kumuhau	Kalahale one *‘āpana*; 0.244 acres Panui one *‘āpana*; 2.374 acres House lot
1533	Kealaiki	Muki, Waihi, Kalokoeli	One *‘āpana*; 2.22 acres Four *lo‘i*
1561	Kaumanu	Amakeahiluna, Kamalokala	One *‘āpana*; 1.73 acres
1562	Kapili	Kaaiiole, Koipuu	Two *‘āpana*; 1.93 acres
1571	Kalihue	Kamalokala	One *‘āpana*; 1.239 acres
1578	Kaihumai	Laekea	Two *‘āpana*; 0.855 acres
1582	Kukahoe	Koipu	Two *‘āpana*; 0.575 acres
1583	Kekapa	Waihi	Two *‘āpana*; 1.77 acres House lot
1601	Kekoamiki	Keahupuaa, Kaaiiiole, Holokoeli	One *‘āpana*; 1.3 acres House lot
1605	Kaualei	Koipuiki, Koipu	Koipuiki one *‘āpana*; 0.73 acres Koipu one *‘āpana*; 0.25 acres
1660	Ewa	Kahuu	Two *‘āpana*; 1.64 acres
1707	I	Kalokoeli	Two *‘āpana*; 3.966 acres House lot
1721	Hinawale	Kuainiho, Kaaiiole	One *‘āpana*; 1.65 acres
5634	Kaiwi	Kalokoeli, Koipuu	One *‘āpana*: 0.567 acres
10474	Namauu	Ahupua‘a	*‘Āpana* 9

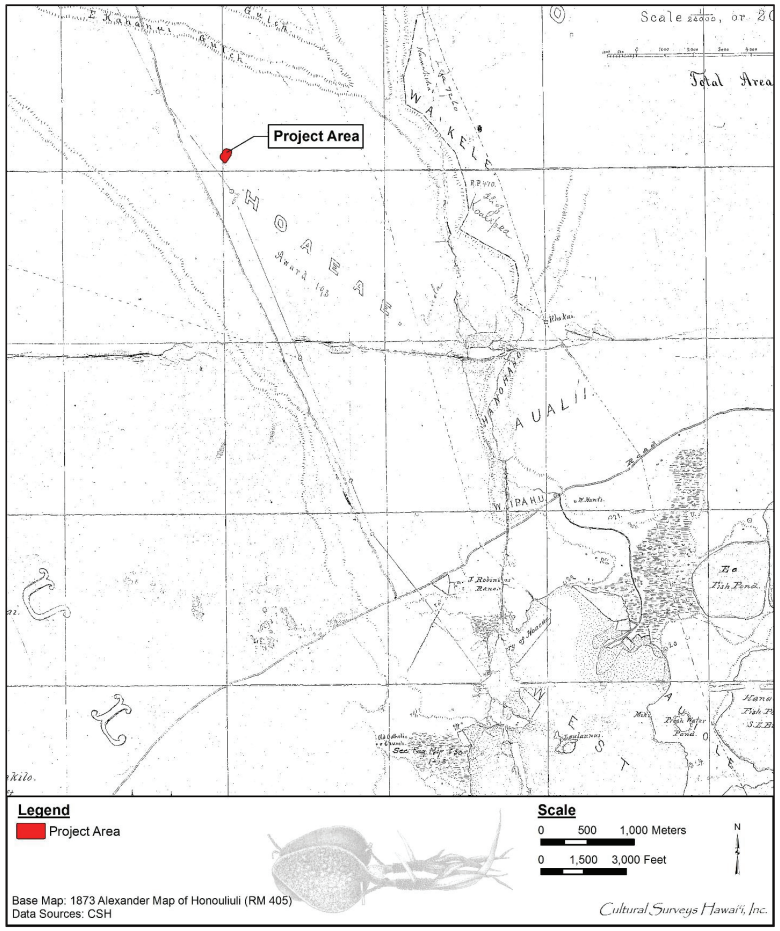

Figure 7. Portion of the 1873 W.D. Alexander map of Honouliuli showing the project area within LCA 193

4.4 Mid- to Late 1800s

4.4.1 Explorer and Military Surveys

The first foreign attempt to survey Pearl Harbor was made in 1840 during the U.S. Exploring Expedition led by Charles Wilkes. He described the area as follows:

> In this district is a large inlet of the sea, into which the river Ewa empties; at the entrance of this inlet is the village of Laeloa: the whole is known by the name of Pearl River or harbour, from the circumstance that the pearl oyster is found here; and it is the only place in these islands where it occurs.
>
> The inlet has somewhat the appearance of a lagoon that has been partly filled up by alluvial deposits. At the request of the king, we made a survey of it: the depth of water at its mouth was found to be only fifteen feet; but after passing this coral bar, which is four hundred feet wide, the depth of water becomes ample for large ships, and the basin is sufficiently extensive to accommodate any number of vessels. If the water upon the bar should be deepened, which I doubt not can be effected, it would afford the best and most capacious harbour in the Pacific. [Wilkes 1845:79]

In 1873, General Schofield presented a confidential report to the U.S. Secretary of War, recommending that Pearl Harbor should be available to the U.S. Navy. Schofield wrote the following:

> In case it should become the policy of the Government of the United States to obtain the possession of this harbor for naval purposes, jurisdiction over all the waters of Pearl River with the adjacent shores to the distance of 4 miles from any anchorage should be ceded to the United States by the Hawaiian Government . . .
>
> The cession of Pearl River could probably be obtained by the United States in consideration of the repeal of the duty of Sandwich Island sugar. Indeed, the sugar-planters are so anxious for a reciprocity treaty, or so anxious rather for free trade in sugar with the United States, that many of them openly proclaim themselves in favor of annexation of these islands of the United States. [Sen. Ex. Docs, 52nd Cong. 2nd Sess. No. 77:150–154, reproduced in Judd 1971:Appendix 3]

This reciprocity treaty was concluded in 1876, with the provision that Hawai‘i would not “lease or relinquish sovereignty to another country or any harbor, etc.” In 1887, the treaty was renewed and amended to allow the United States the “exclusive right to enter the harbor of Pearl River, in the Island of Oahu, to establish and to maintain there a coaling and repair station for the use of vessels of the United States” (Judd 1971:128).

4.4.2 The Oahu Sugar Company and the Waiahole Ditch System

In 1889, Benjamin Dillingham organized the OR&L. The railroad connected the outlying areas of O‘ahu to Honolulu. By 1890, the railroad reached from Honolulu to Pearl City and continued on to Wai‘anae in 1895, to Waialua in 1898, and to Kahuku in 1899 (Kuykendall 1967:100).

The Oahu Sugar Company was incorporated in 1897 and included lands in the foothills and central valley of O‘ahu above the ‘Ewa plain and Pearl Harbor. The 12,000 acres of land were leased from the estates of ‘Ī‘ī, Bishop, and Robinson and had over 900 field workers composed of

44 Hawaiians, 473 Japanese, 399 Chinese, and 57 Portuguese. The sprawling plantation “covered some 20 square miles . . . ranging in elevation from 10 feet at the Waipio Peninsula . . . to 700 feet at the Waiāhole Ditch” (Condé and Best 1973:313).

Prior to commercial sugar cultivation, the Oahu Sugar Company lands were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiahole Water project” (Condé and Best 1973:313). In 1890, Dillingham had successfully promoted the Ewa Plantation Company, the sprawling sugar company just south of the Oahu Sugar Company. Artesian wells had converted those arid ‘Ewa lands into a thriving plantation, and Dillingham recognized the same potential in the Oahu Sugar Company lands.

Water to irrigate the *mauka* cane fields was initially pumped to elevations of 500 ft by some of the “largest steam pumps ever manufactured” (Dorrance and Morgan 2000:49). The expense of pumping water to the high elevations of the plantation led to the proposal to transport water from the windward side of the Ko‘olau Mountains. The Waiahole Water Company was formally incorporated in 1913 and was originally a subsidiary of the Oahu Sugar Company. The Waiahole Ditch was designed by engineer Jorgen Jorgensen, with recommendations by engineer J.B. Lippencott, and assisted by W.A. Wall. The original system, when completed, included 27 tunnels connecting with 37 stream intakes on the north side of the Ko‘olau; the main bore through Waiāhole Valley; 14 tunnels on the southern side of the Ko‘olau at Waiawa; and a ditch extending westward to Honouliuli (Condé and Best 1973:37). Upon its completion in 1916, the Waiahole Ditch was 21.9 miles long (35 km) and cost $2.3 million to construct. The 32 million gallons of daily water enabled the Oahu Sugar Company to grow “some 20 square miles . . . ranging in elevation from 10 feet at the Waipio Peninsula . . . to 700 feet at the Waiahole Ditch” (Condé and Best 1973:313).

The Waiahole Ditch passed through Hō‘ae‘ae, bringing much needed water to the area:

> West of Waikakalaua Gulch, through Hoaeae and to the upper boundary of Oahu Plantation in Honouliuli, the conduit consists of 12,650 feet of cement-lined ditches, and three redwood pipes 5 feet in diameter, having an aggregate length of 2,830 feet. [Kluegel 1917:96]
>
> The Waiahole Water Co. has taken over from the Oahu Sugar Co. the Ahrens Ditch in Waiawa, the Kipapa Ditch, the Waikakalaua Ditch in Waipio, and the Hoaeae Ditch. Two redwood pipes having a total length of 1,223 feet have been laid across two gulches on the line of Hoaeae Ditch, cutting out 2 ¼ miles of ditch. The water delivered by the Waiahole System is chiefly used on newly planted cane on land above the lift of the pumps. [Kluegel 1917:107]

The Waiahole Ditch system, with some modifications, remains in use.

4.5 1900s

In Hō‘ae‘ae and Honouliuli, the cultivation of sisal (*Agavacea*) for high quality rope fiber was attempted on arid lands, although no evidence suggests this enterprise or similar efforts to grow pineapple affected the project area in any way. Thrum’s *Hawaiian Almanac and Annual* speaks of the prospect of sisal cultivation glowingly from 1904 to 1912, but the greater profits to be made from sugarcane cultivation eventually led to the decline of this industry. Upper Hō‘ae‘ae seems to

have been the focus of sisal cultivation by the Hawaiian Fiber Company as shown in excerpts from Thrum’s 1909 (Thrum 1908:167) and 1913 (Thrum 1912:171) annuals.

Further, a Japanese pineapple grower’s enterprise, the Waipio Pineapple Company, was founded in 1908, leasing approximately 808 acres in portions of Kīpapa Gulch (Kimura 1988:103). In 1917, Libby, McNeill & Libby took over Waipio Pineapple Company’s leases and continued to cultivate pineapple in the area (Hawkins 2011:122). By the late 1920s, James Dole’s Hawaiian Pineapple Company, incorporated in 1901, was cultivating pineapple on thousands of acres leased from the ‘Īī estate in the *mauka* area of Waipi‘o.

