CH2MHILL® TRANSMITTAL

To: Raymond Young
City & County of Honolulu
Department of Planning and Permitting

RECEIVED
'14 NOV -7 P2:43
DEPT OF PLANNING
AND PERMITTING
CITY & COUNTY OF HONOLULU

From: CH2M HILL

Date: November 7, 2014

Re: Special Use Permit Application for the Kawailoa Solar Farm Project

We Are Sending You:

☐ Attached
☒ Documents
☐ Drawings

Method of shipment:

☐ Under separate cover via
☐ Copies
☐ Specifications
☐ Other:

Quantity	Description
2	Hard copies of Application for a State Special Use Permit for the Kawailoa Solar Farm Project
1	Electronic copy of Application for a State Special Use Permit for the Kawailoa Solar Farm Project

If the material received is not as listed, please notify us at once.

Remarks:

Raymond,

Enclosed are hard copies and an electronic copy of the application for a Special Use Permit for the Kawailoa Solar Farm Project. Please let us know if you have any questions.

Thank you.

Copy To: Wren Wescoatt, First Wind

Application for a State Special Use Permit

Kawailoa Solar Farm Project

Oʻahu, Hawaiʻi

Tax Map Keys 6-1-006:001 and 6-1-005:001

Prepared for

First Wind (d.b.a. Kawailoa Solar, LLC)

November 2014

CH2MHILL

Contents

Master Permit Application

City and County of Honolulu
DEPARTMENT OF PLANNING AND PERMITTING
650 South King Street
Honolulu, Hawaii 96813

PLANNING DIVISION MASTER APPLICATION FORM

Additional data, drawings/plans, and fee requirements are listed on a separate sheet title "Instructions for Filing". *PLEASE ASK FOR THESE INSTRUCTIONS.*

All specified materials described in the "Instructions for Filing" and required fees must accompany this form; incomplete applications will delay processing. You are encouraged to consult with Planning Division staff in completing the application. Please call appropriate phone number given in the "Instructions for Filing".

Please print legibly or type the required information.

SUBMITTED FEE: $ $15,000.00

PERMIT/APPROVAL REQUESTED (Check one or more as appropriate):

☐ GENERAL PLAN AMENDMENT	☑ SPECIAL USE PERMIT
☐ STATE LAND USE BOUNDARY AMENDMENT (<15 acres) From _____ (District) to _____ (District)	☐ ZONING DISTRICT BOUNDARY ADJUSTMENT, ADMINISTRATIVE
☐ DEVELOPMENT PLAN (DP)/SUSTAINABLE COMMUNITIES PLAN (SCP) AMENDMENT Indicate DP/SCP area _____	☐ ZONE CHANGE From _____ (District) to _____ (District) ☐ AMEND UNILATERAL AGREEMENT TO ORDINANCE NO. _____

☐ PUBLIC INFRASTRUCTURE MAP REVISION (Indicate Map Symbol Request):

☐CY (Corporation Yard) ☐DSP (Desalination Plant) ☐D (Drainage Way (Open Channel) ☐FS (Fire Station) ☐GB (Government Building)
☐GC (Golf Course) ☐P (Parks) ☐PS (Police Station) ☐PKG (Parking Facility/Transit Center) ☐RES (Water Reservoir) ☐SPS (Sewage Pump Station)
☐STP (Sewage Treatment Plant) ☐SW (Solid Waste Facility) ☐TC (Transit Corridor) ☐R (Arterial & Collector Roadway) ☐W (Potable Well)

(Project/Parcel specific information should be provided for General Plan and Development Plan amendments only if appropriate.)

TAX MAP KEY(S): 6-1-006:001 and 6-1-005:001

STREET ADDRESS/LOCATION OF PROPERTY: Ashley Road (Kawailoa), approximately 4 miles northeast of Haleiwa Town

APPLICATION/SUBJECT AREA *(Acres/sq.ft.)*: 384.1 acres WW

THE PROPOSED PROJECT IS LOCATED ☐ INSIDE ☑ OUTSIDE THE:

☐ Urban Growth Boundary
☐ Urban Community Boundary
☐ Rural Community Boundary
☑ Community Growth Boundary

OF THE North Shore DEVELOPMENT PLAN/SUSTAINABLE COMMUNITY PLAN

ZONING DISTRICT(S): AG-1 STATE LAND USE DISTRICT: Agriculture

RECORDED FEE OWNER:
Name (& title, if any) Kapu C. Smith, Sr. Land Assets Manager
Organization Kamehameha Schools
Mailing Address 567 South King Street, Suite 200
Honolulu, Hawaii 96813
Phone Number (808) 523-6200
Signature Kapu C. Smith

APPLICANT:
Name Wren Wescoatt, Director of Development - Hawaii
Organization Kawailoa Solar, LLC
Mailing Address 1099 Alakea Street, Suite 2440
Honolulu, Hawaii 96813
Phone Number (808) 260-5084
Signature _____

PRESENT USE(S) OF PROPERTY/BUILDING:
Wind farm

AUTHORIZED AGENT/CONTACT PERSON:
Name Paul Luersen, CH2M HILL
Mailing Address 1132 Bishop Street, Suite 1100
Honolulu, Hawaii 96813
Phone Number (808) 440-0201
Signature _____

PROJECT NAME (If any): Kawailoa Solar Farm Project

REQUEST/PROPOSAL (Briefly describe the nature of the request, proposed activity or project):

First Wind (d.b.a. Kawailoa Solar, LLC) is proposing to develop a 50 MW solar farm on Oahu's north shore. The project would include a series of horizontal single-axis tracking, ground-mounted panels, two substations, and various electrical equipment. The project would interconnect with HECO's electrical grid via two existing 46kV switching stations on the property. The project requires a Special Use Permit for use of LSB Class B and C land for the proposed solar facilities; it also requires a Special Use Permit for a proposed underground electrical line to be installed along an existing roadway on LSB Class A land.

DPP/ELOG NO. _____ DPP/POSSE NO. _____

Letter of Authorization

firstwind
CLEAN ENERGY. MADE HERE.

November 7, 2014

Mr. George I. Atta, Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawai'i 96813

SUBJECT: Authorization of Agent for Kawailoa Solar Farm Project, Application for State Special Use Permit

Dear Mr. Atta:

This is to advise your office that Paul Luersen of CH2M HILL, Inc. has been engaged as the agent for First Wind (d.b.a Kawailoa Solar, LLC), to act on our behalf regarding zoning matters for the above referenced site.

Should you have any questions, please do not hesitate to call me at (808) 260-5084.

Sincerely,

Wren Wescoatt
Director, Development

cc: Paul Luersen, CH2M HILL

Written Statement

This document has been prepared in support of the application for a State Special Use Permit by First Wind (d.b.a. Kawailoa Solar, LLC)[1] for the proposed Kawailoa Solar Farm Project. Under Chapter 205 of the Hawai'i Revised Statues (HRS), a Special Use Permit (also referred to as a Special Permit) allows the use of land within the State Agricultural or Rural District for "certain unusual and reasonable uses...other than those for which the district is classified."

The proposed project would consist of solar panels and appurtenant facilities on approximately 384.1 acres of land that is classified as Agricultural District by the Hawai'i Land Use Commission (LUC). The facilities would be located within an area that includes approximately 332.3 acres of Class B land and 37.9 acres of Class C land (as rated according to the Land Study Bureau (LSB) productivity rating system). The project area also includes approximately 1.9 acres of existing roadway on Class A land, and would involve installation of approximately 550 linear feet of underground electrical line beneath the roadway. Recently passed legislation (Act 52) permits solar energy facilities on Class A lands, with issuance of a Special Use Permit, provided they are on an existing road within a parcel with a valid county agriculture tax dedication status, and the facilities are placed in a manner that still allows vehicular traffic to use the road. Pursuant to HRS Chapter 205 and the provisions of recently passed legislation (Act 55), solar energy facilities that occupy more than 10 percent of the parcel or 20 acres of land with Class B or C soils are a permitted use within the Agricultural District, with issuance of a Special Use Permit; particular requirements for these uses relate to providing land for compatible agricultural activities and provisions for decommissioning the project. Compliance with these requirements is outlined in this document, as part of the application for a Special Use Permit.

[1] Kawailoa Solar, LLC and Kawailoa Solar Holdings, LLC are wholly owned subsidiaries of First Wind Holdings, LLC. The organizational structure of these entities is shown in Attachment 1.

1.0 Introduction

First Wind is proposing to develop a 50 megawatt (MW) solar farm, approximately 4 miles northeast of Hale'iwa town, on the north shore of the island of O'ahu, Hawai'i. The Kawailoa Solar Farm project has been selected by Hawaiian Electric Company, Inc. (HECO) and received a waiver from the Public Utilities Commission as a utility-scale renewable energy project. HECO is currently undertaking an Interconnection Requirements Study (IRS), as documented in Attachment 2 and has executed a Power Purchase Agreement to purchase energy generated by the project.

The purpose of the Kawailoa Solar Farm is to produce clean, low-cost renewable energy for the island of O'ahu. Hawaii consumers pay some of the highest rates for electricity in the United States, and more than 80% of the state's energy is generated by burning oil and coal. Large solar photovoltaic systems are capable of generating electricity for a cost that is substantially less than HECO's "avoided cost" to produce the same electricity using fossil fuel, without the greenhouse gas emissions from burning that fuel. Based on the projected output of the Kawailoa Solar Farm over a 27-year period, the project will produce the energy to power the equivalent of 15,000 households, will save consumers $200 million compared to HECO's current avoided cost, and will prevent the burning of millions of barrels of oil and millions of tons of CO2 from entering the atmosphere.

The proposed solar farm would be located on approximately 384.1 acres[2] within tax map keys (TMKs) 6-1-006:001 (2,050 acres) and 6-1-005:001 (1,452 acres), which are part of a larger lot owned by Kamehameha Schools. The overall lot (Lot A) is approximately 10,787 acres, as shown on the Site Plan in Attachment 3. The proposed solar farm would be co-located with the existing Kawailoa wind farm, which is also located within Lot A.

By interconnecting to the same electrical switchyards and transmission lines as the existing wind farm, the proposed solar project builds on work that was done to support the wind farm and enables connection to HECO's electrical grid without the need for new interconnection infrastructure. In addition, the solar project adds diversity to the generation resources on the North Shore, thereby providing more consistent and productive electrical output throughout the year. Since the wind project produces electricity when the wind is blowing, and the solar projects generates energy when the sun is shining, the two different technologies will complement each other and capture more energy throughout the day and year. Often, the solar and wind resources in a given area do not coincide, such as cloudy, windy days (or at night) with minimal sun – or hot sunny days with little or no wind. During these conditions, either the wind farm of the solar farm would be able to generate clean energy for utility customers while the other is not producing. During times when high solar and wind resources do coincide, the solar project will be self-curtailed to enable the wind farm to run at full output.[3]

The proposed project site is located within the State Agricultural District. Pursuant to Chapter 205 of the Hawai'i Revised Statutes (HRS) and provisions of recently passed legislation (Act 55), solar energy facilities that occupy more than 10 percent of the parcel or 20 acres of land with a Land Study Bureau (LSB) productivity rating of Class B or C soils are a permitted use within the Agricultural District, subject to issuance of a Special Use Permit. The proposed project would occupy approximately 332.3 acres of Class B land, 37.9 acres of Class C land, and 12 acres of Class E land. The project area would also include approximately 1.9 acres of Class A land, which is comprised entirely of an existing roadway; approximately 550 linear feet of underground electrical line would be installed beneath the roadway. Other recently passed legislation (Act 52) permits solar energy facilities on Class A lands (with issuance of a Special Use Permit), provided they are on an existing road within a parcel with a valid county agriculture tax dedication status, and the facilities are placed in a manner that still allows vehicular traffic to use the road. Pursuant to these requirements, this application is for a Special Use Permit for installation of solar energy facilities on LSB Class B and C lands, as well as installation of electrical line under an existing roadway in LSB Class A lands in the Agricultural District.

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[2] The project area accounts for the area within the perimeter fence, as well as the Mauka substation, onsite roadways, and electrical connector lines, which would be located outside the perimeter fence. These facilities are described in Section 3.0 and are shown in the layout plan in Attachment 3.

[3] The wind project preceded the proposed solar farm, and it therefore has precedence in delivering energy to the grid.

The proposed project does not trigger any of the listed criteria for applicability under HRS Chapter 343. Although power-generating facilities are listed as a compliance trigger, these are specifically defined in HRS Chapter 343-2 as "(1) a new, fossil-fueled, electricity-generating facility, where the electrical output rating of the new equipment exceeds 5.0 megawatts; or (2) an expansion in generating capacity of an existing, fossil-fueled, electricity-generating facility, where the incremental electrical output rating of the new equipment exceeds 5.0 megawatts." Because the proposed development is a solar power generating facility and not a fossil-fueled power generating facility, the proposed action does not require compliance with HRS Chapter 343.

2.0 Site Description

The proposed project site is within TMKs 6-1-006:001 and 6-1-005:001, which are part of Kamehameha School's Kawailoa Plantation. Historically part of a large sugar plantation, this area is comprised of agricultural fields located atop a series of tablelands interspersed with gulches formed by intermittent drainages. The topography ranges from relatively flat or moderately sloping in the agricultural fields to steeply sloping in the gulches. Elevations range from 200 feet above sea level (ASL) to 1,280 feet ASL, which equates to an average grade of approximately 7 percent. The tablelands are accessed via a network of cane haul roads that were developed as part of the plantation operations.

In 2012, the Kawailoa wind farm was constructed within the Kawailoa Plantation lands. Given the relatively minimal footprint of the wind farm facilities, there is ample land remaining for the proposed solar farm. The proposed solar facilities would not conflict with the existing wind farm facilities; to the extent possible, the proposed solar farm project has been designed to utilize existing infrastructure, including the existing network of onsite roads and the interconnection facilities to the HECO electrical transmission system.

Access to the site is provided by a private agricultural road (Ashley Road), which extends from Kamehameha Highway up through the project area, and is maintained as part of the existing wind farm; there is no public access to the site.

The State land use classification is Agricultural and the City & County of Honolulu zoning designation is AG-1 (Restricted Agriculture). No portion of the site is within the Special Management Area (SMA).

With the exception of the wind farm, there is no other development within the proposed project area. The areas surrounding the site support a variety of uses, including agriculture, conservation, and military operations. In general, the areas west, south, and east of the proposed wind farm site are all owned by Kamehameha Schools. Portions of Kawailoa Plantation that are still supplied by the remaining irrigation infrastructure (west of the site and below the 400-foot elevation contour) have been converted into leased plots for diversified agriculture. The remainder of the plantation lands is generally fallow. The far eastern portion of the Kawailoa Plantation property is leased by the U.S. Army for their Kawailoa Training Area, which is part of a designated Tactical Flight Training Area (TFTA). This area is used for aviation and ground training by multiple branches, or services, of the U.S. Department of Defense, including the Army, Marine Corps, Navy, and Air Force. The area to the north includes Waimea Valley, which includes an approximately 1,875-acre cultural and natural resource park managed by Hi'ipaka LLC.

The nearest residences to the proposed solar facilities are those just *mauka* of Kamehameha Highway and those in Pupukea, which are approximately 0.7 mile to the west and 1.0 mile to the north, respectively. Other residential developments are located in Hale'iwa (approximately 3.0 miles to the west), and in Waialua (approximately 5.0 miles from the facilities).

Local climatic conditions in the area are characteristic of lowland areas on the windward side of Oahu, with relatively constant temperatures and persistent northeast trade winds. Based on data collected by the National Oceanic and Atmospheric Administration (NOAA) at their Waimea Arboretum Station (approx. 1 mile north of the site), the average annual rainfall over a 30 year period (1981-2010) is approximately 55 inches; the monthly average ranges between approximately 2.8 inches and 7.0 inches. Minimum temperatures range between 60.1°F and 69.4°F; maximum temperatures range between 79.1°F and 87.6°F (NOAA, 2014).

2.1 Soil Types and Classification

Soil Survey, U.S. Soil Conservation Service

According to maps produced by the U.S. Soil Conservation Service (subsequently renamed the Natural Resource Conservation Service), the predominant soil types within the areas where the solar facilities would be located are in the Wahiawa Series (Wahiawa silty clay, 3 to 15 percent slopes [WaB and WaC]) and Leilehua Series (Leilehua silty clay, 2 to 12 percent slopes [LeB and LeC]). Permeability of these soils is moderately rapid. Runoff is slow to medium, and the erosion hazard is slight to moderate (Foote et al., 1972).

Agricultural Lands of Importance to the State of Hawai‘i (ALISH)

Agricultural lands of importance to the State of Hawai`i (ALISH) is a system that identifies and classifies agriculturally suitable land based on a wide range of factors including soil characteristics, climate, moisture supply, and other general production-related factors. The classification ratings include: (1) unclassified, (1) prime lands, (2) unique lands, and (3) other lands. The area where the solar facilities would be located is comprised of prime lands, as classified under the ALISH system. Prime lands are best suited for the production of food, feed, forage and fiber crops. The land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when properly managed (including water management). Unique lands are those other than prime lands with qualities that favor production of high-value food crops when properly managed (Hawai`i Department of Agriculture, 1977).

Land Study Bureau (LSB)

The LSB rating system is based on the agricultural productivity of soils throughout the State, accounting for characteristics such as texture, slope, salinity, erodibility, and rainfall. The productivity ratings are used to designate each area as Category A, B, C, D, or E, with Category A representing the most productive soils and Category E representing the least productive soils.

The proposed project would occupy approximately 332.3 acres of Class B land, 37.9 acres of Class C land, and 12 acres of Class E land. In addition, the project area would also include approximately 1.9 acres of Class A land, which is comprised of an existing roadway. An overlay of the proposed project facilities and the LSB soil ratings is provided in Attachment 3.

3.0 Project Description

The proposed project involves installation of an approximately 50 MW solar energy facility to provide clean, renewable power to HECO for integration into their electrical distribution system for delivery to customers on the island of O‘ahu. The solar farm would be comprised of a horizontal single-axis tracking, ground-mounted photovoltaic system; the layout is designed to maximize use of the terrain, with the panels facing approximately due south. On average, the panels are expected to extend approximately 4’-6” to 9’-6” off the ground. Each panel would generate power at 1000 volts (V); electrical equipment including combiner boxes, collector lines, inverters, weather monitoring stations, and switch gear would be installed in the vicinity of the panels, as needed to increase the electrical voltage and aggregate the generated electricity for transmittal via the collector system.

The collector system would be comprised of a network of direct-buried underground collection circuits, connecting to two electrical substations. The proposed Mauka and Makai substations would provide for the termination of the collector lines, transform the electricity to 46,000 volts and connect respectively to the existing HECO Mauka and Makai switchyards, both of which were constructed as part of the wind farm project. HECO’s Mauka switchyard provides for interconnection with the HECO’s Waialua-Kuilima 46kV sub-transmission line, and HECO’s Makai switchyard provides for interconnection with HECO’s existing Waialua-Kahuku 46kV sub-transmission line; the solar farm project needs to interconnect with both sub-transmission lines, as each can only accept a limited amount of generation.

Each of the two substations would be an open switchrack design with free-standing steel structures, and would occupy an area approximately 150 feet by 180 feet in area. Both would be enclosed by a perimeter fence; the fence is expected to be an 8-foot-high chain-link fence. The approximate location of the substations is shown in the

site plan and drawings contained in Attachment 3. New electrical equipment to support interconnection of the solar facilities would be installed within each of the existing HECO switchyards.[4] Telecommunications would be provided via an existing fiber optic cable.

The private road (Ashley Road) which currently provides access to the existing wind farm would also serve as the main entry point to the solar farm site. Within the solar farm site, a series of new interior service roads would be constructed to facilitate construction and allow access for ongoing operations and maintenance; these would be gravel roads, with a width of approximately 20 feet. Perimeter fencing would be installed around the solar farm site. The location of the existing roadways and proposed perimeter fencing are noted on the site plan contained in Attachment 3. Photographs of the existing access point and other views within the project site are provided in Attachment 4.

In combination with the solar energy facilities, the area occupied by the panels would also be made available for compatible agricultural activities at a lease rate that is at least fifty per cent below the fair market rent for comparable properties, consistent with the requirements of HRS 205-4.5(a)(21)(A). Within one year of the start of the commercial operation of the solar farm, First Wind will establish, or will be actively seeking to establish a compatible agricultural operation, and will seek to have such compatible agricultural operations on the land for the duration of commercial energy generation operations. Specifically, First Wind plans to lease the project area for the pasturage of sheep, which is widely recognized as a compatible use with solar panels. First Wind executed a Letter of Intent to lease the property to a local ranching business to pasture sheep on the site (Attachment 5). The Lease would commence after the solar project is operational and would include a rental rate that would be no more than 50 percent of the market rate for similar agricultural properties. The Lease would also provide the tenant with use of the fencing and roadways and other infrastructure at the project site. Additional detail on the proposed agricultural implementation plan is provided below in Section 3.1.

Stormwater runoff would be appropriately addressed through design features that incorporate best management practices (BMPs) to minimize the quantity and water quality impacts of the runoff. Areas that are temporarily disturbed during construction would be vegetated using grass species suitable for soil stabilization and erosion control, as well as for grazing stock.

Once constructed, the proposed project would be a primarily passive operation for both solar power generation and ranching. Little to no noise would be generated from the facility. Power generation is generally expected to occur between the hours of 9:00 AM and 4:00 PM, based on solar intensity. Normal operation of the facility would not require onsite personnel and, therefore, the site would not be manned on a daily basis. Periodic maintenance and inspection of the facilities (including supplemental mowing, landscape maintenance, panel cleaning and electrical maintenance) would occur at scheduled intervals. As there would be not onsite personnel and maintenance employees would drive to various locations within the site, no dedicated parking facilities are planned as part of the solar farm project.

The project is expected to have an operational life of approximately 25-30 years, following which the facility may be re-powered with new equipment (under subsequent permits/approvals) or decommissioned. Decommissioning would involve removal of all aboveground structures, including the panels, transformers, and switchyards, as well as removal of all below-ground structures and foundations to a depth of 36 inches below grade, and the property will be returned to substantially the same condition as existed prior to the solar farm use. It is anticipated that most of the materials would be either salvaged or recycled, with the majority of the material likely being shipped to a recycling facility on the mainland. The remaining materials would be disposed of by the contractor at authorized sites in accordance with applicable laws. Site reclamation would be based on site-specific requirements and techniques commonly employed at the time of decommissioning, including grading, spot replacement of topsoil, removal of gravel, and revegetation of all disturbed areas with an appropriate hydroseed mix, such that the physical conditions of the project site would be comparable to the existing conditions. Decommissioning would occur within 12 months of the conclusion of operation or useful life. Attachment 7 includes a decommission plan, which addresses the proposed activities and financial security required for decommissioning.

[4] The new equipment for the Makai switchyard would be located within the existing switchyard fenceline.

Construction of the project is proposed to start in January 2016, with an anticipated duration of approximately 10 months. Accounting for the time needed to complete permitting and construction, plus the operational period and decommissioning, a 35-year duration is requested for the Special Use Permit.

3.1 Agricultural Implementation Plan

The project is primarily designed to generate clean energy, and as the developer and operator of the project, First Wind's experience and expertise is in providing renewable energy. First Wind does not have experience in agricultural activities and plans to sub-lease the pasture operation to an experienced entity. Over the past 18 months of planning, First Wind has examined several options for concurrent agricultural activities as part of a utility scale photovoltaic project, and the data suggest that the most compatible and complementary agricultural use at the Kawailoa site is sheep ranching. First Wind researched other solar projects which utilize sheep grazing and spoke to several local sheep ranchers and local chefs that serve lamb in their restaurants. In addition, First Wind commissioned a study on sheep and solar panels in Hawaii by staff at the Department of Human Nutrition, Food and Animal Sciences, College of Tropical Agriculture and Human Resources, University of Hawaii at Mānoa, which is contained in Attachment 6.

Based on this research, First Wind is confident that (1) a utility-scale solar project and a large sheep pasture can be co-located on the same land to the mutual benefit of both operations, (2) there is a local demand for fresh, grass-fed lamb in restaurants, stores and farmers' markets, and (3) there is a need on O'ahu for affordable pasture acreage to graze sheep and support the startup of a viable sheep ranch.

Compatible Co-location of Solar and Sheep Grazing Activities

The most common agricultural activity on solar projects is sheep grazing. A few years ago this was considered a novel combination, but it has now become a more common practice throughout Europe and the U.S., particularly in climates where annual rainfall can support pasturing livestock without the need for irrigation. According to a recent study of "agri-voltaic" projects, the co-location of agriculture and utility-scale solar is technically feasible and compatible with systems optimized for electricity production. Sheep grazing provides an excellent alternative, not only for agricultural considerations, but also for weed management and fire suppression" (Figone, 2011).

As in most utility-scale solar projects, solar panels at the Kawailoa Solar Farm will be installed on racks with the panels raised off the ground, which will allow adequate room for sheep to graze around and under the equipment. After construction, the site will be re-vegetated with a low-height, shade-tolerant grass mix that will help prevent erosion and provide forage for grazing. After the vegetation is established, the undergrowth will provide a cooler microclimate under the panels which actually increases efficiency of the solar panels, according to a paper by the National Renewable Energy Laboratory (Macknick, 2013). Vegetation in and around a solar project needs to be regularly maintained to prevent tall growth from shading the solar panels, which causes losses in energy generation. Rather than utilizing motorized mowers/weed cutters or chemical herbicides, many solar projects use sheep as a sustainable, environmentally friendly means of vegetation management. Sheep graze under and around the panels and keep the grass and weeds down, and the panels provide shelter for the sheep from rain and sun.

Unlike riding lawn mowers, sheep fit easily between the rows of solar panels and can manage easily on uneven or rocky ground. Two large solar projects in North Carolina employ a herd of sheep to manage the grass between panels where larger mowing equipment would not be feasible (Ranii, 2010). One sheep rancher in England installed 20,000 solar panels in a pasture that supports 500 ewes. He continues to sell award winning Dorset lamb, and his long-time family farm now benefits from two diversified sources of income (Western Morning News, 2014). And closer to home on Kaua'i, rancher Darrell Kaneshiro grazes a herd of 20-30 sheep under several acres of solar panels to keep the grass and weeds under control. When First Wind met with him earlier this year, he was planning to begin grazing his sheep on larger solar projects on the island.

With respect to HRS 205-4.5(a), sheep pasturage is "raising of livestock" and so meets the requirement of being an "agricultural activity" under paragraph *(3) Raising of livestock, including poultry, bees, fish, or other animal or aquatic life that are propagated for economic or personal use.*

Viable Market Opportunity for Sheep

The UH study notes that sheep and goats (small ruminants) are making a resurgence in Hawai'i and that the past decade has generally shown an increase in small ruminant production on both large ranches and on homesteads. In 2013, the statewide inventory was 21,921 head of sheep, with a total value of $854,000. As for farms, the 2012 Hawaii Census of Agriculture identified 353 farms in Hawai'i that raise sheep and lamb. Statewide, the majority of farms (300) have a small inventory of 1-24 sheep; and only twelve farms have an inventory of more than 100 sheep. On O'ahu, all of the sheep farms in 2012 had fewer than 100 sheep per farm.

The UH study and First Wind each conducted local interviews regarding the market for lamb meat. The UH study concluded that there is a growing demand for lamb meat in Hawai'i. The First Wind interviews noted that Darrel Kaneshiro sells fresh lamb meat to local restaurants on Kaua'i, and says that they will take all the meat that he can provide. On Maui, Haleakala Ranch has had a similar experience with their locally raised grass-fed lamb, with local stores quickly selling out of fresh local lamb. A sheep rancher on Hawai'i Island, also a member of the Hawaii Sheep and Goat Association, explained that there is a strong demand for local lamb statewide, and that customers statewide will consume as much lamb as local ranchers can produce. First Wind also talked with two local executive chefs, both of whom have featured lamb in their restaurants for many years and confirm that lamb is popular with both local customers and visitors. One of the chefs already purchases grass-fed local lamb, and both say that they would purchase and serve more if it were available.

Tin Roof Ranch, an organic farm on O'ahu's North Shore, grazes a herd of 20 sheep and sells lamb to local restaurants and a butcher shop in Hale'iwa that features local meats. Tin Roof Ranch reports that their small flock cannot come close to meeting demand, and that their customers have said they will buy as much lamb as the ranchers can produce (Yonan, 2014). They occasionally take fresh lamb products to farmers markets where it also sells out quickly, indicating yet another area where demand is not being met. Taken together, information from multiple sources suggests that there is an unmet demand for locally raised fresh lamb meat in Hawai'i, and despite a successful sales by ranches on Kaua'i, Maui and Hawaii Island, there is currently no larger scale (i.e. over 100 head) sheep ranching business on O'ahu. In the face of unmet demand, it is unlikely that additional sheep farm operations would have a negative impact on existing sheep farm operations.

Providing Land and Support for Sheep Ranching

As the landowner of the proposed project, First Wind intends to select a lessee who can best grow and manage a sheep ranch on the property, then to subsidize land costs and provide other support that will help the lessee develop a successful business. First Wind has talked with several ranchers interested in starting a sheep operation on O'ahu, and most have cited available pasture land, lease terms, and fencing as some of the main challenges. Annual costs for pasture land on O'ahu are typically $25-50 per acre per year. Also, many leases are only provided with terms that are month-to-month or year-to-year, which makes it difficult for ranchers to make long-term plans on investments in infrastructure. One of those upfront investments is fencing, a significant but necessary expense for a pasture operation. As noted in the UH study, perimeter fencing is important for keeping predators out.

Except for the transformers, most of the fenced area used for the solar energy project would be largely available for grazing. The solar panel layout contains a space of approximately 7-10 feet between rows (as well as up to 3-8 feet beneath the panels) to promote growth of field vegetation and accommodate grazing. The project site has been used for cattle pasturage and contains adequate forage to support 100-200 head of sheep on a year-round basis. Grazing has the added benefit of managing vegetation such that plants do not grow tall enough to shade the solar panels and decrease energy production; sheep grazing offers a sustainable alternative to manual/chemical weed control.

By co-locating solar energy with sheep pasturage, the grazing land and some of the infrastructure can be provided at a lower cost to the rancher. The land is essentially paid for by the revenue from the project's energy sales, and therefore can be leased or sub-leased to the rancher for less than market rate. First Wind plans to enter into a lease with a sheep ranching business at a nominal lease rent, less than $10 per acre per year (i.e., at least fifty per cent below the fair market rent for comparable properties), for a term of at least five years. Additionally, First Wind plans to install perimeter fencing and roads as part of the proposed solar project, at no cost to the sheep

operation, and will work with the rancher to facilitate watering systems, electrified fencing, pens and loading facilities, depending on the needs of the operation.

The rancher will provide the expertise, labor, and equipment needed for a sheep farm operation. The UH study identifies factors for consideration: breed of sheep, stocking rates, water, additional predator controls, animal welfare, veterinary care, and vaccination. As noted above, First Wind is a developer of renewable energy projects and so is seeking qualified ranchers with the expertise to successfully operate a sheep farm and take sheep products to market. By lowering start-up and recurring costs for the pasture, the solar project will subsidize the sheep farm and increase its chances for commercially success.

Other Compatible Agricultural Activities at Kawailoa Solar Farm

First Wind will comply with HRS 205-4.5(a)(21)(A) by not only making its solar farm available for compatible agricultural activities, but also by seeking operators of other types of compatible activities. Agricultural business ventures are by nature challenging, and economic success is by no means a certainty. While research and common practice suggests sheep pasture as the most compatible agricultural use for a solar farm, if a sheep ranching lessee is not able to maintain a viable operation, then First Wind would seek another lessee who can be more successful. In their discussions, several sheep ranchers expressed interest in being considered for the property. However, in the case that no lessees can succeed at sheep ranching, the landowner would look at alternative agricultural activities, such as beekeeping, aquaponics, aquaculture or other livestock. Beekeeping is an agricultural activity that is compatible with a solar farm and a sheep ranch (Correa, 2014). Also noted in the UH study is the possibility that solar arrays and aquaponics gardens (lettuce, vegetables) could be compatible. First Wind has also identified fish farming as another compatible activity, and could even consider certain breeds of cattle in some circumstances.

3.2 Infrastructure Requirements

Overall, the proposed project would require minimal public infrastructure. Following is a brief description of the infrastructure relative to wastewater, water, drainage and flooding, streets and transportation.

Wastewater System

Normal operation of the facility would not require onsite personnel. Therefore, the site would not be permanently manned and no permanent wastewater facilities would be required.

Water

Small amounts of water would be required for occasional cleaning of the solar panels and to support co-located ranching operations. Water would be available either from rainwater catchment equipment, onsite irrigation ponds, or transported in via truck. No hook-up to the municipal water system is planned.

Drainage and Flooding

The project site is classified as Flood Zone D, which includes areas where flood hazards are undetermined. Several intermittent waterways run alongside the project site; however, these features are located within steep gulches, such that flooding of the project site is not expected. Drainage across the site currently exists in the form of surface runoff based on the natural topography; the proposed project would not significantly alter the existing drainage patterns.

Streets and Transportation

Access to the project site is via the private access road known as Ashley Road with ingress/egress off Kamehameha Highway. Periodic maintenance and inspection of the solar facilities (including supplemental mowing, landscaping, panel cleaning and electrical maintenance) would occur irregularly, as part of which employees would drive to various locations throughout the site on a network of internal gravel roads (as shown in Attachment 3). No dedicated parking facilities are planned as part of the solar farm project.

4.0 Project Impacts

4.1 Environment

Natural Landforms

The project site was previously used for agricultural operations over an extended period of time, as part of which there was extensive ground disturbance. As a result of the previous agricultural uses, the site is relatively flat with an average slope of approximately 7 percent. Site grading associated with the proposed project would be limited to smoothing out localized high or low spots and would not materially alter any natural landforms.

Natural Habitats

Given the past agricultural uses, there is very minimal natural habitat present on the site. The existing flora and fauna within the project site were characterized as part of a biological resources survey conducted by SWCA Environmental Consultants; the results are summarized below.

Flora

Vegetation within the study area is comprised almost entirely of non-native, weedy plant species that dominate this area since sugar cane cultivation was abandoned. The only native species encountered during SWCA's field survey was '*uhaloa* (*Waltheria indica*), a common species often found in disturbed areas throughout the Hawaiian Islands. The most abundant species within the study area is Guinea grass (*Urochloa maxima*), which is native to Africa and was introduced widely throughout the Pacific as a forage grass (Wagner et al. 1999).

No state or federally listed threatened, endangered, or candidate plant species have been recorded within the study area. The study area does not contain designated (or proposed) critical habitat. Given the general condition of the area and the specific lack of any rare or sensitive native plant species within the study area, construction and operation of the facility is not expected to result in any significant adverse impact on botanical resources.

Fauna

Wildlife surveys were conducted within the larger Kawailoa wind power facility project area through a combination of pedestrian surveys (Hobdy 2010a, 2010b), visual bird surveys (SWCA 2010a), nocturnal radar surveys (Cooper et al. 2011; Cooper and Sanzenbacher, 2011), and the use of bat detection devices (SWCA, 2010).

A total of 26 bird species have been detected in the study area and the immediate vicinity. Of these, only four are native or winter migrants to the Hawaiian Islands and include: Black-crowned night heron (*Nycticorax nycticorax*), Pacific golden-plover (*Pluvialis fulva*), the endangered Newell's shearwater (*Puffinus auricularis newelli*), and Hawaiian duck-mallard hybrid (*Anas* sp.). The Black-crowned night heron and the Pacific golden-plover are common in disturbed and urban lowland areas across the Hawaiian Islands (SWCA, 2011a).

Based on previous radar surveys within the Kawailoa wind farm project area, it is presumed that a small number of Newell's shearwaters may transit the study area during the seabird breeding season (April- December). Although unlikely, it is also possible that the endangered Hawaiian petrel (*Pterodroma sandwichensis*) could transit the area. Nesting habitat for these listed species (i.e., steep slopes vegetated by *uluhe* fern [*Dicranopteris linearis*] undergrowth and scattered 'ōhi'a [*Metrosideros polymorpha*]) does not exist in the study area.

Suitable waterbird habitat (e.g., open water features or mudflats) does not occur within the study area; however, several endangered waterbirds have been observed at nearby waterbodies and/or flying over the Kawailoa area, and could transit the study area while moving between nearby habitat. These include Hawaiian stilts (*Himantopus mexicanus knudseni*), Hawaiian coot (Fulica alai), and Hawaiian moorhen (*Gallinula chloropus sandvicensis*). Ducks resembling Hawaiian ducks (*Anas wyvilliana*) (but likely to be hybrids) have been seen flying over the Kawailoa area and the vicinity. Because of the hybridization of Hawaiian ducks with feral mallards, it is questionable whether any pure Hawaiian ducks are resident on the Island of O'ahu (Browne et al. 1993; USFWS 2005; Uyehara et al. 2007); however, given the dispersal capabilities of the species, it is possible that pure Hawaiian ducks could occasionally fly over from Kaua'i.

There is no scientific evidence of fatality risks to birds associated with photovoltaic arrays, which are black (rather than reflective). In contrast, reflective surfaces are considered especially prone to collisions (McCrary et al. 1986).

Specifically, high rates of avian mortality have been reported from projects with heliostats (mirrors), which concentrate sunlight on a centrally located, tower mounted boiler. As the proposed project utilizes photovoltaic arrays, significant impacts associated with avian mortality are not expected.

The Hawaiian hoary bat (*Lasiurus cinereus semotus*) is the only native mammal species which is still extant within the Hawaiian Islands (USFWS, 1998). The endangered Hawaiian hoary bat has been documented flying in the Kawailoa area through the use of bat detection devices (SWCA 2011b). Bat activity has been detected in essentially all habitats in the Kawailoa area, including clearings, along roads, along the edges of tree lines, in gulches and at irrigation ponds. Monitoring to date indicates that bats use all of these features for travelling and foraging (SWCA 2011b). To minimize potential impacts to this species, clearing and/or trimming of trees above 15 feet in height will not occur between June 1 and September 15 (to avoid the period when non-volant juveniles may be present). In addition, the perimeter fence will have a barbless top-strand of wire to prevent entanglement. First Wind will also work with the U.S. Fish and Wildlife Service and the State of Hawaii Department of Land and Natural Resources Division of Forestry and Wildlife to develop appropriate protocols for the construction and operation of the Project to monitor and mitigate risks to protected species.

Historic Sites

Historic properties that could potentially occur within the project site were characterized as part of an archaeological inventory survey conducted by ASM Affiliates.