Besides sisal, cotton, and pineapple, other crops were grown in central ‘Ewa. One such crop was macadamia nut:

> At Hoaeae, in the Ewa district, is another tract of about six acres on the Robinson estate, reported to be in fine condition . . . Mr. Grant Bailey, manager of the Hoaeae Ranch, kindly furnishes the following data on the infant industry . . . ‘Our planting is about six acres. Apparently one would have to wait about ten years before expecting commercial results on the planting. Our oldest trees are seven years old and they are just now beginning to bear.’ [Thrum 1927:96]

Many irrigated crops such as pineapple, coffee, and macadamia nuts were grown for export markets; however, sugar became the king of crops and fields of sugarcane dominated the landscapes of Hawai‘i from the 1880s through the 1980s. For much of that century, sugar was the single greatest force at work in Hawai‘i—not only economically and politically but socially and environmentally.

The Donn map of 1906 (Figure 8) shows the project area within the extensive Oahu Plantation sugar cultivation lands. The traditional *mauka-makai* trail on the Honouliuli/Hō‘ae‘ae boundary (see Figure 6) is now shown as an unimproved road, but no other development is indicated in the vicinity.

Sugar production at the Oahu Sugar Company, which included the land within the current project area, increased from 29,983 tons in 1915 to 50,005 tons in 1918. The expense of pumping water to the high elevations of the plantation led to the proposal to transport water from the windward side of the Ko‘olau Mountains. The subsidiary Waiahole Water Company was formed in 1913 to dig a tunnel through the Ko‘olau range to transport runoff from the eastern side of the mountains. The Waiāhole Ditch was built to pass through Hō‘ae‘ae, immediately to the north of the project area, bringing water via an interconnected network of irrigation flumes (Figure 9). Figure 10 and Figure 11 show workers at the Waiāhole Tunnel ca. 1916 and the Oahu Sugar Company ca. 1933. Such teams likely excavated the Waiāhole Ditch immediately north of the present project area.

Subsequent maps show the project area surrounded by sugarcane infrastructure, including roads/trails, ditches, reservoirs, and railroads (Figure 12 through Figure 18). The 1919 U.S. Army fire control map (see Figure 12) indicates sugarcane cultivation south of the current project area, however, it is not clear if the project area itself is yet under cultivation at this point. The 1919 map shows small plantation reservoirs immediately southwest and northeast of the project area but these appear different than the bracketing reservoirs subsequently depicted. It appears a ditch extended

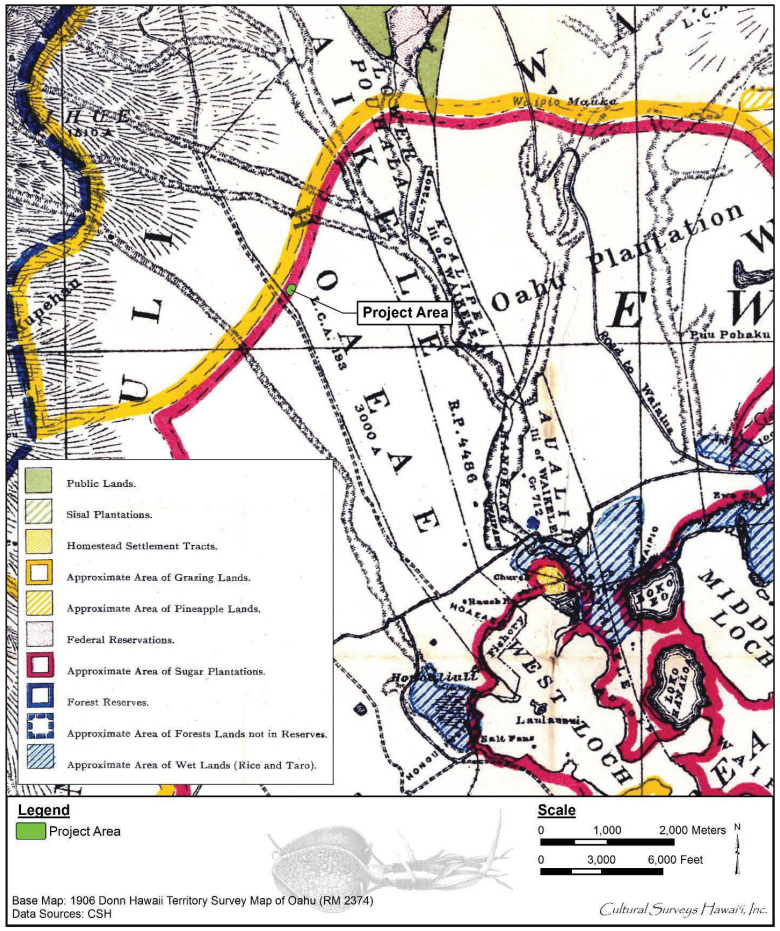

Figure 8. 1906 Donn Hawaii Territory Survey map of O‘ahu showing the project area within the Oahu Sugar Company plantation

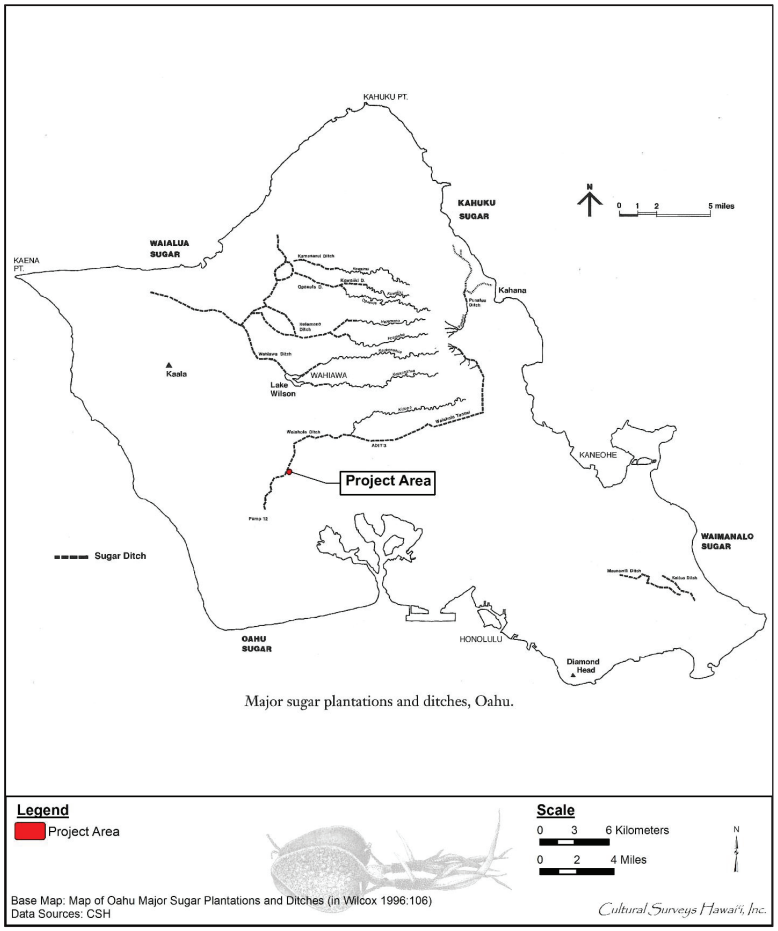

Figure 9. Map of O‘ahu major sugar plantations and ditches (Wilcox 1996:106) showing the location of the project area

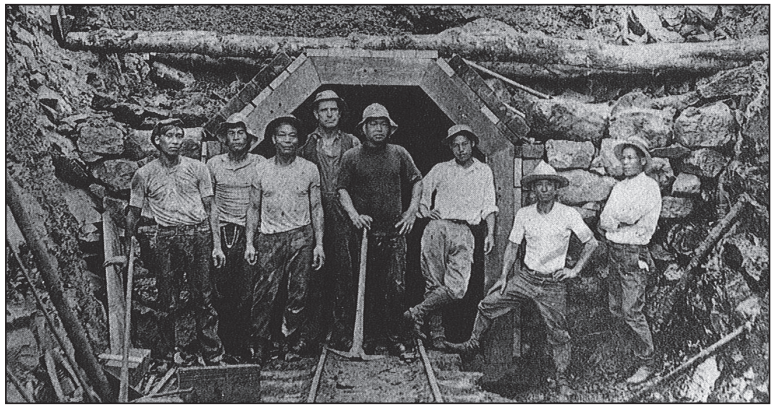

Figure 10. Workers at the Waiāhole Tunnel, ca. 1916 (Wilcox 1996:107)

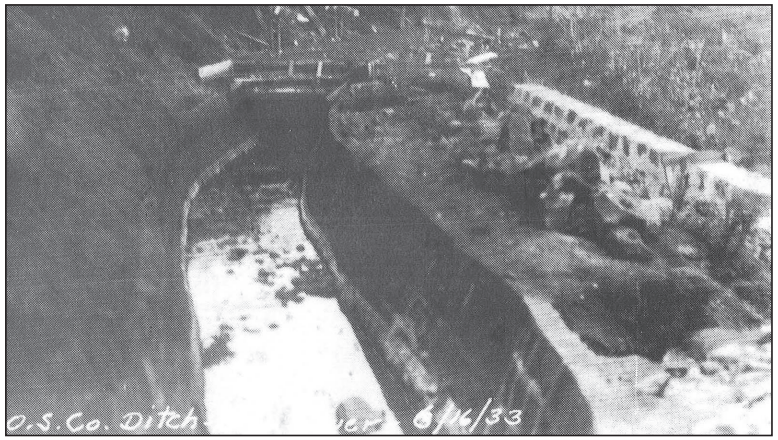

Figure 11. Oahu Sugar Company irrigation ditch under construction in 1933 at Kīpapa Gulch (Bishop Museum)