The results of the archaeological inventory survey indicate that there are two historic sites that could potentially be affected by the project: SIHP Site 7716 and SIHP Site 7171, both of which are abandoned remnant ditch complexes located along the corridor for the electrical line to the Makai switchyard. Each site retains sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O‘ahu; however, the assessment suggests that a reasonable and adequate amount of information has been collected from and about each site to warrant a no further work recommendation, such that no historic properties would be affected.

A copy of the archaeological inventory survey is contained in Attachment 8. This draft report has been submitted to the State Historic Preservation Division (SHPD) for their review and concurrence. No ground-altering activities will occur prior to obtaining approval of the archaeological inventory survey from SHPD.

Views and Aesthetics

In general, views of the project are expected to be minimal based on the low profile of the solar arrays, and the existing topography and vegetation surrounding the project site. To characterize the existing nature of views toward the proposed project, photographs were taken from a variety of representative locations surrounding the project site. Of these, a select number of viewpoints were used to produce simulated views of the proposed solar arrays; these include Pu‘u o Mahuka Heiau (near Waimea Bay), the adjacent residential neighborhood in Pupukea, Kamehameha Highway (on the approach to Hale‘iwa Town), and Mokuleia Beach Park. In addition, a simulation was produced from an oblique aerial perspective, to provide a birds-eye view of the solar arrays. Photographs showing existing and simulated views of the solar arrays are contained in Attachment 9, and are discussed below.[5]

As previously described, the residential areas closest to the project site are along Kamehameha Highway (approximately 0.7 mile to the west) and Pupukea (approximately 1.0 mile to the north). Mauka views of the project site from Kamehameha Highway, including the adjacent residential areas, are obstructed by existing topography and vegetation, particularly a prominent embankment along the western edge of the Kawailoa property. As such, the project is not expected to be visible from these areas, and would not affect the *mauka* views, which are identified as significant scenic resources in the North Shore Sustainable Communities Plan. Views from other adjacent areas, including the residences in Pupukea and Pu‘u o Mahuka Heiau are also expected to be largely obstructed by intervening vegetation, including the canopy of mature trees along the northern side of the Kawailoa property. A simulated view from Pupukea shows the approximate location of the solar arrays (revealed)

[5] The substations were not included in the visual simulations, as the solar panels are the predominant visual feature of the proposed project; given the distance of the substations from publically accessible locations, they are not expected to be visible. Although taller than the panels, these facilities are not solid structures, but rather a series of poles/wires, which minimizes their visibility.

relative to the existing vegetation, indicating that the panels would be largely (if not entirely) blocked by the existing vegetation. Any unblocked views would be minimized by the fact that the panels would be oriented to the south (to maximize the solar radiation as the sun tracks across the sky).

Views from other publically-accessible locations in the surrounding areas would also be minimally impacted, based on distance from the project site, low profile of the panels, and the natural topography and existing vegetation surrounding the site. In particular, important scenic views identified in the North Shore Sustainable Communities Plan, such as those from Kamehameha Highway entering Hale'iwa Town, are not expected to be significantly affected. A simulated view from Kamehameha Highway shows the approximate location of the solar arrays (revealed) relative to the intervening landforms. Although intermittent views may occur in some locations, these are expected to be fleeting, such that the solar facilities would not be a prominent feature of the existing viewplanes.

Areas that would have a relatively unobstructed view of the proposed project are more distant viewpoints west and southwest of the site, such as Mokuleia and the offshore waters. A simulated view from Mokuleia Beach Park indicates the visibility of the panels. Although the panels are not expected to be screened from these vantage points, the visibility is expected to be diminished based on the relatively low profile of the panels and the overall distance to the site, such that the facilities would not be a prominent feature of the viewshed.

Parks and Recreation

The proposed project is not expected to affect any parks or other recreational facilities.

4.2 Public Services

Refuse Collection

Construction and operation of the proposed project is not anticipated to generate a significant amount of solid waste. During construction, all waste would be temporarily stored onsite and periodically transported and properly disposed of in a permitted landfill. Little to no waste would be generated during operation. As such, the project is not expected to affect refuse collection services.

Fire Protection

The Waialua Fire Station is located approximately 2 miles from the entrance to the project site. Construction of the proposed project would involve the use of electrical generating equipment and some flammable materials (for example, diesel fuels, lubricating oils, and hydraulic fluids). The proposed project includes an existing access road and turnaround area that can accommodate fire apparatus; it is anticipated that the solar project does not need to provide water supply for fire flow as no occupied buildings would be constructed within the project site. As such, the proposed project is expected to have minimal impact on fire protection services.

Police Services

The Wahiawā Police Station is located approximately 11 miles from the entrance to the project site. During construction, the site would likely be staffed with security personnel on an as-needed basis. During operations, the facilities would be adequately secured and are not expected to require additional security on a regular basis. As such, the proposed project would have minimal impact on police services.

4.3 Summary of Potential Impacts

Construction of the solar facilities would result in short-term impacts that are temporary, intermittent, and localized. In particular, project construction would involve a variety of ground disturbing activities, including site preparation and grading, equipment assembly and installation (e.g., driving steel posts), and trenching for the underground collection lines. Use of heavy equipment and earthmoving operations conducted as part of these activities would generate noise, as well as fugitive dust and internal combustion engine emissions, resulting in temporary impacts to local air quality. Rain events during construction may cause soil erosion. Given the project site's isolation from populated areas, construction-related impacts would not be significant. Nevertheless, best management practices (BMPs) would be implemented to minimize noise, air emissions, and stormwater runoff. Vehicular traffic would also increase during construction, but this increase would also be short-term and localized. None of these impacts would alter the character of surrounding areas.

Long-term impacts related to operations and maintenance would be minimal; a brief description of typical operational characteristics of solar farm projects is provided below.[6]

- **Glare:** Solar panels are designed to reflect only about 2 percent of incoming sunlight. Panels are typically designed with anti-reflective glass front surfaces to capture and retain as much of the solar spectrum as possible. In general, solar module glass has less reflectivity than water or window glass. A reflectivity study conducted for the proposed project evaluated the potential for glare at 14 locations surrounding the project site, including Wheeler and Dillingham Airfields and various roadways and residential areas. The results indicate that none of the observation points will have potential glare. Theoretically, there could be some fleeting early morning instances of potential glare at some locations, but it would so insignificant that it is considered to be below the calculable threshold. It was not possible to assess the precise glare impacts to aviators within the TFTA (given the variability in training times, locations and elevations); however, the study concluded that the potential for significant glare-related impacts is unlikely, and any glare would be of extremely short duration and probably barely perceptible to aviators in the TFTA. A copy of the reflectivity study is provided in Attachment 10. In the event the project creates a hazardous condition for pilots, First Wind will immediately initiate steps to mitigate the hazard upon notification by the appropriate authorities (e.g., Federal Aviation Administration).

- **Noise:** Ground-mounted inverters and transformers make a humming noise during daytime hours when the solar array generates electricity; this sound is typically inaudible in areas approximately 50-150 feet from the boundary of the array. There may be some sound generated from switching gear associated with the power substation, but this is expected to be minimal. Another noise source would include mowers and string trimmers used for vegetation control. None of these are expected to be audible from the nearest residences, which are approximately 0.7 mile from the solar facilities.

- **Ambient Temperature ("Heat Island"):** Available evidence indicates that functional photovoltaic arrays do not cause a solar "heat island" effect. Solar panels are thin and lightweight and therefore do not store a large amount of heat. This feature also means that panels cool to ambient air temperature shortly after the sun sets. As such, areas surrounding the solar farm are not expected to experience a net heating change from the panels.

- **Electric and Magnetic Fields (EMF):** The extremely low frequency EMF from solar panels is approximately the same as the EMF people are exposed to from household electrical appliances, wiring in buildings, and power transmission lines. In a study of two California solar facilities, EMF levels were found to be highest at the inverters and transformers, but decreased rapidly to less than one milligauss (mG) within 50 feet of the units; one mG is estimated to be the average daily background exposure most people experience at home.

4.4 Agency and Stakeholder Input

First Wind has conducted ongoing outreach with various agencies and stakeholders throughout the course of the project development process. Input provided to date has generally been in support of the project, with specific interest in increasing the generation of renewable energy, reducing electricity costs, enabling the dual use of land for renewable energy and agricultural activities where possible, and ensuring proper decommissioning of the project facilities after completion. In response to this input, specific measures have been incorporated into the proposed project, as described throughout this application.

The proposed solar farm project was mentioned at a regularly scheduled meeting of the North Shore Neighborhood Board (No. 27) on January 28, 2014. A presentation of the project was included on the agenda for the September 23, 2014 meeting. Due to time constraints associated with other meeting business, the presentation was deferred by the neighborhood board to January 2015. A copy of the January and September 2014 meeting minutes are provided as Attachment 11.

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[6] *Clean Energy Results: Questions & Answers on Ground-Mounted Solar Photovoltaic Systems* prepared by the Massachusetts Department of Energy Resources, Massachusetts Department of Environmental Protection, and Massachusetts Clean Energy Center, December 2012.

5.0 Compliance with the Land Use Commission Guidelines

The Land Use Commission (LUC) guidelines for granting a Special Use Permit are listed below, followed by a brief discussion of the project's compliance with each guideline:

- **Such use shall not be contrary to the objectives sought to be accomplished by the (State) Land Use Law and Regulations.**

  The State Land Use Law, which is promulgated in HRS Chapter 205, establishes four major land use districts and the activities that are included as permitted uses in each district. Recent legislation (Act 55 and Act 52) amended the provisions of HRS Chapter 205 relative to solar energy facilities.

  The proposed project would be located within the State Agricultural District. Permitted uses within the State Agricultural District are described in HRS Chapter 205-2 and take into consideration the LSB classification system. The LSB system rates the productivity of soils throughout the State based on characteristics including texture, slope, salinity, erodibility, and rainfall, and designate areas in categories ranging from A to E (with Class A representing the most productive soils and Class E representing the least productive soils). HRS Chapter 205-2 (as amended) includes as a permitted use:

  > *"Solar energy facilities placed within land with soil classified as overall productivity rating class B or C shall not occupy more than ten percent of the acreage of the parcel, or twenty acres of land, whichever is lesser, unless a special use permit is granted pursuant to section 205-6."*

  Permitted uses within the agricultural district are further described in HRS Chapter 205-4.5, which was amended based on Act 55 and Act 52 to restrict uses for solar energy facilities to include the following:

  > *"(20) Solar energy facilities that do not occupy more than ten per cent of the acreage of the parcel, or twenty acres of land, whichever is lesser, or for which a species use permit is granted pursuant to section 205-6; provided that this use shall not be permitted on lands with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating class A unless the solar energy facilities are:*
  >
  > *(A) Located on a paved or unpaved road in existence as of December 31, 2013, and the parcel of land upon which the paved or unpaved road is located has a valid county agriculture tax dedication status or a valid agricultural conservations easement;*
  >
  > *(B) Placed in a manner that still allows vehicular traffic to use the road; and*
  >
  > *(C) Granted a special use permit by the commission pursuant to section 205-6;*
  >
  > *(21) Solar energy facilities on lands with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating B or C for which a special use permit is granted pursuant to section 205-6; provided that:*
  >
  > *(A) The area occupied by the solar energy facilities is also made available for compatible agricultural activities at a lease rate that is at least fifty per cent below the fair market rent for comparable properties;*
  >
  > *(B) Proof of financial security to decommission the facility is provided to the satisfaction of the appropriate county planning commission prior to date of commencement of commercial generation; and*
  >
  > *(C) Solar energy facilities shall be decommissioned at the owner's expense according to the following requirements:*
  >
  > *(i) Removal of all equipment related to the solar energy facility within twelve months of the conclusion of operation or useful life; and*

(ii) Restoration of the disturbed earth to substantially the same physical condition as existed prior to the development of the solar energy facility.

For the purposes of this paragraph, "agricultural activities" means the activities described in paragraphs (1) to (3)."

HRS 205-4.5(a) paragraphs (1), (2), and (3) are quoted below:

"(a) Within the agricultural district, all lands with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating class A or B and for solar energy facilities, class B or C, shall be restricted to the following permitted uses:

(1) Cultivation of crops, including crops for bioenergy, flowers, vegetables, foliage, fruits, forage, and timber;

(2) Game and fish propagation;

(3) Raising of livestock, including poultry, bees, fish, or other animal or aquatic life that are propagated for economic or personal use."

As previously described, the project would occupy approximately 332.3 acres of Class B soils, 37.9 acres of Class C soils, and 12 acres of Class E soils. The project area would also include approximately 1.9 acres of Class A land, which is comprised entirely of an existing roadway; approximately 550 linear feet of underground electrical line would be installed beneath the roadway. This document is being submitted as part of the application for a Special Use Permit, and as described above, the project would comply with the provisions of HRS Chapter 205-4.5 (including Act 55 and Act 52) as follows:

- *In combination with the solar energy facilities, the area occupied by the panels would also be used for compatible agricultural activities that qualify under HRS 205-4.5(a). Within one year of the start of the commercial operation of the solar farm, First Wind will establish, or will be actively seeking to establish a compatible agricultural operation, and will seek to have such compatible agricultural operations on the land for the duration of commercial energy generation operations. First Wind has been in discussions with several local ranchers and plans to lease the project area for the pasturage of sheep. Sheep pasturage is widely recognized as a compatible use with solar panels. The area contains adequate forage to support 100-200 head of sheep on a year-round basis. Grazing has the added benefit of managing vegetation such that plants do not grow tall enough to shade the solar panels and decrease energy production, and is a sustainable alternative to manual/motorized weed control. Recently, First Wind executed a Letter of Intent to lease the property to a local ranching business to pasture sheep on the site (Attachment 5). The Lease would commence after the solar project is operational and would include a rental rate that would be no more than 50 percent of the market rate for similar agricultural properties. The Lease would also provide the tenant with use of the fencing and roadways and other infrastructure at the project site. Additional detail is provided in the Agricultural Implementation Plan, contained in Section 3.1.*
- *The project is expected to have an operational life of approximately 25-30 years, following which the facility may be re-powered with new equipment (under subsequent permits/approvals) or decommissioned. As described in Section 3.0, decommissioning would involve removal of all aboveground structures, including the panels, transformers, and substation equipment, as well as removal of all below-ground structures and foundations to a depth of 36 inches below grade, and the property will be returned to substantially the same condition as existed prior to the solar farm use. It is anticipated that most of the materials would be either salvaged or recycled, with the majority of this material likely being shipped to a recycling facility on the mainland. The remaining materials would be disposed of by the contractor at authorized sites in accordance with applicable laws. Site reclamation would be based on site-specific requirements and techniques commonly employed at the time of decommissioning, and is expected to include grading, spot replacement of topsoil, removal of gravel, and revegetation of all disturbed areas with an appropriate hydroseed mix, such that the physical conditions of the project site would be comparable to the existing*

conditions. Decommissioning would occur within 12 months of the conclusion of the operation or useful life.

- *As described in the decommissioning plan (Attachment 7), First Wind will put financial security in place to cover the estimated cost of decommission. Decommissioning security will be provided in the form of a parent guaranty, letter of credit, or some other acceptable form of security prior to commercial operation of the solar facility. Typically, when the project is financed, either a financial reserve is established in which decommissioning funds are accumulated over several years of proceeds from energy sales, or security is posted via a letter of credit from a commercial lender.*
- *The electrical line that would be installed on Class A lands would be located along a roadway that was constructed for the existing wind farm in 2012; the electrical line would be installed underground, such that it would not impede vehicular traffic along the roadway. The parcel of land upon which the roadway is located is dedicated as vacant agricultural land; Attachment 12 provides documentation of the dedicated use (as indicated by the taxable land value, which is based on the dedicated use value for agriculture) for each of the parcels within the project area.*

As such, the proposed solar farm is consistent with HRS Chapter 205 (as amended by Act 55 and Act 52).

- **That the desired use would not adversely affect surrounding property.**

  With the exception of the existing Kawailoa wind farm, the areas immediately surrounding the project site are undeveloped; these areas support a variety of uses, including agriculture, conservation and military operations. The proposed solar farm would not directly or indirectly affect these adjacent uses.

  The nearest residences to the proposed solar facilities are those just mauka of Kamehameha Highway and those in Pupukea, which are approximately 0.7 mile to the west and 1.0 mile to the north, respectively. Mauka views toward the project site from the residences along Kamehameha Highway are obstructed by existing topography and vegetation, such that the project is not expected to be visible from these areas. Similarly, views from residences in Pupukea are also expected to be largely obstructed by intervening vegetation. Views from other publically-accessible locations in the surrounding areas would also be minimally impacted, based on distance from the project site, low profile of the panels, and the natural topography and existing vegetation surrounding the site. Relatively unobstructed view of the proposed project are expected from more distant viewpoints west and southwest of the site (such as Mokuleia and the offshore waters), but visibility of the solar facilities is expected to be diminished based on the relatively low profile of the panels and the overall distance to the site, such that the facilities would not be a prominent feature of the viewshed.

  The proposed project would not directly interfere with the military training in the TFTA. The potential for indirect impacts associated with glare was considered as part of the reflectivity study. Although it was not possible to assess the precise glare impacts to aviators within the TFTA (given the variability in training times, locations and elevations), the study concluded that the potential for significant glare-related impacts is unlikely, and any glare would be of extremely short duration and probably barely perceptible to aviators in the TFTA. In the event the project creates a hazardous condition for pilots, First Wind will immediately initiate steps to mitigate the hazard upon notification by the appropriate authorities (e.g., Federal Aviation Administration).

  Construction of the solar facilities would involve a variety of ground disturbing activities, such as site preparation and grading, equipment assembly and installation (e.g., driving steel posts), and trenching for the underground collection lines. Use of heavy equipment and earthmoving operations conducted as part of these activities would generate noise, as well as temporary fugitive dust and internal combustion engine emissions, resulting in temporary impacts to local air quality. BMPs would be implemented to minimize the noise and emission levels, and in general, the impacts are expected to be temporary, intermittent, and localized in nature. None of these impacts would be expected to alter the character of the surrounding areas in a manner that would result in adverse effects.

- **Such use would not unreasonably burden public agencies to provide roads and streets, sewers, water, drainage and school improvements, and police and fire protection.**

  The project would not require infrastructure support from public agencies and would be unlikely to use police or fire protection services.

- **Unusual conditions, trends and needs have arisen since the district boundaries and regulations were established.**

  Renewable energy is an important long-term requirement for the State, which first established a renewable portfolio goal in 2001 (Act 272).The legislature has made subsequent modifications and under the current Renewable Portfolio Standard (RPS), each electric utility company must achieve certain targets which are measured as percentages of renewable electrical energy sales:

  - *10% of net electricity sales by Dec 31, 2010*
  - *15% of net electricity sales by Dec 31, 2015*
  - *25% of net electricity sales by Dec 31, 2020*
  - *40% of net electricity sales by Dec 31, 2030*

  As of Dec 31, 2013, 18% of HECO's electrical energy sales on O'ahu was generated by renewable energy sources.

  The project site provides exceptional characteristics for solar power generation: large tract of flat land, good solar irradiance, existing road access that can accommodate construction equipment, and onsite access to the HECO electrical grid to establish interconnection with minimal environmental impact. The project would generate enough renewable energy to power the equivalent of 15,000 O'ahu households.

  Recognizing the overlap of the site attributes needed for solar energy generation with that needed to support agricultural operations, the Kawailoa site provides an opportunity to balance these uses, supporting both energy generation and agricultural production. By providing land for agricultural uses at below-market value rent, as well as pasture infrastructure, the proposed solar farm project seeks to address both needs.

- **That the land upon which the proposed use is sought is unsuited for the uses permitted within the District.**

  The land is not unsuitable for agriculture; rather; it is capable of meeting and balancing two important needs—maintenance for agricultural purposes and development of renewable energy resources. The project is consistent with the underlying objectives of HRS Chapter 205 (as amended by Act 55 and Act 52) first, by supporting and subsidizing complementary agricultural activity so that it is more economically sustainable; and, second, by providing for the eventual restoration of land comparable to the existing conditions, such that future agricultural use may occur.

6.0 Consistency with State and County Plans and Programs

The application for a Special Use Permit requires a project demonstrate consistency with the State's Coastal Zone Management policies and objective (HRS Chapter 205A), the Hawai'i State Plan (HRS Chapter 226), the City and County's General Plan, and the applicable Development Plan or Sustainable Communities Plan. Consistency with these plans and programs is summarized below.

6.1 Coastal Zone Management Objectives and Policies (HRS 205A)

The objectives and policies of the Coastal Zone Management (CZM) program are specified in HRS Chapter 205A-2. These objectives and policies, and a description of the project's consistency with each, are listed below.

OBJECTIVES

(1) Recreational resources;

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

This objective is not applicable to the project; the project area does not contain coastal recreational resources.

(2) Historic resources;

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

An archaeological inventory survey was conducted by ASM Affiliates. The results of the survey indicate that there are two historic sites that could potentially be affected by the project: SIHP Site 7716 and SIHP Site 7171, both of which are abandoned remnant ditch complexes located along the corridor for the electrical line to the Makai switchyard. Each site retains sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O'ahu; however, the assessment suggests that a reasonable and adequate amount of information has been collected from and about each site to warrant a no further work recommendation, such that no historic properties would be affected. A draft report has been submitted to SHPD for their review and concurrence. No ground-altering activities will occur prior to obtaining approval of the archaeological inventory survey from SHPD. As such, the project is believed to be consistent with this objective.

(3) Scenic and open space resources;

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

The solar panels would be mounted low to the ground and their profile would not substantially intrude into the view plane from public vantage points, thus maintaining the "open space" characteristics of this area. As such, the project is believed to be consistent with this objective.

(4) Coastal ecosystems;

(A) Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

As previously described, stormwater runoff would be appropriately addressed through design features that incorporate BMPs to minimize the quantity and water quality impacts associated with runoff. As such, the project is believed to be consistent with this objective.

(5) Economic uses;

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

This objective is not applicable to the project; the project would not affect economic uses or conditions in coastal areas.

(6) Coastal hazards;

(A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution

This objective is not applicable to the project; the project would not be located in an area that is subject to coastal hazards.

(7) Managing development;

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

This objective is not applicable to the project; the project would not be located in an area relevant to coastal resources and hazards.

(8) Public participation;

(A) Stimulate public awareness, education, and participation in coastal management.

This objective is not applicable to the project; the project would not be located in an area relevant to coastal management.

(9) Beach protection;

(A) Protect beaches for public use and recreation.

This objective is not applicable to the project; the project would not be located in an area subject to beach use.

(10) Marine resources;

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

This objective is not applicable to the project; the project would not be located in an area relevant to marine resources.

POLICIES

(1) Recreational resources;

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

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

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

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

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

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

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

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

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

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

This policy is not applicable to the project; the project would not be located in an area that provides coastal resources or other recreational opportunities.

(2) Historic resources;

(A) Identify and analyze significant archaeological resources;

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

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

An archaeological inventory survey was conducted by ASM Affiliates. The results of the survey indicate that there are two historic sites that could potentially be affected by the project: SIHP Site 7716 and SIHP Site 7171, both of which are abandoned remnant ditch complexes located along the corridor for the electrical line to the Makai switchyard. Each site retains sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O'ahu; however, the assessment suggests that a reasonable and adequate amount of information has been collected from and about each site to warrant a no further work recommendation, such that no historic properties would be affected. A draft report has been submitted to SHPD for their review and concurrence. No ground-altering activities will occur prior to obtaining approval of the archaeological inventory survey from SHPD. As such, the project is believed to be consistent with this objective.

(3) Scenic and open space resources;

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

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

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

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

The project would not significantly affect any valued scenic resources and/or shoreline open spaces. The project would involve minimal disturbance of the existing topography and solar panels would be mounted low to the ground such that their profile would not substantially intrude into the view plane from public vantage points, thus maintaining the "open space" characteristics in this area. As such, the project is believed to be consistent with this policy.

(4) Coastal ecosystems;

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

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

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

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

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

The project would not involve the use of marine and coastal resources. However, stormwater runoff from the site would be managed to protect coastal resources. As such, the project is believed to be consistent with this policy.

(5) Economic uses;

(A) Concentrate coastal dependent development in appropriate areas;

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

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

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

(ii) Adverse environmental effects are minimized; and

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

This policy is not applicable to the project; the project would not involve coastal dependent development.

(6) Coastal hazards;

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

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

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

(D) Prevent coastal flooding from inland projects;

This policy is not applicable to the project; the project would not be located in an area subject to coastal hazards, nor would it contribute to coastal flooding.

(7) Managing development;

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

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

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

This policy is not applicable to the project; the project would not involve coastal development.

(8) Public participation;

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

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

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

This policy is not applicable to the project; the project does not relate to coastal zone management processes.

(9) Beach protection;

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

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

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

(D) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and

(E) Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor;

This policy is not applicable to the project; the project does not involve use of a beach.

(10) Marine resources;

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

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

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

(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources. [L 1977, c 188, pt of §3; am L 1993, c 258, §1; am L 1994, c 3, §1; am L 1995, c 104, §5; am L 2001, c 169, §3; am L 2010, c 160, §5]

This policy is not applicable to the project; the project does not involve marine resources.

6.2 Hawaii State Planning Act (HRS 226)

The Hawai'i State Planning Act is contained in HRS Chapter 226. The goal and relevant objectives and policies are listed below, followed by a description of the project's consistency with each.

GOALS (HRS 226-4)

In order to guarantee, for present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve:

(1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai'i's present and future generations.

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

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

This project seeks to balance renewable energy and agricultural activities, both of which are needs that must be met under State law: HRS 205 and the Renewable Portfolio Standard. The proposed solar farm would meets the current and near-term future needs of both. Because State law mandates the decommissioning and removal of the solar panels and related equipment at the end of the project, the

proposed facility is not an irreversible or irrevocable use of the land. The full range of uses of the property is preserved for future generations.

OBJECTIVES AND POLICIES – AGRICULTURE (HRS 226-7)

Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

(1) Viability of Hawai'i's sugar and pineapple industries.

(2) Growth and development of diversified agriculture throughout the State.

(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawai'i's strategic, economic, and social well-being.

Sugar and pineapple are no longer economically viable industries in Hawaii. Given the cost structure of today's global economy, Hawai'i does not have a competitive advantage in industrial-scale agriculture and food processing. Rather than a "stand-alone" agricultural use, this project proposes a dual-use approach to agriculture through the combination of renewable energy and pasturage. By providing land for agricultural uses at a price well below market value, the project is contributing to development of diversified agriculture within the State. By including a provision for decommissioning, the project also preserves the opportunities for other agricultural uses on the property in the future.

To achieve the agriculture objectives, it shall be the policy of this State to:

(1) Establish a clear direction for Hawai'i's agriculture through stakeholder commitment and advocacy.

(2) Encourage agriculture by making best use of natural resources.

(3) Provide the governor and the legislature with information and options needed for prudent decision making for the development of agriculture.

(4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.

(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawai'i's economy.

(6) Seek the enactment and retention of federal and state legislation that benefits Hawai'i's agricultural industries.

(7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawai'i's producers and consumer markets locally, on the continental United States, and internationally.

(8) Support research and development activities that strengthen economic productivity in agriculture, stimulate greater efficiency, and enhance the development of new products and agricultural by-products.

(9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.

(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.

(12) Expand Hawai'i's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.

(13) Promote economically competitive activities that increase Hawai'i's agricultural self-sufficiency.

(14) Promote and assist in the establishment of sound financial programs for diversified agriculture.

(15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.

(16) Facilitate the transition of agricultural lands in economically non-feasible agricultural production to economically viable agricultural uses.

This project is driven by a private initiative to develop solar-powered electricity. Public policies supporting renewable energy have created a unique framework to jointly expand the State's agricultural base. A reasonable option for the proposed solar farm is to promote dual use with diversified livestock. Grass-fed lamb derived from sheep is growing in popularity locally and ranchers have expressed a need for additional grazing land.

6.3 City and County of Honolulu General Plan

The City and County of Honolulu's General Plan is the policy document for the long-range development of the island of O'ahu. The General Plan is a statement of general conditions to be sought over a 20-year planning horizon and policies to help direct attainment of the plan's objectives.

Specific goals and policies of the General Plan that are applicable to the project are as follows:

Economic Activity

Objective C – To maintain the viability of agriculture on O'ahu

Policy 2 - Support agricultural diversification in all agricultural areas on O'ahu.

Policy 3 - Support the development of markets for local products, particularly those with the potential for economic growth.

Policy 5 - Maintain agricultural land along the Windward, North Shore, and Wai'anae coasts for truck farming, flower growing, aquaculture, livestock production, and other types of diversified agriculture.

In combination with the solar energy facilities, the area occupied by the panels would also be used for compatible agricultural activities that qualify under HRS 205-4.5(a). Specifically, First Wind plans to lease the project area for the pasturage of sheep, which is widely recognized as a compatible use with solar panels. The area contains adequate forage to support at least 100 head of sheep on a year-round basis. By providing land for agricultural uses at a price well below market value, the project is contributing to development of diversified agriculture within the State.

Natural Environment

Objective A – To protect and preserve the natural environment

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

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.

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

Policy 3 – Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea

The proposed solar farm is a suitable use for the project site. There are no natural features that would pose a hazard to the facility, and the facility would not adversely affect sensitive environmental resources. The solar farm would be buffered from residences and publically-accessible locations through a combination of physical separation, natural landforms, and existing vegetation. In addition, the site has

existing access to the transportation network and already supports the infrastructure needed to interconnect with HECO's electrical grid, thus minimizing the need for new infrastructure.

Energy

Objective A – To maintain an adequate, dependable, and economical supply of energy for O'ahu residents

Policy 1 – Develop and maintain a comprehensive plan to guide and coordinate energy conservation and alternative energy development and utilization programs on O'ahu.

Objective D – To develop and apply new, locally available energy resources.

Policy 1 – Support and participate in research, development, demonstration, and commercialization programs aimed at producing new, economical, and environmentally sound energy supplies from:

a. Solar insolation;
b. Biomass energy conversion;
c. Wind energy conversion;
d. Geothermal energy; and
e. **Ocean thermal energy conversion.**

This project would provide O'ahu with solar-generated power, thereby replacing the need for nonrenewable, fossil fuel to generate the equivalent quantity of electricity. Photovoltaic technology is well known and has proven to be a dependable energy source. Solar generation provides important environmental benefits, including lower emissions of carbon dioxide and greenhouse gases.

6.4 North Shore Sustainable Communities Plan

The proposed project site is within the region guided by the North Shore Sustainable Communities Plan. Planning principles and guidelines included in the plan provide specific guidance to public agencies and private entities in terms of planning, design, and implementation of projects and programs in the various land use categories. These land use categories include open space and the natural environment, agriculture, parks and recreation, historic and cultural resources, residential communities, commercial areas, industrial areas, visitor facilities, institutional uses, and military uses. Specific land use policies applicable to the project are as follows:

3.1 Open Space and Natural Environment

Emphasis for the policies and guidelines for Open Space and the Natural Environment is placed on an integrated approach to resource management that underscores the Native Hawaiian concept of "ahupua'a." Consistent with this approach, preservation and protection of valued natural features, sensitive lands, agricultural lands and recreational areas are highlighted.

Specific policies include:

- **Protect and enhance significant natural features and ecologically sensitive lands, including mountain areas, shoreline areas, wetlands, fishponds, natural gulches, streams and drainageways. Provide protective buffer zones and setbacks around biologically sensitive areas to minimize habitat disturbance.**
- **Ensure the long-range protection and continuation of agricultural uses on agricultural lands.**
- **Protect and preserve views of scenic resources, including the Wai'anae and Ko'olau Mountain Ranges, coastal pali, the coastline, and the Pacific Ocean.**
- **Limit visual impacts from utility installations. Ensure that permitted utility installations are developed and/or managed in ways that maintain or enhance the natural, cultural, and scenic resource qualities of the surrounding landscape.**

There are no significant natural features or ecologically sensitive lands within the project site, such that the proposed facilities would not adversely affect sensitive environmental resources. The solar farm project would include dual-use of the property for sheep pasturage, which would serve to maintain existing agricultural lands. The solar farm would be buffered from residences and publically-accessible locations through a combination of physical separation, natural landforms, and existing vegetation, and is not expected to significantly impact scenic resources, including significant vistas identified in the Sustainable Communities Plan.

3.2 Agriculture

The policies and guidelines related to Agriculture recognize the importance of protecting productive agricultural land; encourage the development of regional support facilities and infrastructure; and emphasize the importance of prohibiting improper use and subdivision of agricultural land.

Specific policies include:

- **Protect all productive, high-value agricultural lands, regardless of current crop production capabilities, from uses that would undermine or otherwise irreversibly compromise their agricultural potential and crop production capabilities.**
- **Promote the long-term viability of diversified agriculture on the North Shore and ensure the continued productive use of the land.**
- **Ensure that agriculture is the primary use of agricultural lands. Prohibit the improper use of agricultural lands, including the development or subdivision of agriculturally designated and zoned lands for residential and other nonagricultural uses, unless accessory to agricultural uses. Do not allow token farming (i.e., "fake farms") or ranching as a ruse to exploit agricultural land.**
- **Maintain and upgrade the existing agricultural infrastructure (irrigation system and roads).**

In combination with the solar energy facilities, the area occupied by the panels would also be used for compatible agricultural activities that qualify under HRS 205-4.5(a). Specifically, First Wind plans to lease the project area for the pasturage of sheep, which is widely recognized as a compatible use with solar panels. The area contains adequate forage to support at least 100 head of sheep on a year-round basis. By providing land for agricultural uses at a price well below market value (and helping to facilitate watering systems and fencing), the project is contributing to development of diversified agriculture within the State.

3.4 Historic and Cultural Resources

The North Shore Sustainable Communities Plan emphasizes the importance of historic and cultural resources as an integral fabric of the North Shore community and underscores the need to properly identify these resources and protect them from development so they can be preserved for future generations.

Specific policies include:

- **Preserve and protect significant cultural and historic features from earlier periods**
- **Respect significant historic resources by applying appropriate management policies and practices. Such practices may range from total preservation to integration with contemporary uses.**
- **Restore or keep intact sites with cultural and/or religious significance out of respect for their inherent cultural and religious values.**

An archaeological inventory survey was conducted by ASM Affiliates. The results of the survey indicate that there are two historic sites that could potentially be affected by the project: SIHP Site 7716 and SIHP Site 7171, both of which are abandoned remnant ditch complexes located along the corridor for the electrical line to the Makai switchyard. Each site retains sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O'ahu; however, the assessment suggests that a reasonable and adequate

amount of information has been collected from and about each site to warrant a no further work recommendation, such that no historic properties would be affected. A draft report has been submitted to SHPD for their review and concurrence. No ground-altering activities will occur prior to obtaining approval of the archaeological inventory survey from SHPD. As such, the project is believed to be consistent with these policies.

4.4 Electrical Systems

- **Locate and design system elements such as renewable electrical power facilities, substations, communication sites, and transmission lines to avoid or mitigate any potential adverse impacts on scenic and natural resources.**
- **Locate powerlines underground.**
- **Promote the use of renewable energy sources and energy conservation measures.**

The proposed solar farm project would provide clean, renewable energy for integration into the existing HECO electrical grid. It would utilize existing interconnection facilities, such that new overhead transmission lines would not be required. There are no sensitive natural resources located within the project area, and the site is buffered from residences and other publically-accessible areas through a combination of physical separation, natural landforms, and screening vegetation, such that the proposed project is not expected to significantly impact scenic or natural resources.

7.0 Compliance with the Land Use Ordinance (LUO)

The City & County of Honolulu's Land Use Ordinance (LUO) identifies the uses that are considered appropriate in certain zoning districts and the minimum standards and conditions that should be met if those uses are to be permitted. The proposed project is within the restricted agricultural (AG-1) zoning district; agricultural uses are specifically addressed in Section 21-3.50-4 of the LUO, which refers to Table 21-3 (Master Use Table) for permitted uses and structures.

According to DPP's "Solar Farm Guidelines," a solar farm is considered a "utility installation" by the LUO and is permitted in all zoning districts. It may either be a Type "A" or Type "B" depending on a number of factors identified by DPP. Based on a review of the factors, it is assumed the proposed project would be considered a Type "B" utility installation which requires a Conditional Use Permit (minor) for construction in the AG-1 district, according to the LUO's Master Use Table 21-3. Additionally, the proposed communication tower for the project is expected to exceed the maximum height limits, as specified in ROH Chapter 21-3.50-4 [Table 21-3.1] and 21-4.60(c). By separate application, the project will seek a Conditional Use Permit (CUP) minor and zoning waiver for anticipated exceedance of specified height limits.

Compliance with the specific development standards, district development standards and general development standards is discussed below.

7.1 Specific Development Standards

Article 5 of the LUO identifies the specific use development standards for particular conditional use categories. Relative to the proposed project, it is expected that the development standards for Type B utility installations, as provided in Section 21-5.650, will apply to the solar panels and appurtenant structures. These standards are listed below in Table 1.

TABLE 1
Development Standards for Type B Utility Installations

LUO Standard	LUO Provision	Project Site
Landscape Plan (Section 21-5.650(a)(1))	All requests for Type B utility installations shall be accompanied by a landscape plan which shall be approved by the director. Special emphasis shall be placed on visual buffering for the installation from adjacent streets and highways.	The proposed project site is buffered from nearby streets/highways and other publically-accessible locations by natural landforms and vegetation. Additional landscaping would not further screen views of the project site; therefore, a landscape plan has not been prepared.
Utility Installations for Telecommunications (Section 21-5.650(a)(2))	Type B utility installations for telecommunications shall provide fencing or other barriers to restrict public access within the area exposed to a power density of 0.1 milliwatt/cm2 for all associated antennas involving radio frequency (RF) or microwave transmissions.	The proposed project is not a telecommunications project; however, a chain-link fence would be installed around the substation and switchyard to maintain site security.
Antenna Heights (Section 21-5.650(a)(3))	In residential districts where utility lines are predominantly located underground, antennas shall not exceed the governing height limit.	The proposed project is not located in a residential district.

7.2 District Development Standards

Article 3 of the LUO identifies the district development standards for the applicable zoning district. Specifically, Section 21-3.50-4 addresses the development standards for the agricultural district (with specific standards listed in Table 21-3.1 of the LUO). These standards, and a description of how the proposed project complies with those standards, are presented in Table 2.

As previously described, the project would be located with a lot that is approximately 10,787 acres in size (see Attachment 3). Within the lot, the building area of the proposed solar project would be approximately 104 acres, for a net lot coverage of approximately 1 percent.