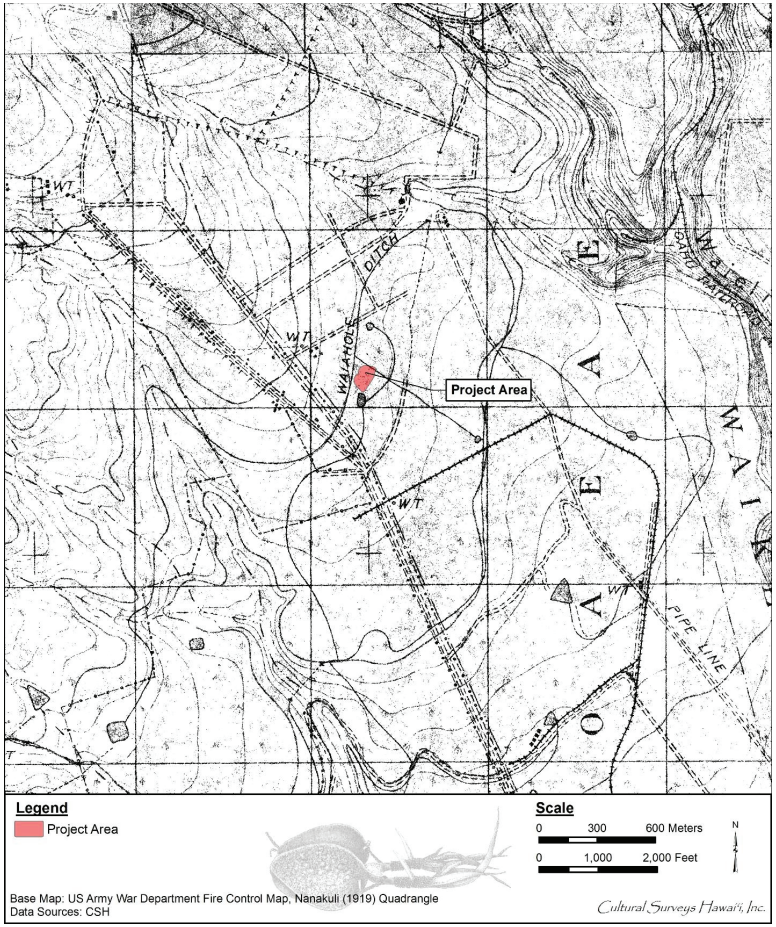

Figure 12. 1919 U.S. Army War Department fire control map indicating the project area surrounded by sugarcane cultivation and associated infrastructure

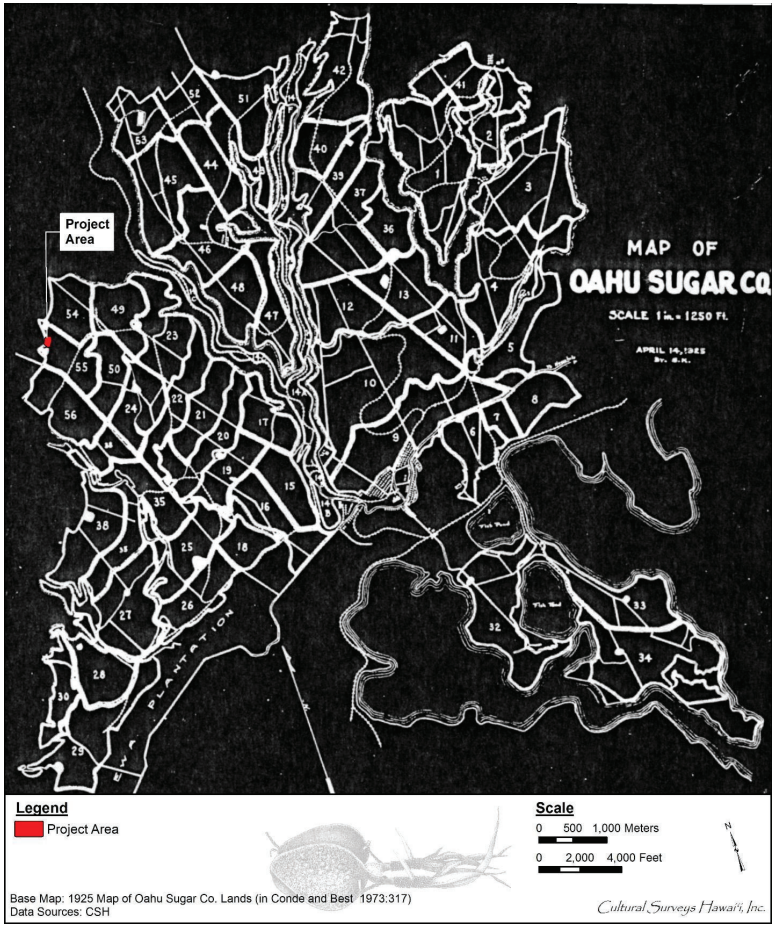

Figure 13. 1925 map of Oahu Sugar Company Lands indicating the project area within Field 55 (Condé and Best 1973:317)

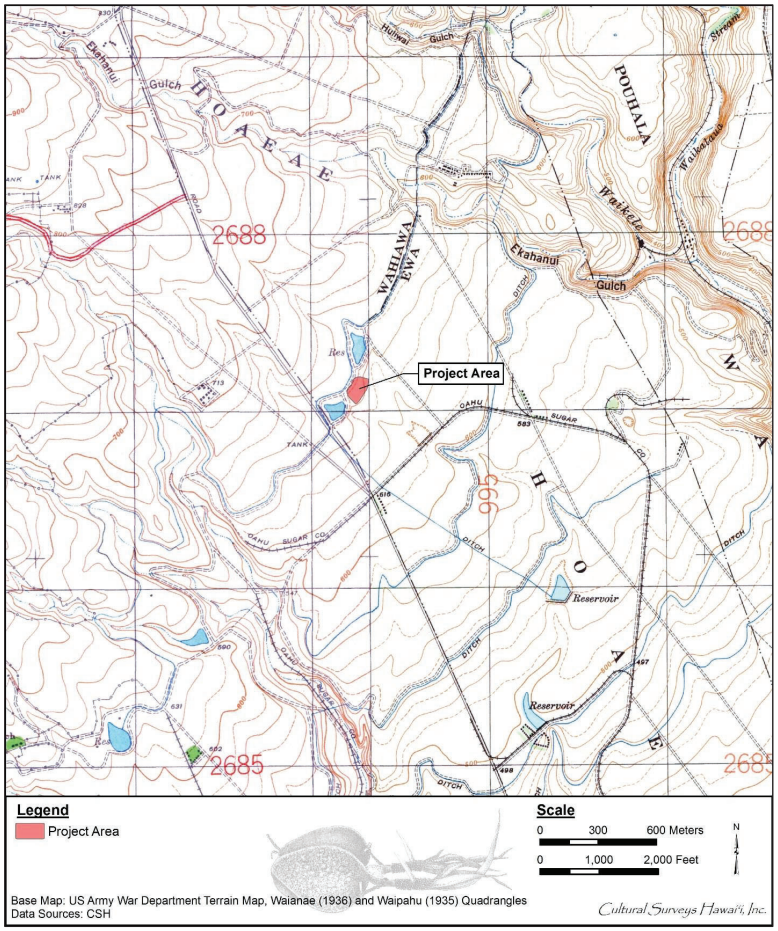

Figure 14. Portion of U.S Army War Department terrain map, Waipahu (1935) and Waianae (1936) Quadrangles, indicating the project area (ditches are depicted as blue lines, and unimproved roads are depicted as two parallel dashed lines)

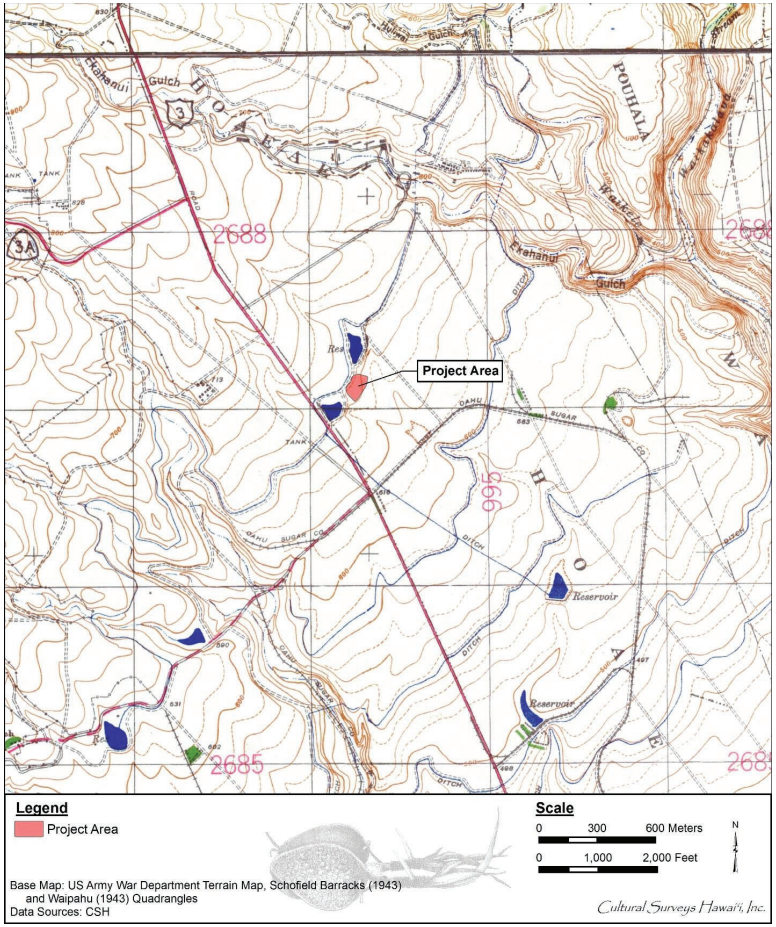

Figure 15. 1943 Portion of U.S Army War Department terrain map, Waipahu and Schofield Barracks Quadrangles, indicating the project area

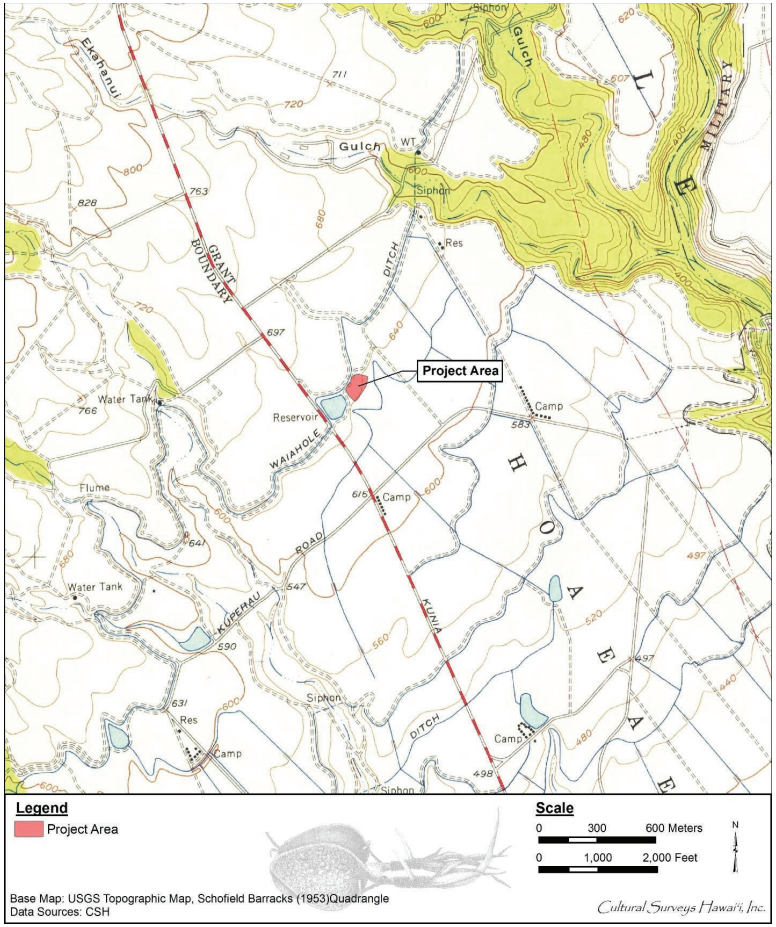

Figure 16. Portion of 1953 Schofield Barracks USGS topographic quadrangle indicating the project area