TABLE 2
District Development Standards for the Restricted Agricultural (AG-1) District

LUO Standard		LUO Provision (AG-1 District)	Project Site
Minimum lot area		5 acres	approx. 10,787 acres
Minimum lot width/depth		150 feet	>150 feet (see Site Plan in Attachment 3)
Yards:	Front	15 feet	>15 feet (see Site Plan in Attachment 3)
	Side	10 feet	>10 feet (see Site Plan in Attachment 3)
Maximum building area		For non-agricultural purposes, 10 percent of zoning lot	Maximum building area is expected to be approximately 1 percent of the zoning lot
Maximum height		15 - 25 feet [a]	In compliance; see Section 7.3

NOTE:

[a] Per Section 21-3.50-4(c), the maximum height may be increased from 15 to 25 feet if height setbacks are provided. Any portion of a structure exceeding 15 feet shall be set back from every side and read buildable area boundary line one feet for each two feet of additional height above 15 feet.

As shown in Table 2, the proposed project is expected to meet the development standards for the restricted agriculture (AG-1) zoning district; compliance with the maximum height requirements is discussed below in Section 7.3.

7.3 General Development Standards

Article 4 of the LUO identifies the general development standards that must be met for any use or site, irrespective of the zoning district in which it is located. The general development standards that are pertinent to the proposed project are those for heights (Section 21-4.60), and landscaping, screening and buffering (Sections 21-4.70 and 4.71); these are discussed below. No outdoor lighting is proposed, and there are no non-conforming lots or structures.

Heights: Section 21-4.60 specifies that all structures shall fall within a building height envelope at a height specified by the LUO or as specified on the zoning maps. As discussed above, Section 21-3.50-4 specifies that the maximum height in the AG-1 district is 25 feet (provided that the portion of the structure that exceeds 15 feet has a setback of one foot for every two feet of additional height). Pursuant to Section 21-4.60(c)(4), utility poles and antennas are exempted from zoning district height limits; it is specified that utility poles shall not exceed 500 feet from existing grade, and antennas associated with utility installations shall not exceed 10 feet above the governing height limit.

It is anticipated that the substation control buildings would be subject to the AG-1 zoning district height limit (15-25 feet); as these would be approximately 20 feet tall and would conform to the height setback requirements, they are expected to comply with the AG-1 zoning district height limit. It is anticipated that the electrical equipment associated with the substation and interconnection facilities qualify as utility poles, and pursuant to Section 21-4.60(c)(4)(A) are subject to a height limit of 500 feet from existing grade. This equipment would range in height up to 80 feet (for the shield pole), and therefore is also expected to be in compliance with the height standards.

Landscaping, Screening and Buffering: The development standards for a Type B Utility Installation require the development of a landscape plan, which emphasizes visual buffering from adjacent streets and highways. As described above, the solar facility would not be readily visible from Kamehameha Highway, the nearest roadway, as mauka views are obstructed by existing topography and vegetation, particularly a prominent embankment along the western edge of the Kawailoa property. Views from other publically-accessible locations in the surrounding areas would also be minimally impacted, based on distance from the project site, low profile of the panels, and the natural topography and existing vegetation surrounding the site. Areas that would have a relatively unobstructed view of the proposed project are more distant viewpoints west and southwest of the site, such as Mokuleia and the offshore waters. Based on an assessment of the potentially affected viewsheds (and the distance, elevation and angle of those views), there are no portions of the project site in which landscaping would provide additional visual screening. As such, a landscaping plan has not been prepared.

General development standards are identified for landscaping and screening of parking lots, automobile service stations, service and loading spaces, trash enclosures, utility substations and rooftop machinery in zoning districts as specified in Section 21-4.70. Other requirements for screening or buffering are listed in Section 21-4.70-1. Compliance with these standards is summarized in Table 3.

TABLE 3
General Development Standards for Landscaping, Screening, and Buffering

LUO Standard	LUO Provision	Project Site
Parking lots of five or more spaces	Minimum 5-foot wide landscape strip adjacent to any adjoining street right-of-way.	Not applicable; project does not include parking lot.
	The 5-foot landscape strip shall contain a continuous screening hedge not less than 36 inches in height at 18 inches on center. A minimum 36-inch-high wall/fence may be placed behind the setback line in lieu of a hedge with a vine or shrub along the front side of the wall.	
	One canopy-form tree a minimum of 2-inch caliper shall be planted in the landscape strip for each 50 feet of street frontage.	

LUO Standard	LUO Provision	Project Site
Open parking lots with more than ten parking stalls	One canopy-form tree a minimum of 2-inch caliper for every six parking stalls, or one canopy-form tree of 6-inch caliper for every 12 parking stalls.	Not applicable; project does not include parking lot.
Parking structures	An 18-inch landscaping strip along the abutting property line, and a minimum two-inch caliper tree for every 50 linear feet of building length.	Not applicable; project does not include parking structure.
Outdoor trash storage areas	Screened on a minimum of three sides by a wall or hedge at least 6 feet in height.	Not applicable; project does not include outdoor trash storage area.
Service areas and loading spaces	Screened from adjoining lots in country, residential, apartment and apartment mixed use districts by a wall six feet in height.	Not applicable; project does not include service area or loading space.
Utility substations	Within country, residential, apartment, apartment mixed use and resort districts, utility substations (other than individual transformers) shall be enclosed by a solid wall or a fence with a screening hedge a minimum of five feet in height.	Not applicable; project is in agricultural district.
Irrigation system	All plant material and landscaping shall be provided with a permanent irrigation system.	The proposed project site is screened by natural landforms and existing vegetation. Additional landscaping would not further screen views of the project site; therefore, landscaping is not proposed.
Rooftop machinery and equipment	Provide screening from all directions	Not applicable; project does not include any rooftop machinery or equipment.
Screening wall or buffering	Screen from adjacent zoning lot in a country, residential, apartment, apartment mixed use, or resort district by a solid wall or fence (except chain link) or an equivalent landscape buffer.	Not applicable; project and surrounding parcels are in agricultural district.

Article 6 of the LUO identifies the off-street parking and loading requirements, which are intended to minimize street congestion and traffic hazards, and to provide safe and convenient access to residences, businesses, public services and places of public assembly. Table 21-6.1 specifies that the off-street parking requirements for utility installations (Type A or B) shall be determined by the director.

Normal operation of the facility would not require onsite personnel and therefore, the site would not be manned. Periodic maintenance and inspection of the facilities (including mowing, landscaping, panel cleaning and electrical maintenance) would occur irregularly and would require employees to drive to various locations throughout the site. As such, no centralized parking facilities are planned.

References

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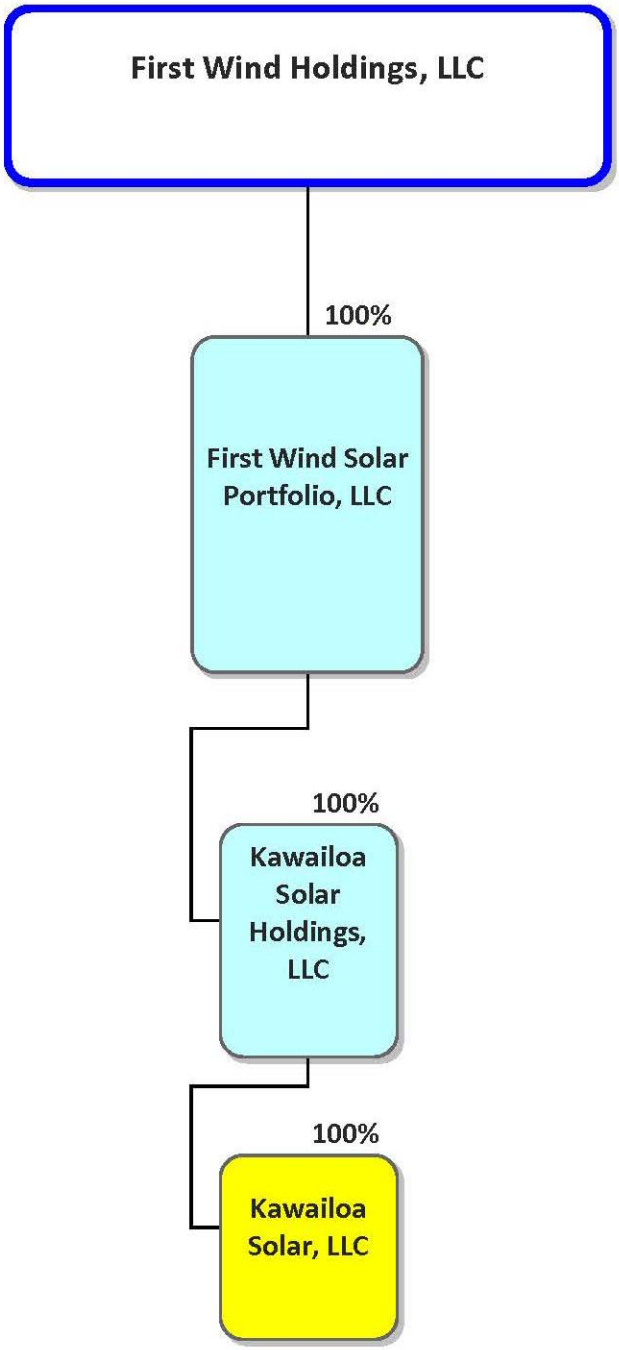
Attachment 1. Kawailoa Solar, LLC Organizational Structure

Kawailoa Solar, LLC Organizational Structure



Attachment 2. IRS Determination Letter

Rodney Chong
Manager, Renewable Acquisition

December 6, 2013

Ms. Kelly O'Brien
Vice President, Development
First Wind Energy, LLC
810 Richards Street, Suite 650
Honolulu, HI. 96813

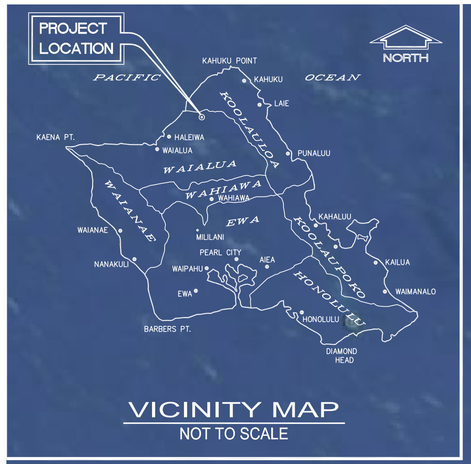
Re: IRS Determination Letter

Dear Ms. O'Brien,

This letter is to confirm that your project, Kawailoa Solar, has been selected by Hawaiian Electric to participate in the Invitation for Waiver Projects currently under review in Docket Nos. 2013-0156 and 2013-0381. Per the terms of the Interconnection Requirement Study Letter Agreement, executed on or around October 21, 2013, Hawaiian Electric has begun to undertake an Interconnection Requirements Study ("IRS") for your project. Please include this letter with your application materials to the City and County of Honolulu Department of Permitting and Planning as proof of your participation in this process.

Sincerely,

Attachment 3. Site Plan and Drawings



VICINITY MAP

NOT TO SCALE

TRUE NORTH

SCALE: 1 IN. = 2000 FT.

GRAPHIC SCALE

0 2000 4000 8000

WAIMEA BAY

PROJECT SITE

HALEIWA TOWN

MOKULEIA

DILLINGHAM AIRFIELD

KAWAILOA SOLAR FARM	VICINITY MAP	FIRST WIND, LLC
		FIGURE 1

ALTA / ACSM LAND TITLE SURVEY

EASEMENT 1
OF KAWAILOA WIND PROJECT

at Kawailoa, Waialua, Oahu, Hawaii

GRAPHIC SCALE

1000 0 500 1000 2000 4000

(IN FEET)

1 inch = 1000 feet

TRUE NORTH
Scale: 1 in. = 1000 ft.

INSET
1 in. = 400 ft.

ENLARGEMENT
1 in. = 10 ft.

VICINITY MAP
Not to Scale

LEGEND

3(A) Denotes encumbrance to the subject property as numbered in the Pro Forma Policy.

NOTES:

1. Azimuths and coordinates are referred to Government Survey Triangulation Station "WAIMEA".
2. This property is located within the areas designated Zone X (areas determined to be outside the 0.2% annual chance floodplain) and Zone D (areas in which flood hazards are undetermined but possible) as shown on Flood Insurance Rate Maps revised January 19, 2011.
3. Photogrammetric mapping used here is from an AutoCAD file provided by First Wind and is used to show the location of exsiting features.
4. Turbines, buildings and other improvements shown within Easement 1 have been located by a survey on the ground, completed on October 19, 2012.
5. Exceptions affecting Easement 1 are shown as referenced to Schedule B Exceptions from Coverage Part I of the Proforma Policy.
6. Boundaries of Lot A are as shown on "Plan Showing Lot A Being a Portion of Royal Patent 4475, Land Commission Award 7713, Apana 33 to V. Kamamalu" dated February 22, 2012, revised March 2, 2012, by Hawaii Land Consultants.
7. Boundaries of parcels TMK: 6-1-05: 15, 16, 17 & 19 are as shown on Tax Map Plat TMK: 6-1-05 and may be subject to change.
8. Boundaries of parcel TMK: 6-1-08: 25 are as shown on Tax Map Plat TMK: 6-1-08 and may be subject to change.

To: Union Bank, N.A., as Administrative Agent for the Lenders and in its separate capacity as Security Agent for the Secured Parties; Kawailoa Wind, LLC; Title Guaranty of Hawaii, Inc., and First American Title Company and their respective successors and assigns.

This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2011 Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes items 3 and 15 of Table A thereof. The field work was completed on October 19, 2012.

Date of Map: October 30, 2012

This work was prepared by me or under my direct supervision.

Lance T. Stevens
Licensed Professional Land Surveyor
Certificate Number 10733
License Expires April 30, 2012

Telephone: (808) 591-2022
Email: lstevens@cpshawaii.net

ADVANCE PRINT
DATE October 30, 2012

Property Address: 61-488 Kamehameha Hwy.
Haleiwa, Hawaii 96712

PROPERTY DESCRIPTION:

PRO FORMA POLICY: Title Guaranty of Hawaii, Inc.
Agent's No. 2011365429
Prepared: February 13, 2012
Revised: March 9, 2012

SCHEDULE C

The land referred to in this policy is described as follows:

That certain unrecorded KAWAILOA WIND ENERGY PROJECT GRANT OF EASEMENT (WIND ENERGY) dated as of _____, 2012, by and between the TRUSTEES OF THE ESTATE OF BERNICE PAUAHI BISHOP, as grantor and KAWAILOA WIND, LLC, a Delaware limited liability company, as grantee. Granting the Wind Easement over and across the Easement Property for purposes of wind energy generation and related uses, together with a license over and across the Licensed Area, for purposes of ingress to and egress from the Wind Energy Project; and subject to the terms and provisions contained therein.

A Memorandum of said Grant of Easement is dated _____, 2012, recorded as Document No. _____.

I. The Easement Property is described as follows:

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Royal Patent Number 4475, Land Commission Award Number 7713, Apana 33 to V. Kamamalu), situate, lying and being at Kawailoa and Paalaa, Waialua, City and County of Honolulu, State of Hawaii, being Lot A, containing an area of 10,786.735 acres, more or less, and further described in Exhibit "1" attached hereto.

II. The Licensed Area is described as follows:

First: During the period of construction of the Wind Energy Project and from and after the completion of construction of the Wind Energy Project, the roadway generally referred to as "Ashley Road" located on TMK Nos. (1) 6-1-005-001; (1) 6-1-005-015; (1) 6-1-005-016; (1) 6-1-005-019; (1) 6-1-006-001; and (1) 6-1-008-025.

Second: During the period of construction of the Wind Energy Project, the portion of the roadway(s) generally referred to as (A) "Mid-Line Road" to the extent located on Grantor's land identified as TMK Nos. (1) 6-1-005-001 and (1) 6-1-007-001; (B) "Cane Haul Road" to the extent located on Grantor's land identified as TMK No. (1) 6-1-005-014 and (C) "Kawailoa Drive" and "Kawailoa Road" to the extent located on Grantor's land identified as TMK Nos. (1) 6-2-002-001; (1) 6-1-005-001; (1) 6-2-009-001; (1) 6-1-007-001; and (1) 6-2-011-001, it being understood that access across four kuleana parcels (ie., (1) 6-1-005:003; 020; 021 and 022) which form a portion of Kawailoa Drive and Kawailoa Road has been obtained by Grantor pursuant to the following easements which are appurtenant to, and for the benefit of, the Easement Property (as well as other properties): (i) that certain GRANT OF ACCESS AND UTILITY EASEMENTS, recorded as Document No. 2011-104982, as amended by instrument recorded as Document No. 2011-162491; (ii) that certain GRANT OF ACCESS AND UTILITY EASEMENTS, recorded as Document No. 2011-104984, as amended by instrument recorded as Document No. 2011-162568; (iii) that certain GRANT OF ACCESS AND UTILITY EASEMENTS, recorded as Document No. 2011-104986; and (iv) that certain GRANT OF ACCESS AND UTILITY EASEMENTS, recorded as Document No. 2011-104988, as amended by instrument recorded as Document No. 2011-165255, more particularly described therein; and subject to the terms and provisions contained therein.

CONTROLPOINT SURVEYING, INC.
1150 South King Street, Suite 1200
HONOLULU, HAWAII 96814

Tax Map Key: 6-1-05: 01, 15, 16, 17 & 19; 6-1-06: 01; 6-1-07: 01; 6-1-08: 25; 6-2-09: 01; 6-2-10: 01; 6-2-11: 01; 6-2-02: por. 01; 6-2-04: por. 43; 6-2-05: por. 01; 6-2-06: por. 07; 6-2-07: 03 & por. 32

F.B. No. 3144A

Job No. 11026-06
DN: 11026-06-ALTA-UPDATE.dwg

March 12, 2012
Update: October 30, 2012
42"x30"

GRAPHIC SCALE

0 500 1000 2000

TRUE NORTH

SCALE: 1 IN. = 500 FT.

KAMEHAMEHA HWY.

INSET 3

ASHLEY RD. (EXISTING)

HECO MAKAI SWITCHYARD (EXISTING)

Existing Easement (15-ft. wd.) for Access and Utilities

256'-0" EASE.

ACCESS ROAD (EXISTING)

(P) RISER POLE

(P) UNDERGROUND 46kV LINE TO HECO SWITCHYARD. APPROX. 1,300'

(P) OVERHEAD 46kV LINE TO RISER POLE. APPROX. 2,800'

FW SOLAR MAKAI SUBSTATION

ACCESS ROAD (EXISTING)
(P) POINT OF INGRESS/EGRESS

NEW PERIMETER FENCE

(P) POINT OF INGRESS/EGRESS

NEW PERIMETER FENCE

EXISTING TREE LINE

NEW PERIMETER FENCE

MID-LINE ROAD (EXISTING)

WINDMILL W/ 600' SHADED AREA SETBACK, TYP. (EXISTING)

DIRT ACCESS ROAD (EXISTING)

EXISTING TREE LINE

NEW PERIMETER FENCE

FW SOLAR MAUKA SUBSTATION

(P) OVERHEAD TRANSMISSION LINE FOR CIRCUIT #2 AND CIRCUIT #3

46kV OHE TRANMSSION LINE W/ 50' UTILITY EASEMENT (EXISTING)

NEW PERIMETER FENCE

WIND FARM SUBSTATION AND O&M BUILDING((EXISTING)

HECO MAUKA SWITCHYARD (EXISTING)

WIND FARM EASEMENT

ASHLEY RD. (EXISTING)

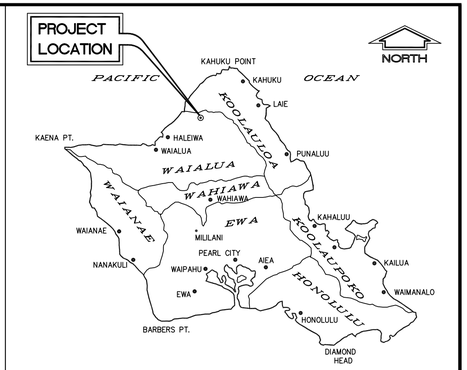
NEW PERIMETER FENCE

PV 1.1 PV 1.2 PV 1.3 PV 1.4 PV 1.5 PV 1.6 PV 1.7 PV 1.8 PV 1.9 PV 1.10 PV 1.11 PV 1.12 PV 1.13

PV 2.1 PV 2.2 PV 2.3 PV 2.4 PV 2.5 PV 2.6 PV 2.7 PV 2.8 PV 2.9 PV 2.10 PV 2.11 PV 2.12 PV 3.1 PV 3.2 PV 3.3 PV 3.4 PV 3.5 PV 3.6 PV 3.7 PV 3.8 PV 3.9 PV 1.14

PROJECT LOCATION

NORTH



VICINITY MAP

NOT TO SCALE

KAWAILOA SOLAR FARM

GENERAL LAYOUT PLAN

FIRST WIND, LLC

FIGURE 2

	TOTAL	LSB A	LSB B	LSB C	LSB D	LSB E
Solar Arrays (area within fenceline)	372.8	0	324.3	37.6	0	10.9
Mauka Substation[1]	0.9	0	0.9	0	0	0
Existing Roadways[2]	9.3	1.9	6.4	0.3	0	0.7
Electrical Lines	1.1	0	0.7	0	0	0.4
TOTAL	**384.1**	**1.9**	**332.3**	**37.9**	**0**	**12**

NOTES:

[1] The Makai substation is within the fenceline, so the acreage is included with the solar arrays.