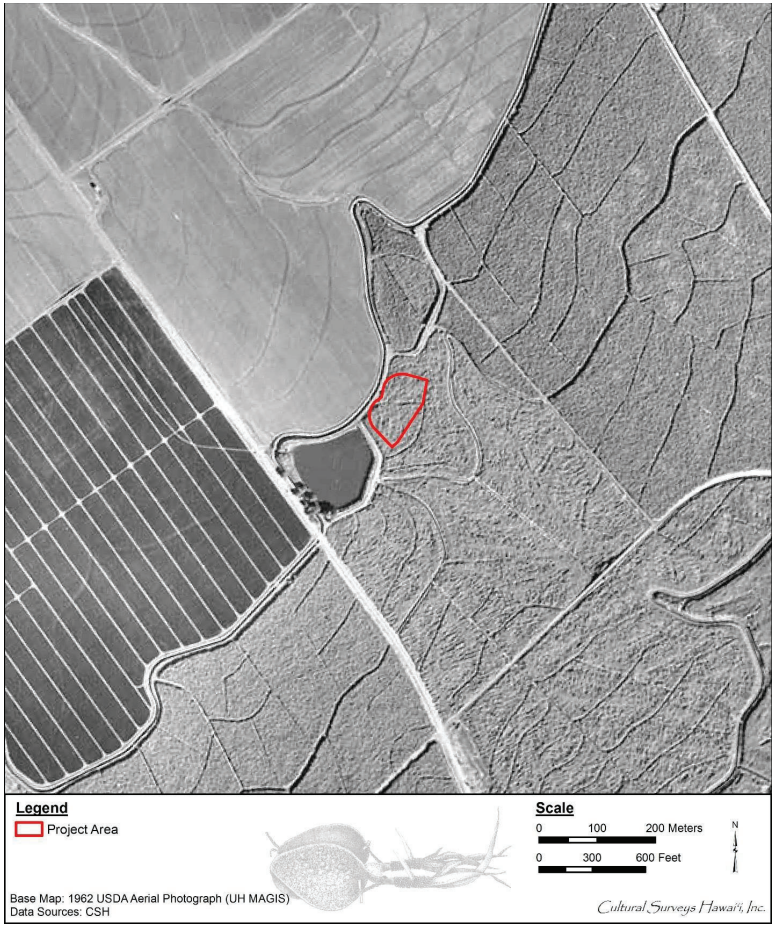

Figure 17. 1962 USDA aerial photograph (UH MAGIS) showing the project area

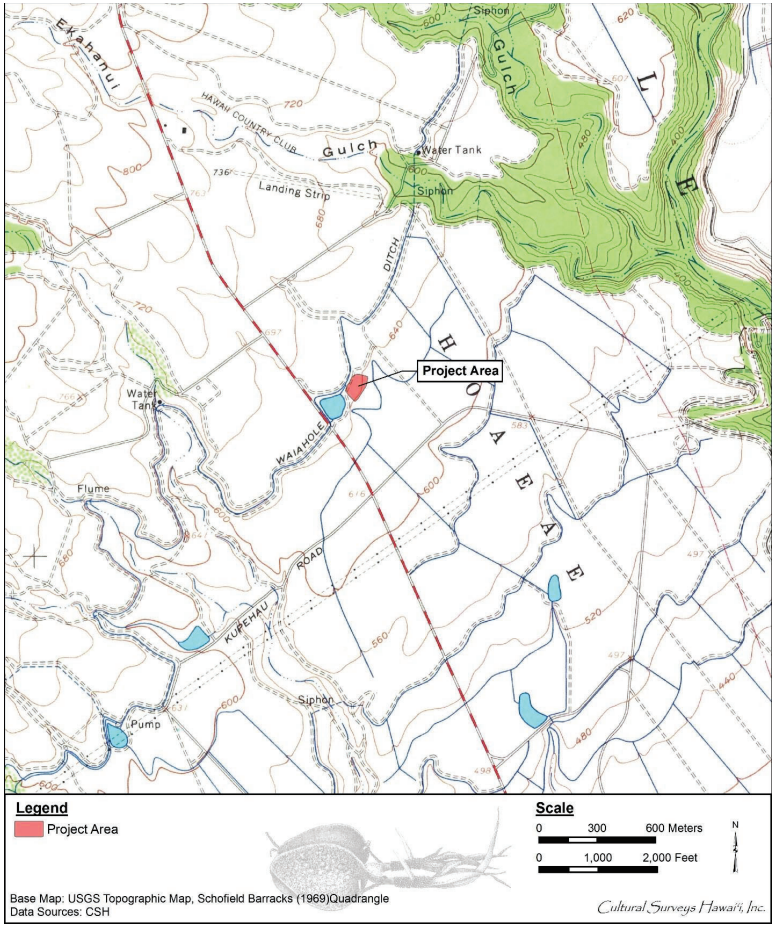

Figure 18. Portion of 1969 Schofield Barracks USGS topographic quadrangle indicating the project area

straight southeast from the Waiāhole Ditch through the northeast side of the project area to a small reservoir 800 m downslope.

A 1925 map of Oahu Sugar Company lands (see Figure 13) appears to show the project area within the north edge of Field 55, indicating it was a relatively late field (numbers range from 1 through 56), likely due to its proximity to the mill in Waipahu. This map indicates Kunia Road just to the southwest was a major *mauka* access road at the time.

The 1936 map (see Figure 14) shows the project area bracketed between two similar-sized reservoirs immediately to the southwest and north. Small plantation camps are depicted approximately 500 m to the west and south but otherwise the project area appears to be pretty much just fields and irrigation and transportation infrastructure. The 1943 map (see Figure 15) shows virtually the same scene.

In some ways, the 1953 USGS map (see Figure 16) is very much the same but notably the Oahu Sugar Company train tracks that have been prominent since 1919 (see Figure 12) are now gone and the network of cane haul roads are more prominent. Another irrigation ditch system has been developed following the contour just downslope of the project area. The reservoir just to the north is no longer shown. It seems probable that the project area has been continuously in sugarcane cultivation for decades.

The 1962 aerial photograph (see Figure 17) shows the project area as completely in cane fields. Even the former reservoir just to the north is completely in cane fields. The 1969 map shows much of the same scene (see Figure 18).

Innovation was encouraged at the Oahu Sugar Company. Mechanical loading of harvested cane began in 1924 and mechanical harvesting was introduced during World War II. A plantation railroad carried harvests to a mill at Waipahu and the raw sugar was transported to the Honolulu docks by the OR&L until the railroad was replaced by trucks in 1950. In 1970, when the Ewa Plantation ceased operations, much of its land was acquired by the Oahu Sugar Company, which produced some 76,925 tons of sugar from 11,526 cultivated acres in 1990. However, by 1993 both the plantation and the mill were surrounded by urban growth, and the Oahu Sugar Company closed after the 1995 harvest.

4.6 Hō‘ae‘ae in the Popular Press (1853-1918)

It is often the case that the popular press offers insights into land use, social history, and the traditional and customary practices of ethnic communities that are not available from standard historical studies. This is particularly true for smaller, more obscure areas such as the Hō‘ae‘ae Ahupua‘a that have not been a major focus of historical study. The relatively recent advent of searchable archives such as the Library of Congress “Chronicling America” website has offered a time-efficient research tool to further explore the land use, social history, and the practices of ethnic communities in Hō‘ae‘ae Ahupua‘a. A total of 352 newspaper articles from a dozen newspapers were reviewed that included the key word “Hoaeae” spanning the timeframe from January 1853 through June 1918. The “Chronicling America” website appears to address Hawai‘i newspapers from 1836 through 1922; reasons for the apparent absence of articles at the end of this range are unclear. It may be the case that there were no articles about Hō‘ae‘ae between 1836 and 1853 and it may be the case that the place name “Hō‘ae‘ae” “dropped out” of popular usage following World War I as it was replaced by more popular place names such as “Waipahu.” Only

one of these newspaper articles was not about Ho‘ae‘ae Ahupua‘a in ‘Ewa (there was a Ms. Hoaeae of Kaua‘i).

References to Hō‘ae‘ae were identified in the following 12 newspapers:

- *Daily Bulletin* (1888–1893),
- *Evening Bulletin* (1896–1912),
- *Hawaii Holomua Progress* (1893),
- *Hawaiian Gazette* (1888–1917),
- *Hawaiian Star* (1893–1912),
- *Hilo Tribune* (1903),
- *Honolulu Republican* (1901),
- *Honolulu Star-Bulletin* (1912–1917),
- *Independent* (1901),
- *Maui News* (1903–1918),
- *Pacific Commercial Advertiser* (1862–1910), and the
- *Polynesian* (1853-1862).

4.6.1 Control of Access to Hō‘ae‘ae Lands

One of the most popular themes for Hō‘ae‘ae lands in popular newspapers is small advertisements restricting access or “trespass.” These start in September 1889 with a “Notice” promulgated by A.J. Campbell, Manager of Hoaeae Ranch, forbidding “shooting or trespass” (*Daily Bulletin* 4 September 1889 “Notice”). Some 98 trespass notices were identified in *Daily Bulletin* (1889–1893), *Pacific Commercial Advertiser* (1892–1905), *Hawaiian Star* (1901), and *Evening Bulletin* (1901–1905). The trespassing prohibitions promulgated by Hoaeae Ranch are associated with A.J. Campbell, S.M. Damon, J.I. Dowsett, and J.M. Dowsett. M.P. Robinson is much associated with trespass notices for Hō‘ae‘ae (1893–1905) that do not specifically reference the Hoaeae Ranch. In 1910, the Hawaiian Fibre Company, Ltd. was actively warning people not to trespass or shoot on their Hō‘ae‘ae lands *(Pacific Commercial Advertiser* 28 September 1910). All of these trespass notices reference “shooting,” “shooting of game,” “hunting,” or “sportsmen” and it appears self-evident that unauthorized hunting on Hō‘ae‘ae lands was perceived as enough of a problem that it needed to be addressed repeatedly.

One aspect of these trespass notices is that large landowners clearly believed they had the exclusive right to regulate public access to their lands from as early as 1889, during the years of the Hawaiian Kingdom.