[2] The existing roadways included in the project area are shown on the map in red.

GRAPHIC SCALE

0 500 1000 2000

TRUE NORTH

SCALE: 1 IN. = 500 FT.

KAMEHAMEHA HWY.

ACCESS ROAD (EXISTING)
(P) POINT OF INGRESS/EGRESS

NEW PERIMETER FENCE

LSB B

LSB E

LSB C

INSET 3

ASHLEY RD. (EXISTING)

HECO MAKAI SWITCHYARD (EXISTING)

Existing Easement (15-ft. wd.) for Access and Utilities

ACCESS ROAD (EXISTING)

(P) RISER POLE

LSB A

(P) UNDERGROUND 46kV LINE TO HECO SWITCHYARD. APPROX. 1,300'

(P) OVERHEAD 46kV LINE TO RISER POLE. APPROX. 2,800'

FW SOLAR MAKAI SUBSTATION

(P) POINT OF INGRESS/EGRESS

WINDMILL W/ 600' SHADED AREA SETBACK, TYP. (EXISTING)

DIRT ACCESS ROAD (EXISTING)

FW SOLAR MAUKA SUBSTATION

(P) OVERHEAD TRANSMISSION LINE FOR CIRCUIT #2 AND CIRCUIT #3

46kV OHE TRANMSSION LINE W/ 50' UTILITY EASEMENT (EXISTING)

WIND FARM SUBSTATION AND O&M BUILDING((EXISTING)

HECO MAUKA SWITCHYARD (EXISTING)

WIND FARM EASEMENT

MID-LINE ROAD (EXISTING)

PV 1.1 PV 1.2 PV 1.3 PV 1.4 PV 1.5 PV 1.6 PV 1.7 PV 1.8 PV 1.9 PV 1.10 PV 1.11 PV 1.12 PV 1.13 PV 1.14

PV 2.1 PV 2.2 PV 2.3 PV 2.4 PV 2.5 PV 2.6 PV 2.7 PV 2.8 PV 2.9 PV 2.10 PV 2.11 PV 2.12

PV 3.1 PV 3.2 PV 3.3 PV 3.4 PV 3.5 PV 3.6 PV 3.7 PV 3.8 PV 3.9

PROJECT LOCATION

NORTH

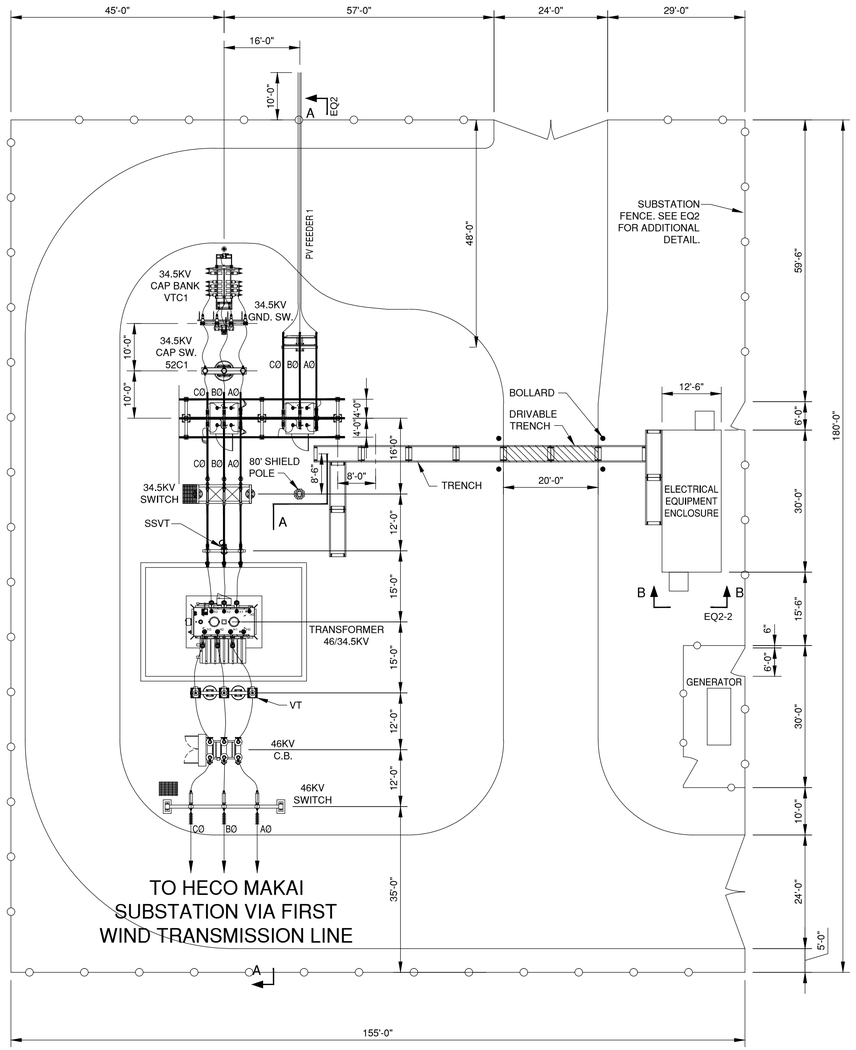
PACIFIC OCEAN

KAHUKU POINT, KAHUKU, LAIE, KOOLAULOA, KAENA PT., HALEIWA, WAIALUA, PUNALUU, WAIALUA, WAHIAWA, WAHIAWA, WAIANAE, WAIANAE, MILILANI, KAHALUU, EWA, PEARL CITY, AIEA, KAILUA, NANAKULI, WAIPAHU, EWA, KOOLAUPOKO, WAIMANALO, HONOLULU, HONOLULU, BARBERS PT., DIAMOND HEAD

VICINITY MAP

NOT TO SCALE

KAWAILOA SOLAR FARM	LSB MAP	FIRST WIND, LLC
		FIGURE 4



N

SITE NORTH
SCALE: 1/16"=1'-0"
0 4' 8' 12' 16' 20'

Kawailoa - Makai 46 kV Substation

Hawaii

Rev.	Date	Description	By
PR-0	08/11/14	ISSUED FOR REVIEW	UEI
PR-1	11/04/14	ISSUED FOR REVIEW	UEI

PRELIMINARY
NOT FOR CONSTRUCTION

firstwind℠
CLEAN ENERGY. MADE HERE.

Ulteig

Bismark-Denver-Detroit Lakes-Fargo-Sioux Falls-St. Paul
3350 38th Avenue South
Fargo, North Dakota 58104
Phone: 701-280.8500 Fax: 701.237.3191
Web: www.ulteig.com

Drawn By: RPW
Checked By: MB
Approved By: JG

FIRST WIND SUBSTATION GENERAL ARRANGEMENT 20MW

Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

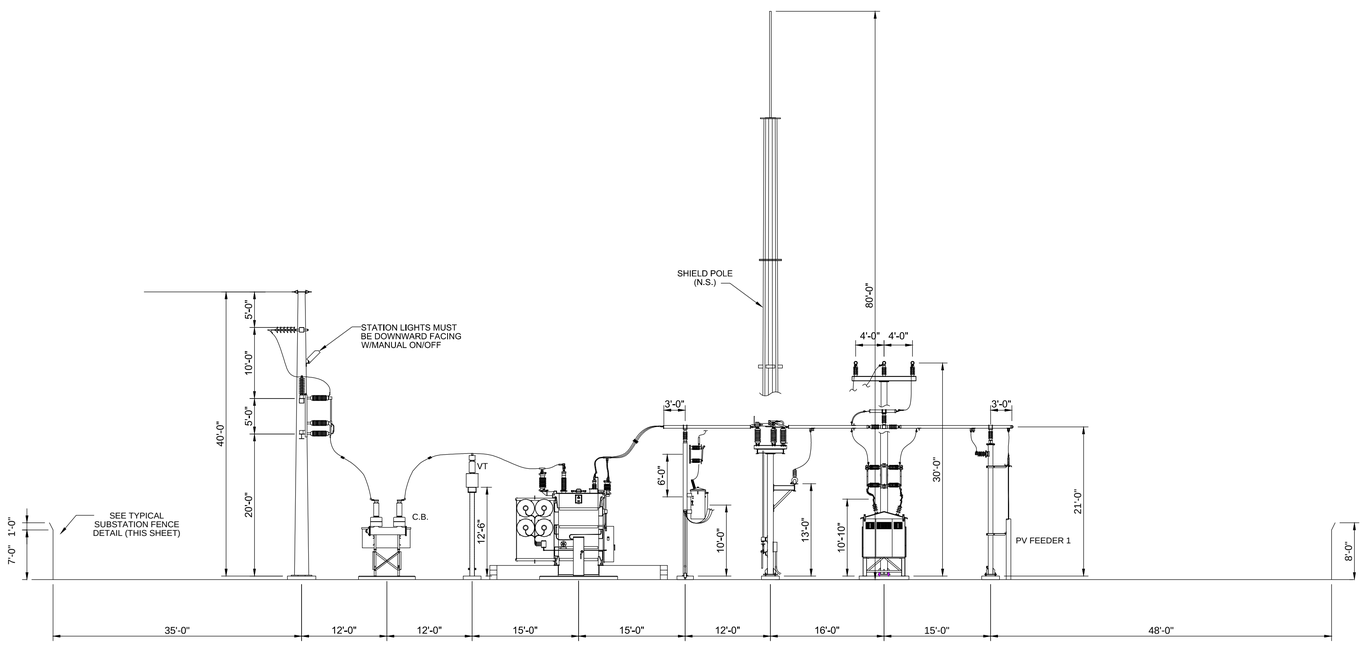
EQ1-2

Kawailoa - Makai
46 kV Substation

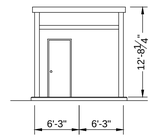
Hawaii

Rev.	Date	Description	By
PR-0	04/25/14	ISSUED FOR REVIEW	UEI
PR-1	05/08/14	UPDATES PER FW	UEI
PR-2	11/04/14	ISSUED FOR REVIEW	UEI
PR-3	11/07/14	ISSUED FOR REVIEW	UEI

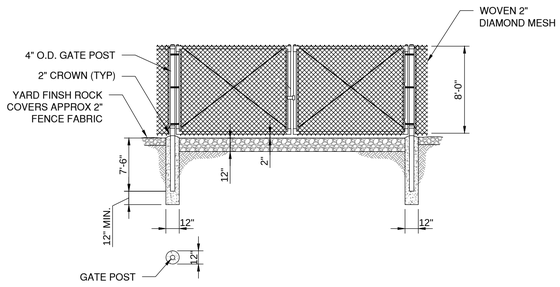
SCALE: 3/32"=1'-0"
0 2' 4' 6' 8' 10'



SECTION A-A

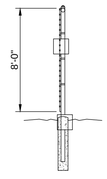


SECTION B-B



TYPICAL GATE

GATES TO ONLY OPEN IN (NOT TO SCALE)



LINE POST

(NOT TO SCALE)

PRELIMINARY

NOT FOR CONSTRUCTION

firstwind℠

CLEAN ENERGY. MADE HERE.

Ulteig

Bismark-Denver-Detroit Lakes-Fargo-Sioux Falls-St. Paul
3350 38th Avenue South
Fargo, North Dakota 58104
Phone: 701-280.8500 Fax: 701.237.3191
Web: www.ulteig.com

Drawn By: RPW
Checked By: MB
Approved By: JG

FIRST WIND SUBSTATION SECTIONS AND DETAILS

Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

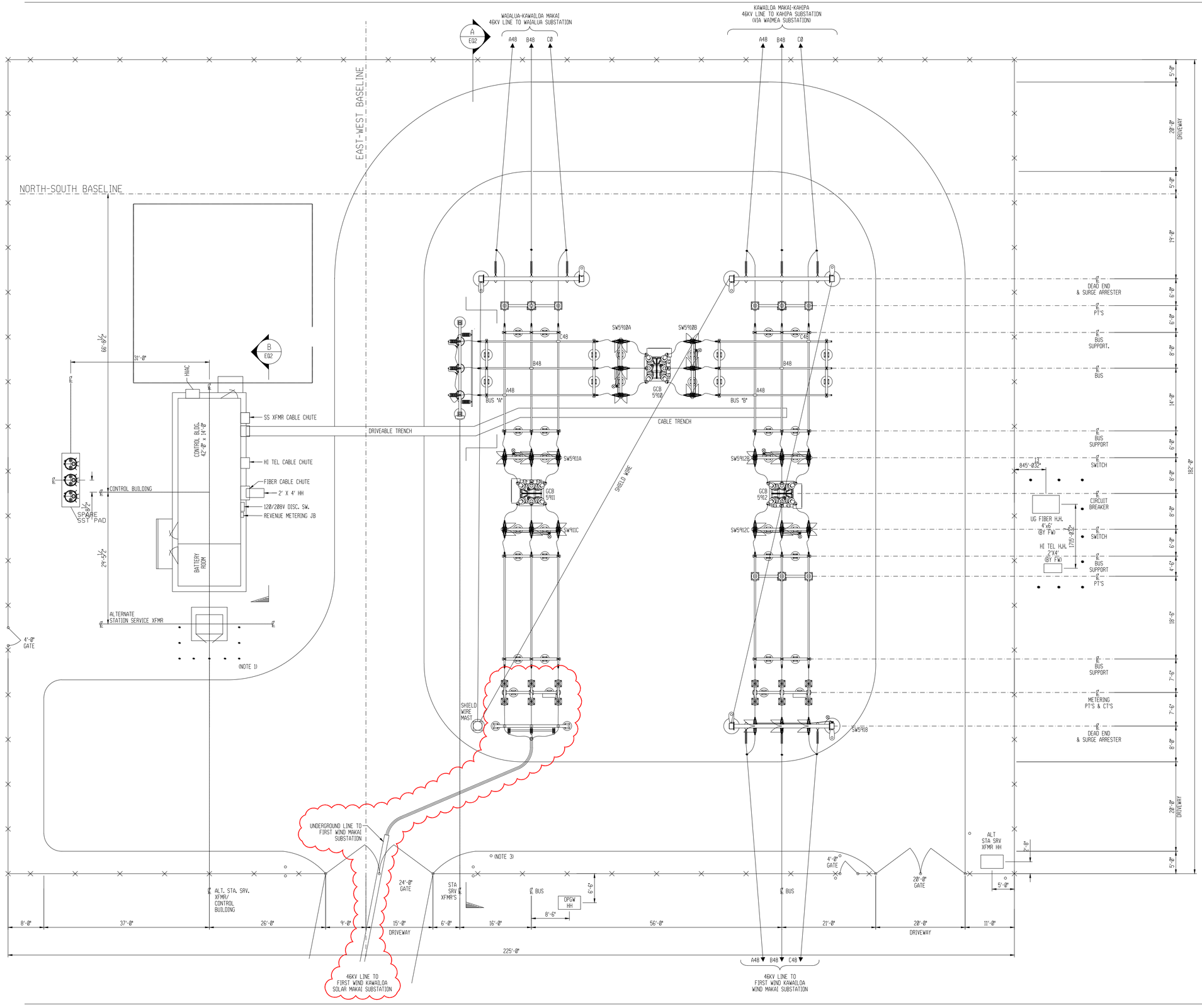
EQ2-2

Kawailoa - Makai
46 kV Switchyard

Hawaii

Rev.	Date	Description	By
PR-0	11/04/14	ISSUED FOR REVIEW	UEI

NOTE:
CLOUDED EQUIPMENT REPRESENTS NEW EQUIPMENT THAT WILL BE INSTALLED TO SUPPORT THE SOLAR PROJECT. ALL OTHER EQUIPMENT IS EXISTING.



PRELIMINARY
NOT FOR CONSTRUCTION

firstwind℠
CLEAN ENERGY. MADE HERE.

Ulteig

Bismark-Denver-Detroit Lakes-Fargo-Sioux Falls-St. Paul
3350 38th Avenue South
Fargo, North Dakota 58104
Phone: 701-280.8500 Fax: 701.237.3191
Web: www.ulteig.com

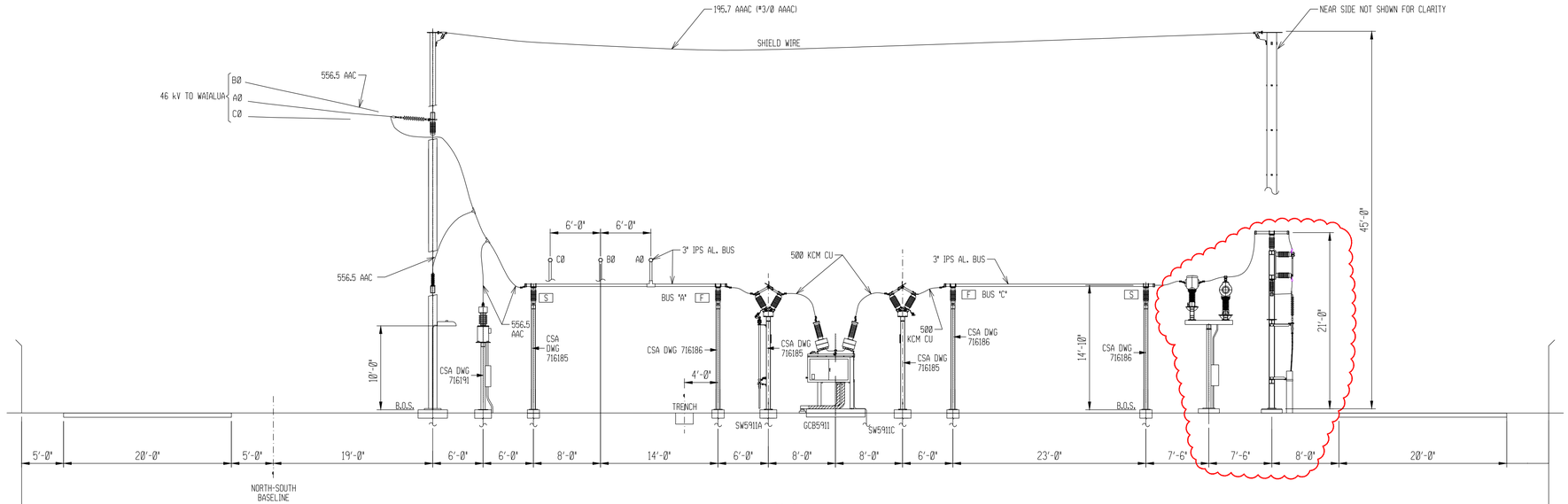
Drawn By: RPW
Checked By: MB
Approved By: JG

HECO
MAKAI INTERFACE

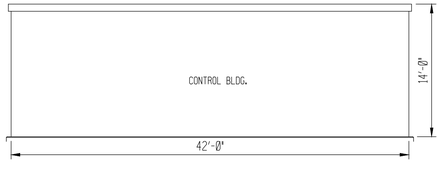
Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

EQ1

SCALE: 1/8"=1'-0"
0 2' 4' 6' 8' 10'



SECTION A
EQ1



SECTION B
EQ1

Kawailoa - Makai
46 kV Switchyard

Hawaii

Rev.	Date	Description	By
PR-0	11/04/14	ISSUED FOR REVIEW	UEI

NOTE:
CLOUDED EQUIPMENT REPRESENTS NEW EQUIPMENT THAT WILL BE INSTALLED TO SUPPORT THE SOLAR PROJECT. ALL OTHER EQUIPMENT IS EXISTING.