4.6.2 Hunting at Hō‘ae‘ae and Vicinity

The 98 identified trespass notices for Hō‘ae‘ae noted above all reference “shooting,” “shooting of game,” “hunting,” or “sportsmen,” suggesting there was something to hunt at Hō‘ae‘ae. In the odd case of the shooting of Ah See in the back at Hō‘ae‘ae by the youths Willie Davis and Mark Robinson in August 1901, it is asserted that “The boys had gone up into the mountains to hunt goats” (*Pacific Commercial Advertiser* 21 August 1901). Goats are understood to have been ubiquitous in the mountains of O‘ahu ca. 1900. An article entitled “Will Stock Preserves with Pheasants Again” notes, “A consignment of seventeen pheasants of three varieties arrived from Canada and California. These will be distributed among shooting preserves at Ahuimanu, upper

Hoaeae and Sisal” (*Evening Bulletin* 5 February 1912). It appears the prohibitions against trespassing were largely focused on preventing the poaching of game birds.

4.6.3 Diversified Agricultural Production at Hō‘ae‘ae

4.6.3.1 Cattle

Hoaeae Ranch is referenced in more than 50 articles between 1888 and 1901. It may be that the Ranch started earlier and lasted longer but it seems pretty clear sisal and sugar operations at Hō‘ae‘ae had eclipsed the ranch as an economic and social force in Hō‘ae‘ae by the beginning of the twentieth century. Most ranches not associated with the Portuguese were typically beef cattle ranches but in early 1896 there were 25 advertisements for “Table Butter” from “celebrated dairies” including Hoaeae (*Pacific Commercial Advertiser* 20 February 1896 through 21 March 1896).

4.6.3.2 Horses

It was common for ranches to raise horses, particularly for horse racing. Accounts of famous O‘ahu horses praised “Signal,” a mare, by “McClellan,” imported in 1884 by Hoaeae Ranch that produced a number of stylish saddle and carriage horses (*Pacific Commercial Advertiser* 23 December 1903).

Injuries arising from training horses were common and are reported from Hoaeae Ranch in 1898 (*Pacific Commercial Advertiser* 13 January 1898).

4.6.3.3 Rice

Clearly rice production at Hō‘ae‘ae was a major enterprise but we only have ancillary references:

- An article “Over the Oahu Railway Line” discussing the new OR&L railroad notes, “The road will reach the shores of the lagoon in Halawakai and from this point on to Hoaeae will run along the shores, passing through a continuous and unbroken rice field. . . ” (*Hawaiian Gazette* 25 September 1888).
- An article on a railroad press excursion to visit the Haleiwa Hotel notes that in passing “Through the rice fields of Waipio and Hoaeae the speed was increased” (*Pacific Commercial Advertiser* 5 August 1899).
- An article on a domestic tragedy, “Suicided While Insane,” notes that at the time of a Chinese woman at Hō‘ae‘ae taking strychnine “her husband was out in the rice fields shooting rice birds . . . ” (*Hawaiian Star* 21 November 1903).

4.6.3.4 Traditional Hawaiian Crops

The continuation of traditional Hawaiian agricultural practices at Hō‘ae‘ae in the 1853–1918 timeframe is uncertain. The newspaper accounts only record three references to taro.

The first is in a dispute between Mataio Kekūanao‘a and Charles Dana in 1856 involving “a certain tract of kalo land and a fishpond adjoining situated at Hoaeae” that resulted in a “Marshal’s sale” (*Polynesian* 7 and 21 June 1856). This suggests Hawaiian taro lands were falling out of Hawaiian ownership.

The second occurs in the case of the murder of Tong Hoon Hoo at Hō‘ae‘ae who chased a burglar, Liung Yao, “across a taro patch” only to be shot dead (*Hawaiian Gazette* 17 October 1893; *Pacific Commercial Advertiser* 16 October 1893). In this timeframe many taro patches are believed to have been managed by Chinese who converted them from taro production to rice production (and back) in response to market forces.

A third reference to taro is in an account of “Realty Transfers” from “M.P. Robinson et al to Kum Sai Yuen of six taro patches” at Hō‘ae‘ae for 10 years at $100 per year (*Hawaiian Star* 19 December 1903; *Pacific Commercial Advertiser* 19 December 1903). Again, this supports the general belief that Chinese farmers were taking over former taro lands at the turn of the century for the production of taro and/or rice.

The only other reference to any traditional Hawaiian cultigens is in an account of “The Oahu Railroad Project,” noting that the completion of the OR&L railroad to an interim terminus at Hō‘ae‘ae had the effect that “banana, vegetable and sugar culture have been stimulated and property has more than doubled in market value” (*Daily Bulletin* 14 July 1890). The indication is of commercial cultivation; there is no reference to the ethnicity of the cultivators.

A reference to a fishpond has been noted in the dispute above between Mataio Kekūanao‘a and Charles Dana in 1856 but there is no other clear reference to fishponds at Hō‘ae‘ae in these newspaper accounts.

4.6.3.5 Sisal

Commercial sisal (rope) production was a big deal in Hō‘ae‘ae for a short period. The operation bursts on the scene in 1908 with the “Hawaiian Fibre Co.” when it is reported that:

> Over 500 acres of new planting has recently been put out at the new plantation in upper Hoaeae and work is being vigorously pushed to cover the entire tract of some 1800 acres with sisal and the gulches with forest trees . . . The machinery of the company has been all overhauled and refitted and will immediately start up as the company now has 600 acres of matured plants ready to take off and 260 acres additional will be ready by the time the crop is harvested . . . The officers of the Hawaiian Sisal Company are Cecil Brown, president, M.P. Robinson, vice president . . . [*Pacific Commercial Advertiser* 30 May 1908]

Much of the initial transformation of lands at Hō‘ae‘ae may have been for sisal as documented in an article titled “Traction Plows for Hoaeae Sisal Lands”:

> The Directors of the Hawaiian Fibre Company decided to investigate the matter of traction plows for plowing Hoaeae lands adding 1200 to 1400 acres of sisal and forest to the six hundred acres the company has already planted there. The company has ‘enough in sight to keep its machinery in operation night and day for a year. It will begin shipments by the next American-Hawaiian steamship.’ [*Pacific Commercial Advertiser* 26 August 1908]

An article on “Sisal Planting” continues the bullish theme of rapid agricultural land development:

> The Hawaiian Fibre Company is planning to plow with traction plows all the Hoaeae lands and plant the same in sisal and forest, adding from 1200 to 1400 acres

> to the 600 acres they already have planted there . . . The work of harvesting at the plantation at Sisal has begun and there is sufficient in sight to keep the decorating machine at work for a year. [*Pacific Commercial Advertiser* 30 August 1908]

We appear to start learning of a new place name, “Sisal,” in 1910 (*Pacific Commercial Advertiser* 28 September 1910).

One of the last accounts of sisal at Hō‘ae‘ae comes from a Maui Island source relating that control of the Hawaiian Fibre Company sisal growers passed to the Hawaiian Pineapple Company. The fiber company was said to have had about 1,800 acres at Hō‘ae‘ae and at Sisal, near ‘Ewa:

> About 1000 acres was planted to sisal, and has since the beginning of the world war enjoyed a considerable degree of prosperity . . . The prevailing high price of sisal is said to have been the reason which urged the pineapple company to takeup the new industry. Plans have been made so that if there should be a decline in sisal prices after the war, the land can be planted to pineapples. [*Maui News* 7 June 1918]

4.6.3.6 Pineapple

At the end of the 1800s, pineapple showed promise in central O‘ahu.

> Pineapple cultivation by the Pearl City Fruit and Packing Company is a success in the uplands of Hoaeae in upper lands the company swapped for low lands. It is the intention of the company to ultimately move its cannery and packing plant to the plantation on the hills. [*Hawaiian Star* 13 January 1899]

There is no reason to believe a cannery was ever built in the uplands of Hō‘ae‘ae. A neighboring property was the holdings of “the California colony” where “pineapples, grapes, melons, strawberries, vegetables of all kinds and some fruit trees” were being cultivated (*Hawaiian Star* 13 January 1899). As noted above, in 1918 with the collapse of the sisal industry following the end of World War I, sisal lands appear to have been converted to pineapple.

4.6.4 The Rise of Oahu Sugar Company at Hō‘ae‘ae

In 1897, Benjamin Frank Dillingham promoted the Oahu Sugar Company, Inc. that leased lands from the John Papa ‘Ī‘ī, Bishop, and Robinson estates. Back as early as 1890 it was widely noted that the OR&L railroad had stimulated sugar cultivation on serviced lands (*Daily Bulletin* 14 July 1890). The Oahu Sugar Company was a calculated investment and Dillingham sought expert testimony, the sharing of which undoubtedly encouraged investors in his enterprises. This included the publishing (twice) of a letter from J. Marsden, the Commissioner of Agriculture and Forestry, regarding a proposed B.F. Dillingham plantation at “Waipio, Hoaeae and Honouliuli” who noted “the land is perfectly clear from any growth except grass” and noted the proximity of limestone for liming the fields. Commissioner Marsden commented that, “A veritable gold mine has been lying at Ewa and you are the first one who has had the courage to dig it” (*Pacific Commercial Advertiser* 2 January 1895).

An opinion was also sought from W.D. Alexander (and published twice) who concluded “Between Hoaeae and Waiawa there is land enough for a first-class plantation. . . ” (*Pacific Commercial Advertiser* 2 January 1895).

The development of the Hō‘ae‘ae fields by the Oahu Sugar Company appears to have gotten off to a slow start because of a lack of water. We learn, for example, that

> . . . 282 acres of long ratoon cane, above the 550 feet level in Hoaeae, depending entirely on rain and mountain water, could only with difficulty be kept alive during the hot summer months. Eighty two acres of this field had to be abandoned. [*Hawaiian Star* 23 February 1906]

The fields of Hō‘ae‘ae were transformed by the Waiahole Ditch.

> The Waiahole aqueduct was completed as far as the boundary line of Hoaeae and Honouliuli, on May 27, 1916 and the water turned in on that date. [*Honolulu Star-Bulletin* 16 February 1917]

> Of the area planted, 1374 acres is new land, taken in under the Waiahole ditch in Waipio and Hoaeae . . . the young ratoons, particularly in the Hoaeae and Honouliuli Sections, are in a very advanced condition . . . [*Hawaiian Gazette* 16 February 1917]

4.6.5 Ethnicity at Hō‘ae‘ae

4.6.5.1 Hawaiians

Mark Prevor Robinson was the owner of Hoaeae Ranch and among other things was a member of Queen Lili‘uokalani’s cabinet (Minister of Foreign Affairs) and a founder of First National Bank of Hawaii and First American Savings. His father, John James Robinson arrived in Hawai‘i in 1820 and married Rebecca Prevor and had eight children. While Rebecca Prevor’s genealogy is not altogether clear, she is understood to have been a daughter of Kamakana, a Maui chiefess (“Mysterious Mary Foster,” *Honolulu Star-Bulletin* 22 September 2006) and thus Mark P. Robinson was a very prominent Hawaiian.