PRELIMINARY
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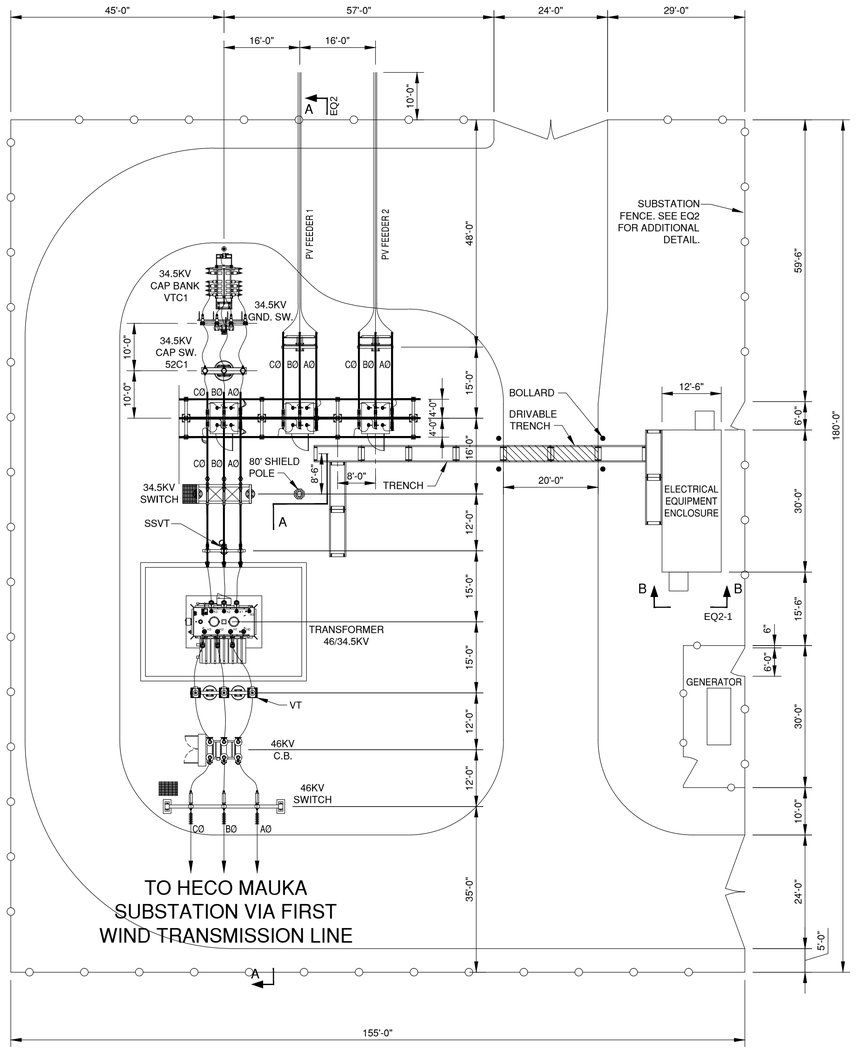
Fargo, North Dakota 58104
Phone: 701-280.8500 Fax: 701.237.3191
Web: www.ulteig.com

Drawn By: RPW
Checked By: MB
Approved By: JG

HECO
MAKAI INTERFACE
SECTIONS AND DETAILS

Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

EQ2



N

SITE NORTH
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Kawailoa - Mauka 46 kV Substation

Hawaii

Rev.	Date	Description	By
PR-0	08/11/14	ISSUED FOR REVIEW	UEI
PR-1	11/04/14	ISSUED FOR REVIEW	UEI

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Drawn By: RPW
Checked By: MB
Approved By: JG

FIRST WIND SUBSTATION GENERAL ARRANGEMENT 30MW

Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

EQ1-1

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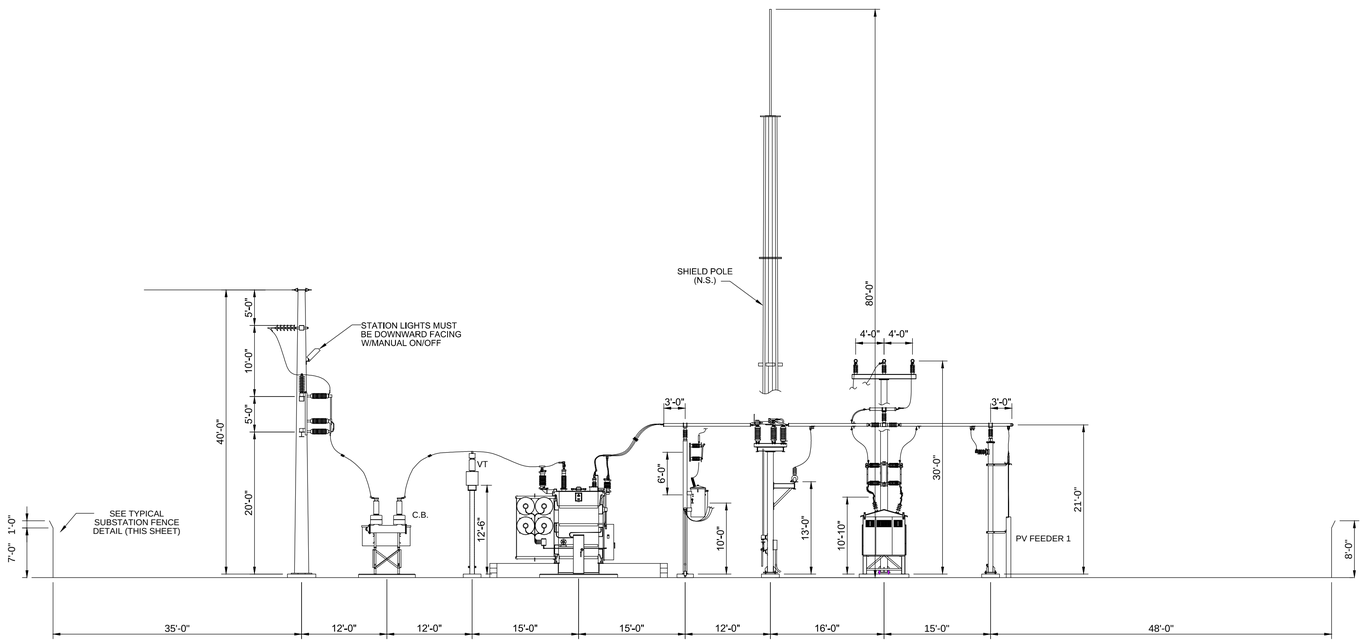
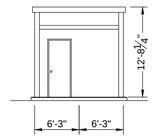
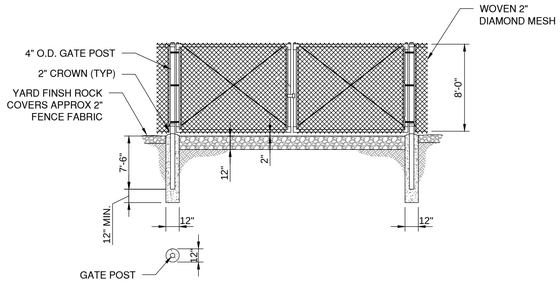


SECTION A-A

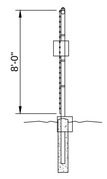


SECTION B-B



TYPICAL GATE

GATES TO ONLY OPEN IN
(NOT TO SCALE)



LINE POST

(NOT TO SCALE)

Kawailoa - Mauka
46 kV Substation

Hawaii

Rev.	Date	Description	By
PR-0	04/25/14	ISSUED FOR REVIEW	UEI
PR-1	05/08/14	UPDATES PER FW	UEI
PR-2	11/04/14	ISSUED FOR REVIEW	UEI
PR-3	11/07/14	ISSUED FOR REVIEW	UEI

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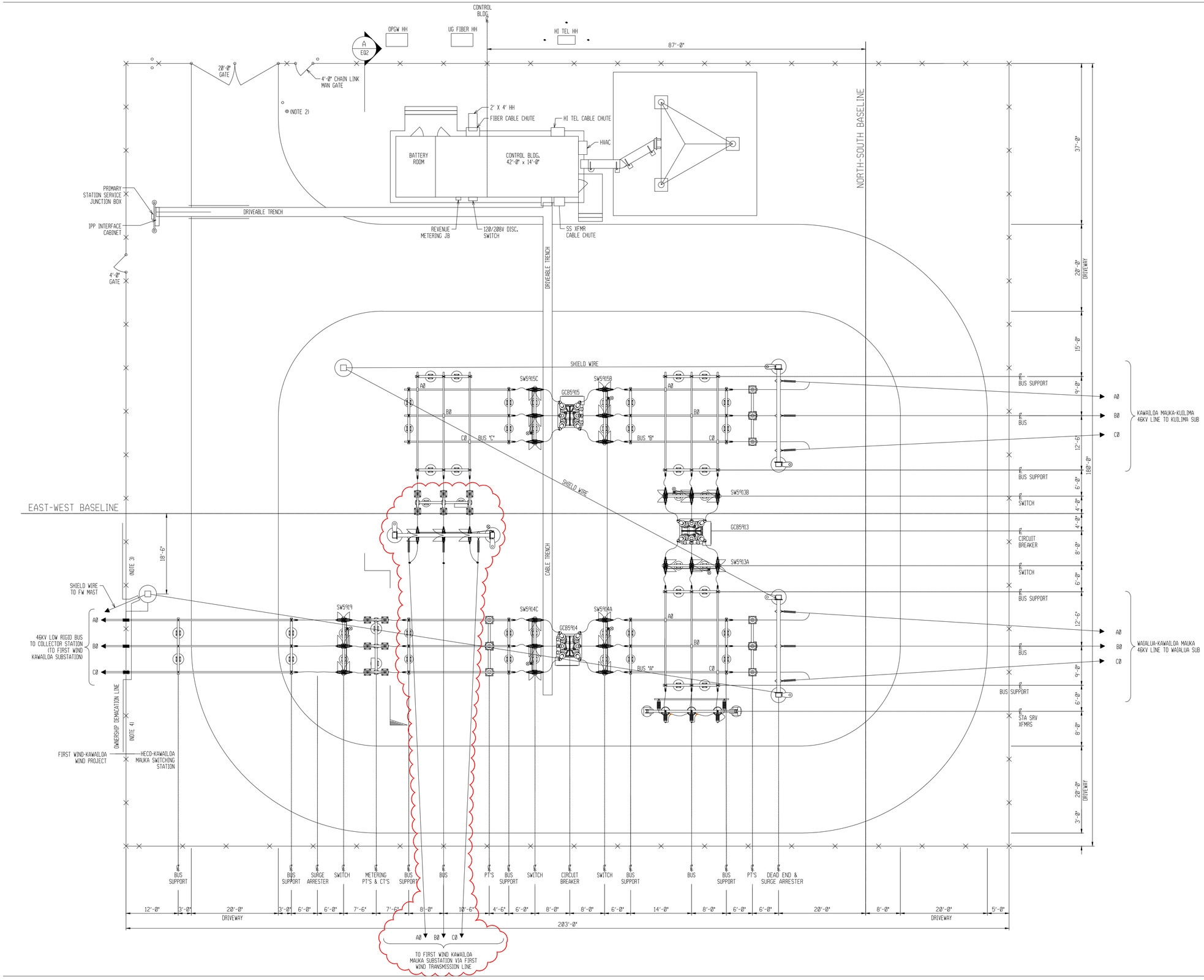
Checked By: MB
Approved By: JG

FIRST WIND SUBSTATION SECTIONS AND DETAILS

Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

EQ2-1



N

SCALE: 3/32"=1'-0"

0 2' 4' 6' 8' 10'

Kawailoa - Mauka 46 kV Switchyard

Hawaii

Rev.	Date	Description	By
PR-0	11/04/14	ISSUED FOR REVIEW	UEI

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Drawn By: RPW
Checked By: MB
Approved By: JG

HECO
MAUKA INTERFACE

Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

EQ1

SCALE: 1/8"=1'-0"
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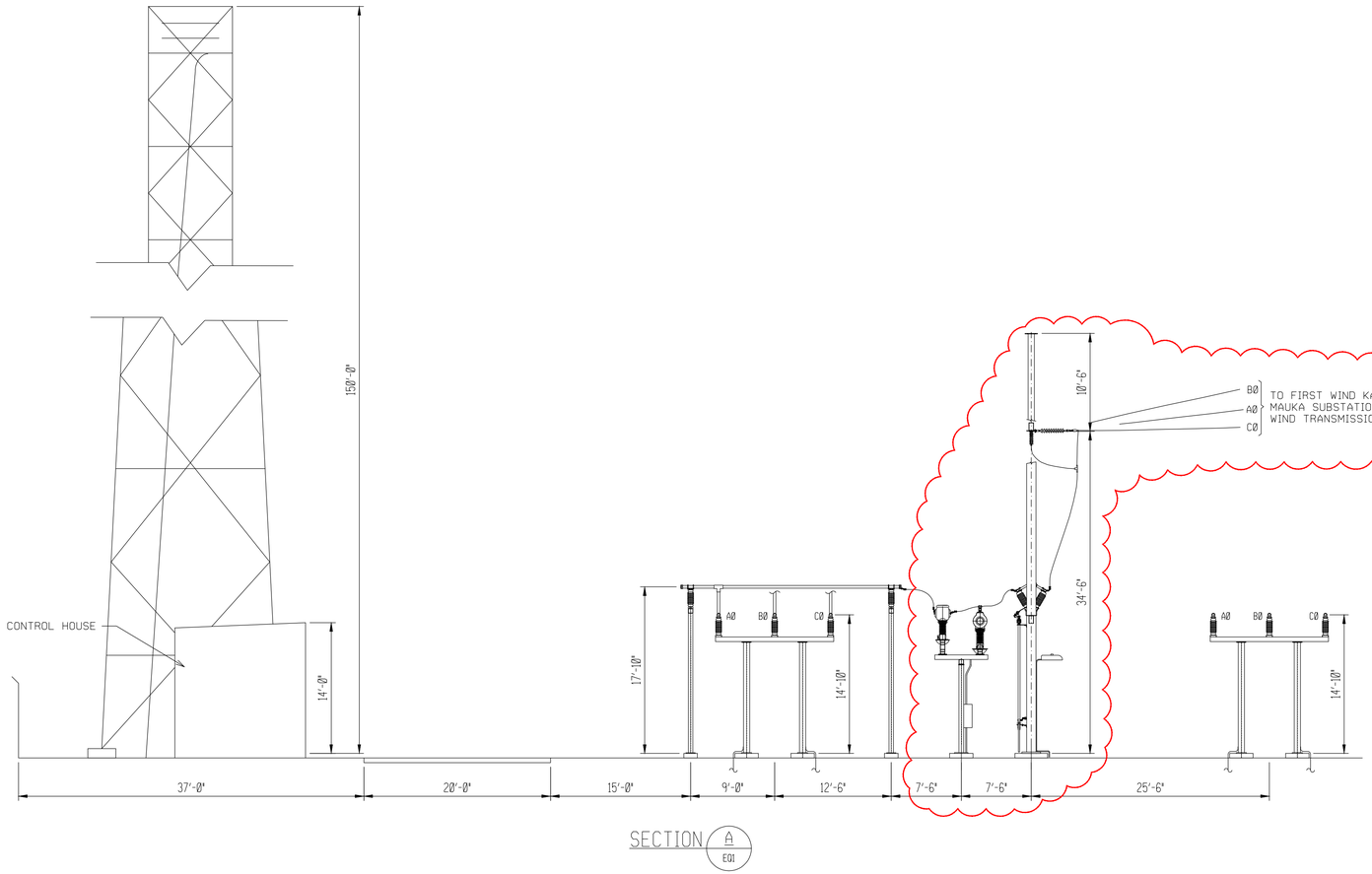

SECTION A / EQ1

Kawailoa - Mauka
46 kV Switchyard

Hawaii

Rev.	Date	Description	By
PR-0	11/04/14	ISSUED FOR REVIEW	UEI

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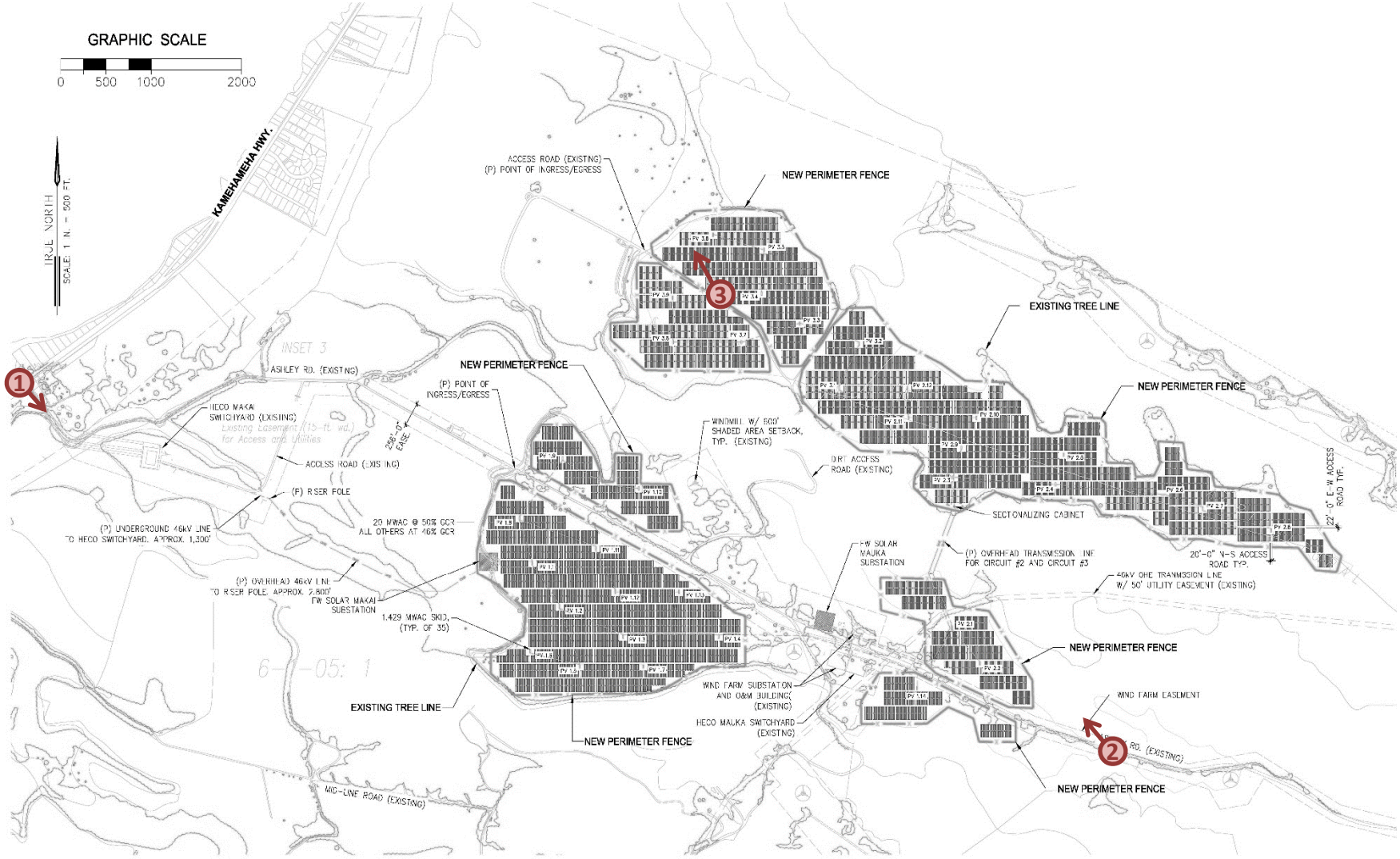
HECO
MAUKA INTERFACE
SECTIONS AND DETAILS