There are surprisingly few other references to Hawaiians at Hō‘ae‘ae. There is a reference to a policeman named Mahuka from Hō‘ae‘ae who died of natural causes in 1915 but otherwise almost all references to Hawaiians at Hō‘ae‘ae appear to be in the context of land transactions or disputes. The Board of Commissioners to quiet Land Titles awarded Hō‘ae‘ae (among many other large properties) to N. Namauu in 1853 but he was deceased by that time. The *ali‘i* Mataio Kekūanao‘a was in legal disputes regarding Hō‘ae‘ae lands with Samuel Thompson in 1853 and Charles Dana in 1856. Lands were conveyed by Kekūanao‘a and Kapoli, widow of Namauu, to Samuel Thompson prior to 1862. In 1894, there was an argument over land at Hō‘ae‘ae among descendants of Kahooweliweli. In 1903, A. Kauhi and wife sold land at Hō‘ae‘ae to Kulapii for $200. In 1905, it appears Mark P. Robinson sold land at Hō‘ae‘ae to D. Kalou who sold it back to Robinson in a transaction that is unclear. In 1905, there were land transactions involving the estate of J.K. Kahookanoi, K.P. Kaneiahuea, and M.P. Robinson with Robinson seemingly purchasing land for $50 and selling it back for $50. There was another land sale in 1905 from Lui Kaihikapu to M.P. Robinson for $250. In 1907, Daniela Kalou bought land from the A.N. Campbell Trust for $200 and immediately sold it to Mark P. Robinson for $275. Also in 1907, the Dowsett Company, Ltd., filed “ejectment proceedings” against Keliikipi, Ilikole, and three Japanese as unlawfully being in possession of land at Kaulu, Hō‘ae‘ae. The upshot of these financial transactions was dispossession of Hawaiians of their lands. One other notice believed to refer to a Hawaiian was a small “personal” notice to a Mrs. Foster going to Hō‘ae‘ae for a vacation in 1895. This is understood to be Mary

Elizabeth Mikahala Robinson Foster (1844–1930) granddaughter of Kamakana, a Maui chiefess and sister of Mark P. Robinson.

4.6.5.2 Chinese

The stories of Chinese at Hō‘ae‘ae are marked by violence. The first account is of the murder of Tong Hoon Hoo, otherwise known as Tong Yong and perhaps most likely as Dan Hung Hoy (as the victim was named in the United Chinese Society offering of a reward), who lived at Hō‘ae‘ae and was shot and killed by the burglar Liung Yao. There were at least 13 articles in five different newspapers about this case between 16 and 25 October 1893. Despite the aggregate offer of $300, a sizable reward at that time, there is no account of the suspect being apprehended. The last we read is in an article entitled “Not Caught Yet: Liung Yao, the Chinese Murderer is a Will-o’-the-Wisp” that relates that Liung Yao had been seen several times:

> [B]ut all have been afraid to touch him as it is said he is armed to the teeth . . . two white men came to the police station and offered to guarantee to catch Yao if they could be allowed the privilege of shooting him on sight, which was refused . . . [*Pacific Commercial Advertiser* 25 October 1893]

We next encounter a reference to Chinese at Hō‘ae‘ae in the context of unappreciated cooking for the overseers (*luna*) at Oahu Sugar Company plantation at Hō‘ae‘ae.

> . . . a strike of lunas on the new Oahu plantation . . . the kick of the men was the class of food served by the salaried chefs at Hoaeae . . . served by Chinese, according to Chinese ideas. Nearly everything was burned to a crisp . . . This is the first trouble Manager Ahrens has had with white men in his employ. [*Hawaiian Star* 5 May 1898]

Certainly one of the biggest stories in the history of Hō‘ae‘ae involves the shooting of Ah Chee in August 1901, covered by five different newspapers:

- “A Waipahu Tragedy: Willie Davis Charged with Shooting Chinese,” *Evening Bulletin* 20 August 1901,
- “He Was Shot in the Back: Ah Chee Attacked on the Highway,” *Hawaiian Star* 20 August 1901,
- “Inoffensive Chinese Fired Upon by Hoaeae Toughs,” *Honolulu Republican* 21 August 1901,
- “Shot in the Back: A Mysterious Gun Scrape at Ewa,” *Pacific Commercial Advertiser* 21 August 1901, and
- “A Shooting Scrape,” *Independent* 21 August 1901.

The facts of the case are consistent in the different accounts. Two Chinese men were riding in a “brake” (a horse drawn carriage typically with four wheels, a high seat upon which the driver sits, and an open bed platform behind). The Chinese maintained they were accosted by the two boys and told to halt. Fearing robbery, they urged their horse and drove away and then both boys began to fire at them with revolvers. The perpetrators of the attack were Willie Davis and Mark Robinson, boys about 18 years of age. Robinson was the son of Mark Robinson, owner of Hoaeae Ranch and Davis’ father was Joseph Davis, the manager of Robinson’s ranch at Hoaeae. The deputy sheriff found young Robinson in possession of a .38 caliber revolver with four empty

cartridges. No gun was found on Davis and it was speculated he had thrown it away. Both boys were believed to be under the influence of alcohol at the time of the shooting. Ah Chee was reported to be in a very precarious condition from the gunshot wound. Davis was asserted by the Chinese companion to be the one who shot Ah Chee. The Robinson boy was not held by the sheriff. Four accounts relate the youths talking about shooting dogs. The fate of the merchant Ah Chee is uncertain but it seems likely he survived as there is no account of either of the young, well-connected *haole* (foreigner; white person) men being brought to trial for anything.

In 1903, we have the account of the “Suicided While Insane,” in which a 31-year-old Chinese mother apparently committed suicide with strychnine poison while her husband attended his rice fields (*Hawaiian Star* 21 November 1903).

4.6.5.3 Japanese

We have only one early account specific to Japanese at Hō‘ae‘ae summarized in an article entitled “Was Hanging to a Tree: Desperate Ending of a Jap at Hoaeae”:

> A Japanese laborer at Ewa Plantation named Sagura was found hanging dead from a kiawe tree at Hō‘ae‘ae Gulch. A coroner’s jury determined suicide. There was excitement ‘that the fellow had been lynched.’ He was buried in Ewa. [*The Hawaiian Star* 6 February 1899]

The speculation as to whether the Japanese worker had in fact been lynched has a certain resonance with the case of the seemingly unprovoked shooting of the Chinese Ah Chee by Caucasian youth associated with Hoaeae Ranch two years later.

Section 5 Previous Archaeological Research

While the southwest corner of the island of O‘ahu has been subjected to many archaeological studies, none have been located within or immediately adjacent to the current project. The following discussion focuses on previous archaeological projects in Hō‘ae‘ae Ahupua‘a and the vicinity of the project area (Figure 19 and Table 2). Historic properties in the vicinity are depicted in Figure 20 and Table 3.

5.1 McAllister’s Survey

In his island-wide survey of 1930, archaeologist J. Gilbert McAllister recorded three sites (Sites 127–129) in the vicinity of the current project, located approximately 1-1.5 km southeast of the project area (see Figure 20 and Table 3). Site 127 is Mokoula Heiau, Site 128 is Waipahu Spring, and Site 129 is Hapupu Heiau. McAllister (1933) described the sites as follows:

> Site 127. Mokoula Heiau, southwest of the main road in the village of Waipahu.
>
> The heiau has been completely destroyed for building purposes of the neighborhood. The site is at the edge of a 50-foot elevation which projects out into the present rice fields and was pointed out by Kaluawai, a kamaaina undoubtedly more than 100 years old.
>
> Site 128. Waipahu spring, famous in tradition as the place at which the tapa mallet appeared after having been lost in Kahuku (68, p. 41). A pump has been placed over the site.
>
> Site 129. Heiau, Waipahu, said to have been named Hapupu.
>
> The Waipahu plantation stables on the mountain side of the road across from the schoolhouse west of the town now occupy the site of the former heiau at Waikele. Nothing remains of the heiau. According to Thrum (79, 4), it was a ‘Heiaupookanaka, where the chief Hao was surprised during temple worship and slain with his priest and attendant chiefs by direction of the moi of Oahu, about 1650.’ The site was pointed out by Kapano. [McAllister 1933:106]

5.2 Modern Archaeological Studies

5.2.1 Kennedy (1987)

In 1987, Archaeological Consultants of Hawaii, Inc. reported “no above ground archaeological features [with] little chance of subsurface recovery” (Kennedy 1987:2) on a 20-acre parcel approximately 3.5 km northwest of the project area.

5.2.2 Kennedy (1988)

In 1988, Archaeological Consultants of Hawaii, Inc. (Joe Kennedy) surveyed the land associated with the Royal Kunia Phase II subdivision, located about 1.5 km south of the current project. The 670-acre survey was conducted by “a two man survey team [that] covered the area by automobile along the network of cane haul roads and by foot in the few areas where this was necessary. Visibility was limited by the dense stands of sugarcane” (Kennedy 1988:1). No archaeological sites were identified.

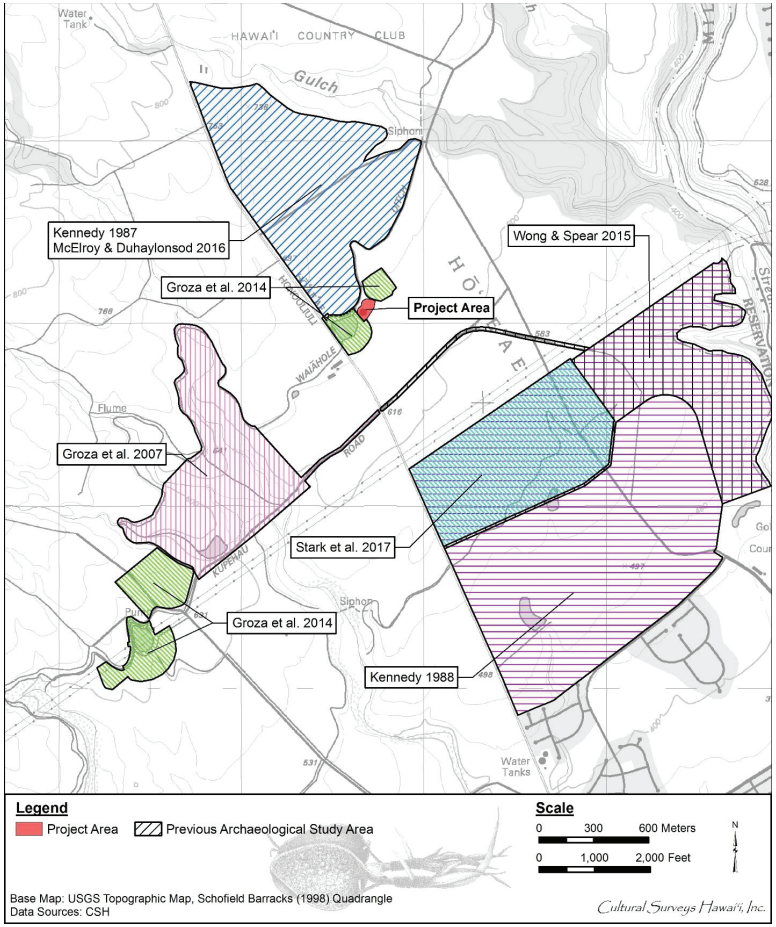

Figure 19. Map showing the locations of previous archaeological studies within the vicinity of the project area

Table 2. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results
McAllister 1933	Archaeological reconnaissance survey	Island of O‘ahu	McAllister Sites 127 (Mokoula Heiau), 128 (Waipahu Spring), and 129 (Hapupu Heiau) in vicinity of project area
Kennedy 1987	Archaeological reconnaissance survey	Hō‘ae‘ae, TMK: [1] 9-4-004	No above ground archaeological features noted, “and little chance for subsurface recovery” (Kennedy 1987:2)
Kennedy 1988	Archaeological reconnaissance survey	Royal Kunia, Phase II, TMK: [1] 9-4-002:001	No historic properties identified
Groza et al. 2007	Archaeological inventory survey	Mauka Detention Basin located west of Kunia Rd, TMK: [1] 9-2-001:001	All sites identified (SIHP #s 50-80-09-2268, 50-80-06-6892, -6893, and -6894) associated with water control, Waiāhole Ditch, and/or Oahu Sugar Co.
Groza et al. 2014	Archaeological inventory survey	Waiāhole Ditch, Honouliuli and Hō‘ae‘ae Ahupua‘a, TMKs: [1] 9-2-001:001; 9-4-003:001	Identified 25 sub-features of Waiāhole Ditch (SIHP # 50-80-09-2268) within project area
Wong and Spear 2015	Archaeological inventory survey	161-acre Ho‘ohana Solar Farm project in Kunia, Hō‘ae‘ae and Waikele *ahupua‘a*, TMK: [1] 9-4-002:052	A historic road complex, newly described (SIHP # 50-80-08-7671) including three features: Feature 1, an alignment; Feature 2, a wall; and Feature 3, paved segments relating to plantation-era (pre-dating 1927)
McElroy and Duhaylonsod 2016	Archaeological inventory survey	203.2-acre New Hope Network Development in Kunia, Hō‘ae‘ae Ahupua‘a, TMK: [1] 9-4-004:009	Project area same as Kennedy 1987 study area; no historic properties identified
Stark et al. 2017	Archaeological inventory survey	60.7-hectare (150-acre) Kunia Agricultural Park project, Hō‘ae‘ae Ahupua‘a, TMK: [1] 9-4-002:080	Identified SIHP # 50-80-08-7758 including five features pertaining to agricultural activity, specifically related to Oahu Sugar Co.

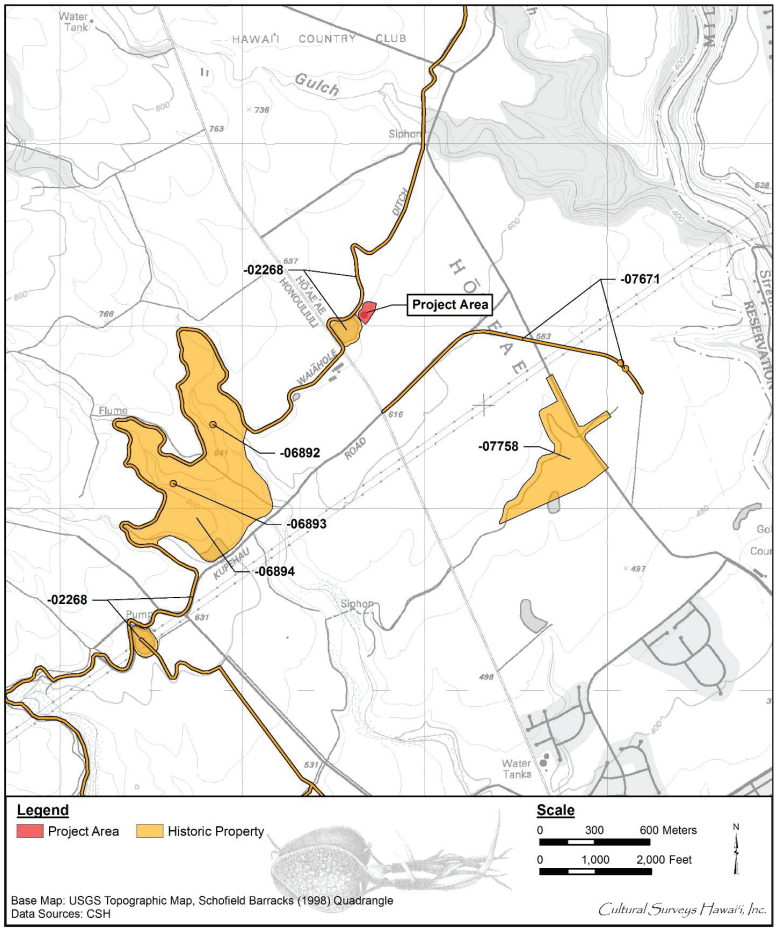

Figure 20. Previously identified archaeological sites located within the vicinity of the project area

Table 3. Previously identified historic properties in the vicinity of the project area

SIHP # (50-80-)	Nature of Site	Source	Comment
06-6892	Historic bridge	Groza et al. 2007	Plantation-era (1929) rectangular bridge with wall that crosses one of intermittent tributaries of Honouliuli Stream
06-6893	Historic bridge	Groza et al. 2007	Plantation-era (1929) rectangular bridge with wall that crosses one of intermittent tributaries of Honouliuli Stream
06-6894	Plantation agricultural complex	Groza et al. 2007	Post-Contact
08-7671	A historic road complex, including three features: Feature 1, an alignment, Feature 2, a wall, and Feature 3, paved segments	Wong and Spear 2015	Plantation-era (pre-dating 1927)
08-7758	Five features of one site pertaining to agricultural activity, specifically related to Oahu Sugar Co.	Stark et al. 2015	Plantation-era
09-2268	Improved irrigation ditch (Waiāhole Ditch)	Dega et al. 1998	Post-Contact

5.2.3 Groza et al. 2007

In 2007, CSH completed an inventory survey for the Ho‘opili project, Mauka Detention Basin, in Honouliuli Ahupua‘a (Groza et al. 2007). During the project, the entirety of the 143-acre Mauka Detention Basin was surveyed on foot. The pedestrian survey revealed several sites (SIHP #s 50-80-09-2268, 50-80-06-6892, -6893, and -6894), one of which consisted of 31 features. All sites identified were associated with water control, the Waiāhole Ditch, and/or the Oahu Sugar Company.

5.2.4 Groza et al. 2014

In 2013, CSH conducted an inventory survey for the Waiāhole Reservoir System, located about 3.5 km northwest of the current project (Groza et al. 2014). Twenty-five sub-features of the Waiāhole Ditch (SIHP # 50-80-09-2268) were identified within the project area. Fifteen of the sub-features are associated with Reservoir 155, and eight of the sub-features are associated with Reservoir 225. Reservoirs 155 and 225 are features of the Waiāhole Ditch Irrigation System.

5.2.5 Wong and Spear 2015

Scientific Consultant Services, Inc. (Wong, and Spear 2015) reported on an archaeological inventory survey for a Ho‘ohana Solar Farm project in Kunia, Waikele Ahupua‘a, TMK: [1] 9-4-

002:052. Their project area was primarily a 161-acre parcel in Waikele, on the west side of Waikele Stream gulch, but included two corridors extending west to Kunia Road. One historic property, a historic road complex, was newly described (SIHP # 50-80-08-7671) including three features: Feature 1, an alignment; Feature 2, a wall; and Feature 3, paved segments. The alignment and wall features are 1.2 km to the southeast. The Feature 3, paved segments associated with a plantation road and former railway route predating 1927, are depicted as extending within approximately 400 m to the southeast of the present project area along Kupehau Road. Seven railroad spikes were reported along the SIHP # -7671 Feature 3 corridor (from the central portion) and three traditional Hawaiian artifacts (a basalt adze preform and two basalt flakes with polished facets) were reported on the surface of a plantation road in the southern portion of their project area.

5.2.6 McElroy and Duhaylonsod 2016

Keala Pono Archaeological Consulting LLC (McElroy and Duhaylonsod 2016) reported on an archaeological inventory survey (called an archaeological assessment in the absence of finds) for a 203.2-acre project area proposed for New Hope Network development of a community center integrated with agricultural use in Kunia, Hō‘ae‘ae Ahupua‘a, TMK: [1] 9-4-004:009. The project area was the same as the Kennedy 1987 study area. Fieldwork included pedestrian inspection and test excavation of eight trenches. It was noted that the entire project area had been disturbed by previous and current agricultural use. No historic properties were observed and no further work was recommended.

5.2.7 Stark et al. 2017

CSH (Stark et al. 2015) produced an archaeological inventory survey for a 60.7-hectare (150-acre) Kunia Agricultural Park project, Hō‘ae‘ae Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-4-002:080. The project area is located immediately to the east of Kunia Road, surrounded by large agricultural lots managed by Waileke Farms, with the Royal Kunia residential community to the south and Kupehau Road to the north. One site designated SIHP # 50-80-08-7758 consists of five features of one site pertaining to agricultural activity, specifically related to the Oahu Sugar Company. Each feature (1–5) represents an activity area relating to contemporaneous agricultural activity. Feature 1 is a retaining wall (linear); Feature 2 and Feature 3 are portions of a historic irrigation ditch (linear); Feature 4 is the structural remnant of a headworks feature connecting Feature 2 and Feature 3; and Feature 5 is a historic lithic workshop relating to the production of faced basalt boulders observed in Features 1–4.

Section 6 Previous Oral Histories

The following oral history accounts are taken from the University of Hawai‘i’s Center of Oral History. The University of Hawai‘i, Mānoa, established the Center for Oral History (COH) in the Department of Ethnic Studies, which “collects, documents, preserves and highlights the recollections of Native Hawaiians and the multi-ethnic people of Hawai‘i. It produces oral histories and interpretive historical materials about lifeways, key historic events, social movements and Hawai‘i’s role in the globalizing world, for the widest possible use” (UH Department of Ethnic Studies 2018).

Ruth Yamaguchi, born in Wailupe, O‘ahu in 1927, recalls her childhood on farmland in Pu‘uloa. In 1941, Yamaguchi moved with her family to a 9-acre farmland plot purchased through a Farm Security Administration loan. When questioned why her family decided to purchase farmland in Pu‘uloa, Ms. Yamaguchi responded stating,

> Well, it seemed as though farming was coming up. And but on his own, he figured that he could not just go and buy land. And when he heard that Pu‘uloa was being opened and Farm Security Administration was opened, that’s how he got into it. [At that time, Hind-Clarke Dairy was in transition. There was a change in management.] And the thing in those days, in the late thirties, forties, unions were coming up. And he knew that the union was trying to get into the dairy. And he thought that maybe he would be better off, the way things were going, that if he goes into farming, and have his own land. You see. [UH 1992:1660]

Ms. Yamaguchi elaborated mentioning the prominence of large farm landowners of the time and the role her Japanese heritage played in buying land.

> Well, I thought it was because farmland already was being scarce. Because, like, Hind-Clarke Dairy, no way was he able to—I thought maybe he wasn’t able to buy land there. And most of the land at that time was owned by Bishop [Estate]. Bishop, Campbell Estate, Dowsett [Estate]. But then, that land was owned by Dowsett. And Farm Security Administration was able to purchase it for farm purposes, (from) Dowsett. I don’t think there were too many land open to Japanese people. But Dowsett in Pu‘uloa was open, that was one area. [UH 1992:1661]

Prior to the development of land in Pu‘uloa, Ms. Yamaguchi described the landscape saying, “It was nothing but rocks and *kiawe* trees. It was just miles and miles and miles of *kiawe* trees. So each farmer had to cut down *kiawe* trees, clear the land, uproot all those *kiawe* trees” (UH 1992:1661)

Born on Pearl City Peninsula in 1908, Masao Asada recalls the character of Pearl Harbor in the early twentieth century detailing the O‘ahu Railway & Land (OR&L) Company’s railway tracks along the harbor.

> See, olden days [beginning in 1891] the railroad used to run a train [i.e., a railroad branch line] to the [Pearl City] Peninsula, they had a special engine and one coach. [B.F.] Dillingham owned the railroad. The railroad owned the property. The [OR&L] owned all the [Pearl City] Peninsula property. [In 1888 B.F. Dillingham acquired 75 acres of Manana Peninsula, later called Pearl City Peninsula, for 50

> dollars an acre. The following year, another 145 acres were added. OR&L then ran a branch line down the peninsula in 1891.] So each time a train is coming in from town, [passengers] would wait at the Pearl City station, and this train would pick up the passengers, if there is any, to go down the peninsula. After the [main] train passed Pearl City, going on through Waipahu to ‘Ewa Mill, they used to run the [branch] train, whether there was passenger on or not. So each time a [main] train comes into Pearl City, the [branch] train would go down. And each time a [main] train is going to town, they come down and run the [branch] train down, and then meet the [main] train that’s going to town at the peninsula. [UH 1992:832]

George ‘Ī‘ī Brown III, the great-great grandson of John Papa ‘Ī‘ī, grew up on family land outside of Waipahu, O‘ahu. Mr. Brown, born in 1945, described the area outside Waipahu during his childhood in the following terms:

> At that time, Waipahu was way out in the middle of nowhere, really. And we were a mile or so, or more, from Waipahu. And the property we grew up on was bordered by swamp on one side and cane fields on the other. And on the third side there was my great-grandmother’s old house, and kind of a dairy, cattle in a kind of a pasture. And the other side was kind of barren, and at some distance there’s a little pig farm and a little village of plantation workers. So it was very, very, very rural. Now there’s a golf course on one side and the rest of it is surrounded by houses. [UH 1998:140]

Section 7 Summary and Recommendations

7.1 Results of Background Research

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

1. The project area is approximately 6 km inland (northwest) from the West Loch of Pearl Harbor on gently ascending plateau lands of the southern central valley of O‘ahu. In pre-Contact Hawai‘i, the project area would have been mostly lowland dry shrub and grassland; however, natural vegetation patterns within the project area have been severely altered by at least 100 years of intensive sugarcane agriculture.
2. The project area is within the 124.8-sq-km (48-sq-mile) Waikele Stream watershed. Waikele Stream is a perennial stream with a total aggregate stream length (including nine tributary streams) of 216.8 km (134.7 miles). Waikele is translated by Pukui et al. as “muddy water” (Pukui et al. 1974:223). The non-perennial Hō‘ae‘ae Stream bounds Kalei‘opu‘u Elementary School on its west side. Hō‘ae‘ae Stream is a relatively short stream of approximately 2.5 km length that debouches into the north end of the West Loch of Pearl Harbor.
3. The Legend of Kalei‘ōpu‘u tells of how *kahuna lā‘au lapa‘au* (medicinal healers) came to Hō‘ae‘ae by canoe to harvest their medicines. Legend says that they disembarked from their canoes and sent up a chant in the style called “*ho‘āeae*.” When they chanted, a rainbow appeared allowing the plants on the hillsides to take on the colors of the rainbow. Hence the name Kalei‘opu‘u, literally translates as “lei on the hillside” (Kalei‘opu‘u Elementary School 2016).
4. Pikoi was a legendary hero, the son of a crow (*‘alalā*) and brother to five sister-*akua* (gods) who took the form of rats. He was famous for his ability to shoot arrows and often made bets that he could hit rats from a long distance (Fornander 1917:450–463). Pikoi’s skill was commemorated in a saying that mentions the plain of Keahumoa—a plain stretching over the uplands of Hō‘ae‘ae.
5. Hō‘ae‘ae means “to make soft or fine” (Pukui et al. 1974:47). Pukui et al. (1974) do not explain why the *ahupua‘a* was given this name, but do mention there was a famous *pōhaku* called Pōhaku-Pili. Pōhaku-Pili meaning “clinging rock,” is located on a cliff at the boundary between Hō‘ae‘ae and Waikele and is said to have belonged to the gods Kāne and Kanaloa (Pukui et. al 1974:47). Thrum (1922:632) reports that Hō‘ae‘ae means “to pulverize.” Pukui and Elbert (1986) recorded the possible meanings of Hō‘ae‘ae as “to rise the tide, to make fine, to pulverize, to refine, to soften.” ‘Ae can also mean to lend, to say yes, to consent, to approve or can also be the sap wrung from seaweed or leaves of plants such as *kalo* (taro) (Pukui and Elbert 1986).
6. In several legends of ‘Ewa, there is mention of the “plain of Keahumoa.” John Papa ‘Ī‘ī (1959:96) locates this plain opposite the trail to Pohakea Pass, stretching across the *ahupua‘a* of Honouliuli and Hō‘ae‘ae. McAllister (1933:107) states the plain was west of Kīpapa Gulch in Waikele. The plain of Keahumoa is also mentioned in legends of Waipi‘o. Thus, this is probably a general name for the flat plain *mauka* of the productive floodplain area directly adjacent to Pearl Harbor.

7. The rich resources of the Pearl Harbor lochs, the shoreline fishponds, the numerous springs, and the irrigated lands along the streams allowed central ‘Ewa to flourish as a lively population center and was often taken by competing chiefs in pre-Contact times. Handy (1940:82) noted that Hō‘ae‘ae had “a moderate-sized area of terraces watered by springs inland from West Loch of Pearl Harbor.”
8. Several pre-Contact/early historic trails crossed ‘Ewa: a cross-*ahupua‘a* trail that traversed ‘Ewa and connected Honolulu to Wai‘anae; a *mauka-makai* (inland-seaward) trail that branched off from the cross-*ahupua‘a* trail and approximated the boundary between Honouliuli and Hō‘ae‘ae to the Pōhākea Pass and Kolekole Pass to Wai‘anae; and a second branching *mauka-makai* trail that generally followed the path of Waikele Stream in Waikele Ahupua‘a to Wahiawā in central O‘ahu (‘Ī‘ī 1959).
9. In a study of the resources and population of the *ahupua‘a* in ‘Ewa, Ross Cordy (1996:12) wrote a correlation study of three factors: floodplain size, fishery size, and population size. Hō‘ae‘ae had a small floodplain area, directly adjacent to the north shore of Pearl Harbor’s West Loch, and a fairly small fishery, which took up only a small portion of West Loch. Hō‘ae‘ae had the smallest population of the four *ahupua‘a* in central ‘Ewa.
10. It is through records for Land Commission Awards (LCAs) generated during the Māhele that the first specific documentation of life in Hawai‘i as it had evolved up to the mid-nineteenth century comes to light. A total of 23 land claims were made in the Hō‘ae‘ae Ahupua‘a, with 20 claims awarded to *maka‘āinana*. The bulk of these claims deal with Hō‘ae‘ae fisheries around West Loch to the south of the project area. No *kuleana* (Native land rights) LCA claims were near the present project area.
11. In Hō‘ae‘ae and Honouliuli, the cultivation of sisal (*Agavacea*) for high quality rope fiber was attempted on arid lands, although no evidence suggests this enterprise or similar efforts to grow pineapple affected the project area in any way. Thrum’s *Hawaiian Almanac and Annual* speaks of the prospect of sisal cultivation from 1904 to 1912, but the greater profits to be made from sugarcane cultivation eventually led to the decline of this industry.
12. The relatively recent advent of searchable archives such as the Library of Congress “Chronicling America” website has offered a time-efficient research tool to further explore the land use, social history, and the practices of ethnic communities at Hō‘ae‘ae Ahupua‘a. A total of 352 newspaper articles were reviewed that included the key word “Hoaeae” spanning the timeframe from January 1853 through June 1918. References to Hō‘ae‘ae were identified in 12 newspapers yielding articles related to control of access to Hō‘ae‘ae lands, hunting at Hō‘ae‘ae, diversified agriculture, the rise of the Oahu Sugar Company, and ethnicity in Hō‘ae‘ae.
13. The earliest archaeological survey of the project area and its environs was undertaken in 1930 by J. Gilbert McAllister. McAllister recorded Mokoula Heiau (Site 127), Waipahu Spring (Site 128), and Hapupu Heiau (Site 129). These sites are located approximately 1-1.5 km southeast of the project area.
14. Two modern-era archaeological studies were conducted in the vicinity of the project area. During the Kennedy (1987) archaeological reconnaissance survey, no surface archaeological features were observed. An inventory survey for the Waiāhole Reservoir

System (Groza et al. 2014) identified 25 sub-features of the Waiāhole Ditch Irrigation System (SIHP # 50-80-09-2268).
15. Previous oral history accounts collected by UHCOH also provide key insights into land use during the early to mid-twentieth century. According to Ruth Yamaguchi, by the mid-twentieth century large portions of land around Pu‘uloa had been opened for farming. Once heavily forested with *kiawe*, many Japanese families purchased and cleared these lands for crop cultivation. Mr. Mao Asada also recalled that the OR&L railway tracks were once a prominent feature within the coastal region of Pu‘uloa. Mr. George ‘Ī‘ī Brown III recalled that sugarcane cultivation, and dairy and pig farming were mostly pursued further inland, near Waipahu.

7.2 Impacts and Recommendations

Based on the information gathered from the cultural and historic background detailed in this cultural assessment, the proposed project should not have any impacts to cultural resources. Although highly unlikely, in the event that any cultural resources are encountered during construction, we recommend the following:

1. Should burials, subsurface cultural deposits, or pit caves (sinkholes) with openings greater than 1 m in diameter 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. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended.
3. In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinternment plan and/or preservation plan.

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