Project Number: 14.00327
Date: November 4, 2014
Sheets: 1 of 1

EQ2

Attachment 4. Representative Photographs within Project Site

Location Key for Photographs Within Project Site



Photograph 1. Existing access to project site from Kamehameha Highway via Ashley Road

Photograph 2. View of southern portions of the project site from the existing Ashley Road

Photograph 3. View across northern portion of project site, looking northwest toward ocean

Attachment 5. Letter of Intent for Sheep Pasturage

firstwind

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October 7, 2014

John Morgan
Kualoa Ranch Hawaii, Inc.
P.O. Box 650
Kaaawa, Hawaii 96730

Re: Letter of Intent for Pasture License

Dear Mr. Morgan:

Introduction. Kawailoa Solar, LLC, a Delaware limited liability company ("***Licensor***"), an affiliate of First Wind Holdings, LLC, is pleased to provide this letter of intent ("***Letter of Intent***") to confirm its agreement to negotiate the terms of a definitive license agreement with Kualoa Ranch Hawaii, Inc. ("***Licensee***") Licensor and Licensee each referred to herein as a ***"Party"*** and collectively referred to herein as, the ***"Parties"*** for the license to use land in Kawailoa, Hawaii (collectively, the "***Property***"), which is currently being leased by the Licensor.

License. From the date of this Letter of Intent until April 30, 2015 (the "***LOI Term***"), Licensor and Licensee shall negotiate in good faith regarding the terms and provisions of a License to pasture sheep the Property, at a rate of $10 per acre per year, not to exceed $2,000 per year, and which shall also contain such other reasonable terms and provisions as the Parties may agree. The Parties recognize that successful negotiation of the License will also entail substantial definition and refinement of the concepts expressed in this LOI and final mutual agreement on all of the terms and conditions set forth herein. The LOI Term may be extended by mutual agreement of the Parties in writing.

Confidentiality. Licensor and Licensee intend to execute a Nondisclosure Agreement (the "***NDA***"). Terms of this Letter of Intent and any other information and materials concerning the proposed transaction that are provided by Parties and designated in writing at the time of delivery as confidential shall be considered "Confidential Information" subject to the terms of the NDA.

Negotiation In Good Faith; Exclusivity. During the LOI Term, the Parties agree to negotiate exclusively with each other and in good faith to develop mutually acceptable terms and documentation for the transactions described above. Upon expiration of the LOI Term (as it may be extended by mutual agreement), these commitments of exclusivity and good faith negotiations shall terminate.

Non-Binding Letter of Intent. The above terms and conditions are provided for discussion purposes and are not intended to represent a commitment. Except with respect to the paragraphs entitled "Confidentiality," "Negotiation in Good Faith; Exclusivity" and "Non-Binding Letter of Intent," this Letter of Intent does not constitute a legally binding obligation of either Party and will not give rise to any right or obligation based on any legal or equitable theory (including any right to continue

negotiations beyond the LOI Term). The terms and conditions set forth herein are intended to be an outline of terms that may be incorporated into the License. No binding obligation will be created unless, and until, the Parties execute the License.

Kawailoa Solar, LLC
By: Kawailoa Solar Holdings, LLC, Its Member

By: _____
Name: Jennifer Lootens
Title: Assistant Secretary

Acknowledged and accepted this 7th day of October, 2014.

We agree to the terms of the foregoing Letter of Intent, and wish to proceed with the negotiation of the License as provided therein.
[Licensee]

By: _____

Name: John Morgan

Title: President, Kualoa Ranch Hawaii, Inc.

Attachment 6. Sheep and Solar Panels in Hawai‘i

Sheep and Solar Panels in Hawaii
A report prepared for First Wind

By

Nicole Correa, MS Candidate
Douglas L. Vincent, Ph.D., P.A.S., Animal Scientist and Professor

Department of Human Nutrition, Food and Animal Sciences
College of Tropical Agriculture and Human Resources
University of Hawaii at Manoa

Image courtesy Renewable Energy World.com
http://www.renewableenergyworld.com/rea/images/operations-maintenance-and-solar-sheep/73097

Introduction

Sheep and goats (small ruminants) are making a resurgence in Hawaii (Stevenson et al. 2012). The past decade has shown an increase in small ruminant production on both large ranches and on homesteads. There is strong demand for lamb meat, but producers also use these animals for land management, such as weed management, brush control and reduction of fire fuel. Orchard growers, fruit and vegetable growers and other farmers are using small ruminants to both diversify their agricultural output and as practical, low cost solutions for weed control. As many farmers are using sheep and goats to supplement their agricultural cropping enterprise, it stands to reason that the use of sheep to graze around and under photovoltaic (PV) arrays could add value to this use of land.

First Wind is proposing to build utility scale solar PV projects on Oahu and to lease the land under some of these solar facilities for pasturing sheep. In order to better understand the market and logistics involved in commercial sheep ranching, First Wind contacted our Department and requested this report. The purposes of this report are to assess the economic viability of commercial sheep ranching on Oahu, to discuss the compatibility of grazing sheep on a photovoltaic (PV) energy project,to make recommendations for developing a successful sheep operation and to assess the sites being considered for co-location of sheep and solar.

Co-locating sheep and solar arrays

The use of sheep grazing among PV arrays presents an opportunity for farmland diversification. **Sheep are clearly compatible with PV**. Sheep grazing provide a low-cost, low effort solution for controlling the vegetation overgrowth while producing local lamb for consumption. Co-localization of solar panels with sheep grazing present an opportunity for economic diversification, pairing energy production with local food production. Sustainable energy and sustainable agriculture can come together with well planned development. Projects like the one proposed here are happening around the world. You can find successful projects where sheep graze among solar panels in Texas, North Carolina, Massachusetts, Oregon, England, Northern Ireland and on Kauai. These include areas where the sun "shines" heavily and in areas where the sunshine is minimal but daylight is plentiful. Co-locating sheep among solar panels can be a "win-win" solution to the need for sustainable energy and reducing importation of food.

Production and Marketing

To specific questions, the Hawaii Agricultural Statistics Service (HASS) is the most authoritative source for agricultural data; HASS is part of the USDA National Agricultural Statistics Service and collects data on all of Hawaii agriculture. However, due to the small numbers of many enterprises and to protect the confidentiality of individual farms, HASS may only present data lumped together statewide. According the 2012 Hawaii Census of Agriculture, the number of farms raising sheep and lambs in Hawaii is 353, with the majority of farms (300 farms) having an inventory of between 1-24 sheep. Forty-one farms have between 25 to 99 sheep, with only 12

farms having greater than 100 sheep. The inventory of sheep, according to 2013 data is 21,921 head with a value of $854,000. In comparison to the 2007 Census of Agriculture, the numbers of sheep farms across the state have declined from 394 in 2007 to 353 in 2012. However, the number of sheep farms on **Oahu has increased** from 16 in 2007 to 20 in 2012. All of the Oahu sheep farms in 2012 had fewer than 100 sheep per farm.

Kauai County ranks first in sales of sheep, goats, mohair with a value of $736,000, followed by Hawaii Island $389,000, Maui County, $360,000, and Oahu at $82,000 (2012 Hawaii Census of Agriculture).

Fewer than 200 head of lamb, averaging 135 lbs. live weight, are slaughtered in USDA-inspected slaughterhouses statewide, annually (HASS 2014). Slaughterhouses on all islands will process sheep. In addition, some entrepreneurs are exploring the feasibility of mobile or modular slaughter and processing technology for Hawaii (DuPonte, 2014, pers. comm.; Stevenson et al., 2011).

We conducted telephone surveys on Oahu regarding the existing market for lamb meat. Grocery stores and meat markets were contacted about lamb sales. Many markets, e.g. Times in Aiea, sell lamb meat only around holidays such as Easter, Thanksgiving, and Christmas. Other Times markets, such as Wahiawa and Kalaeloa sell lamb regularly but only certain cuts. Of the markets, Times, Whole Foods Market, Tamura's, Foodland and some Safeway stores sell lamb. KTA on the Big Island sells lamb meat, when available, local. Times in Kahala sells lamb meat year round and they sell sirloin, loin chops, rib chops and boneless meat cuts. The lamb sold in the market is imported from Australia or the U .S. mainland. Tamura's in Wahiawa sells roughly 4 cases of lamb a year. VJ's Butcher Block in Haleiwa. sells roughly one whole lamb per week at 50 lbs. dry weight. Their lamb comes from Niihau. Whole Foods Market (WFM) in Hawaii, especially the Kahala store, carries lamb meat year round. WFM imports lamb from New Zealand and have plans to bring in more meat from the U.S. mainland because they have no local producers. WFM would like to sell more local lamb but also have specific animal welfare guidelines about the management and handling of livestock. With their goal of having 50-60% local products, WFM offers low interest loans to help small farmers and ranchers. **The availability of local lamb meat on Oahu, especially, would be attractive to local grocery outlets, if the quality and supply were sufficient to meet the existing demand.**

Another possible outlet for local lamb is marketing directly to restaurants. Across the state, some sheep producers sell or contract with restaurants or resorts to provide a local lamb product. It can be whole carcasses, legs or racks. These marketing opportunities occur as the chef, restaurateur or resort manager develop relationships with individual farmers and ranchers. An example of this sort of relationship between a farmer and restaurants is Shinsato Farm (pork). Through the production of a high quality pork product, Shinsato farm sells pork to a variety of Oahu restaurants. Among the Oahu restaurants that Shinsato farms sells pork are 12th Avenue Grill, Bernini Honolulu, EAT Honolulu, Town, La Tour Café, SALT Kitchen, The Whole Ox Deli, BLT Steakhouse, Cactus, Kalapawai Café, Prima, The Grove, Roy's Ko Olina. The success

of Shinsato Farms and the promotion of local pasture=raised lamb and mutton at food events like the "Mealani's Taste of the Hawaiian Range" brings awareness of the availability of product, to consumers, resort food managers and individual chefs.

Other direct marketing opportunities, if supply is sufficient, is through Farmers Markets. Many farmers markets on Oahu sell grass-finished beef, some imported from Hawaii or Maui, and some produced locally, i.e. North Shore Cattle Co. at the KCC Farmers Market (Oahu's largest farmers market). If enough supply can be produced, another outlet for lamb meat might be through Community Supported Agriculture (CSAs) such as Oahu Fresh.

Regardless of how the lamb meat is marketed, there is an unmet demand for local lamb meat on Oahu. Ranchers selling lamb meat on Hawaii, Maui and Kauai sell all the lamb they produce. They have no difficulty marketing their product locally, in places where the population is considerably less than on Oahu. Similarly, it stands to reason, increased production of high quality lamb meat on Oahu would have no problem in the marketplace. The numbers of farms producing lamb on Oahu has increased from 2007 to 2012 and with improved productivity, there should be no problem in exceeding the $87,000 in annual lamb sales.

Breeds

In the tropics, hair sheep breeds were developed for tropical climates. Hair sheep are not crosses between sheep and goats. Rather the difference between hair sheep and wooled sheep is the ratio of hair to wool fibers. The biggest advantage that hair sheep have over wooled sheep, especially in the tropics is that they do not need to be sheared. Tail docking is a common procedure in wooled sheep but is not necessary with haired sheep. Hair sheep tend to be more resistant to internal parasites. These sheep tend to have longer "sides" with greater lean, and less fat carcasses. Hair sheep can be horned (Dorper) or polled (without horns, St. Croix, Barbados). Polled breeds are easier to work with and the horns do not have to be trimmed or removed. The common hair sheep breeds are St. Croix, Kathadin, Barbados black belly, and Dorper, and their crosses. The challenge in the Hawaii as many ranchers are attempting to expand their flocks is finding breeding stock. The Hawaii Sheep and Goat Association (HSGA) has in the past served as a clearinghouse for sales of sheep. Below are pictures of Dorper (l) and St. Croix (r) breeds. Each breed has their own organization and web site; St. Croix, Katahdin, Barbados Black Belly, and Dorper.


Suitability of Proposed Sites

Consultant Nicole Correa visited the two proposed sites on Oahu with Mr. Wren Wescoatt of First Wind on August 29, 2014. Located in central Oahu and on the north shore of Oahu, both sites are estimated at ~1500 ft above sea level. Both sites are relatively level and have road access. Wind turbines are located on one of the sites. Based upon the site visit, the sites proposed are more than suitable for sheep grazing. The land is dry enough to ensure that foot rot will be at a minimum but damp enough to sustain a large supply of forage for the sheep. The land has a slight slope for good drainage. The pastures also seem very clean free of debris or trash or objects that might injure the animals. No barns or sheds will be necessary; if shelter is needed to the PV panels can provide shade. Access to water should not be a problem.

Grazing, Stocking Rates, and Water

There are several factors that will influence the amount of sheep that can be pastured. Understanding the stocking rate, i.e. the number of animal units per acre of forage is key to successfully producing lambs. The stocking rate also determines the lifespan of the pastures being grazed. If the stocking rate is too high, this will cause the pastures to be overgrazed, can cause permanent damage to the pasture, enabling weed infestation, and the animals will be lacking in nutrition. Under typical Hawaii pasture conditions, Thorne and Stevenson (2007) have shown that a 1000 lb. cow can use 2 acres of pasture. The equivalent in sheep, based upon body size and demand would be equivalent to 7 ewes (@ 150 lbs. each of breeding stock) per 2 acres. This would be equivalent to 350 sheep per 100 acres of grazable pastures. This is likely an over estimate because this does not take into consideration the following:

- Rams (larger animals and require more nutrients and more space.)
- Ewes with lambs (lactating ewes nursing lambs require greater nutrition)
- Quality and nutrient content of the forage itself. Tropical grasses have different nutrient content, palatability, dry matter, depending upon type and maturity of the forage. The amount of trees, scrub plants or other vegetation on the property will influence the availability of forage for the sheep. However, high density grazing (larger

groups in smaller areas with rotation daily) can encourage the sheep to graze the vegetation down.

- The stocking density of the will have to be adjusted to compensate for the shading due to the solar panels. If PV panels cover 1/3 of the fenced area, the number of sheep on the pasture, may have to be adjusted downward to ensure sufficient forage is available. Until the solar arrays are installed, there is no certainty about what the effects of the shading by the arrays, coupled with the grazing pressure, will be on forage productivity.

Water is most essential when raising livestock and should be available at all times for animals to drink freely. It should always be clean and free of parasites or harmful bacteria. Waterers should be cleaned on a regular basis to prevent algal growth. Livestock can reject the water source due to algal growth, causing the animal to become dehydrated. Dehydration alters the ability of the sheep to process forage nutrients and can inhibit growth.

The amount of water consumed by a sheep is based upon the size, physiological condition (i.e. lactating, pregnant) and the environmental temperature. Higher temperature and humidity will result in greater consumption of water. Sheep will consume 0.5 to 2.0 gallons of water per day while grazing. Some of the water consumption may come through the eating wet forages. There are many different types of watering devices on the market at a variety of costs and maintenance requirements; from automated watering systems, to watering troughs that need to be filled by hand. In large acreages, automated watering devices have greater costs to install and maintain. Not all animals instinctively know how to use an automatic watering device.

Water troughs are a second option. Troughs are movable throughout the paddock and can help distribute sheep to different parts of the paddock. If an area is being under-grazed, moving the water source can encourage the sheep to move to areas where grazing pressure is needed. One problem with water troughs is contamination by feral pigs. Wherever possible feral pigs must be excluded from water troughs or other water containers. If feral pigs enter the trough and cause a muddying effect to the water, sheep may not drink the water.

There may be natural sources of water but caution must be taken into consideration when using natural sources of water, if there is potential that contaminated runoff is returned to the stream or water source.

Predator Control and Fencing

Perimeter fencing for sheep is very important and must be both strong and reliable for keeping sheep in and keeping predators out. Fencing should be installed to permit ease of movement of sheep from area to area within the perimeter. The permits both efficient forage utilization while reducing the impact of shading on PV panels due to overgrowth of tall grasses.

There are different types of fencing that can be utilized such as hog wire, chain link or electric fencing. Hog wire would be useful as a perimeter fencing with the use of t-posts or telephone poles to hold the fencing up. When the wire is stretched at its maximum capacity it is very hard

for predatory animals to attempt to push under the fence and is still safe for the sheep if they push up against the fence for any reason. This is the same for chain link fencing. If a string of electric fencing is added to the bottom, outside of the chain link/hog wire, this could further deter animals from entering.

Electric fencing is also useful for mobile fencing. While hog wire and chain link fencing are a more permanent option, electric can be moved around within the perimeter to effectively rotate sheep in order to have them graze in different areas. It is important to have the ability to move sheep easily within the perimeter to maximize forage use and to effectively manage vegetation. The use of electric fencing represents a low cost method to adjust paddocks within the perimeter and localize grazing in areas of need.

Barbed wire fencing is not recommended in this case as it could severely affect sheep if they become tangled in the wiring or are pushed up against the wiring. This may not have the same effect on a predator as a deterrent. Pigs easily push through barbed wire fencing and many hunting dogs can easily sneak under the fence or jump over it. Even if the fencing does nick a hunting dog, many of them are accustomed to being in the mountains where they will experience tree branches poking them or prickly weeds and it will not affect them the way it could damage the sheep flock.

With the amount of predators that will attack sheep, fencing is not a sure fire way to keep sheep safe. Feral pigs, being omnivores, will attack lambs when possible as well as adult sheep if given the opportunity. Along with pigs, dog packs can do serious damage to a sheep flock. Being that there are so many hunters on the island, having guard animals for the sheep flock is something to be considered. Many hunters will hunt with anywhere from 2-10 dogs at a time, sometimes more if they are training puppies. Many of these dogs are not trained to avoid livestock such as sheep, cattle or horses, thus making sheep an easy target. Some common dog breeds used for guard dogs are Catahoula Leopard Hound, Rhodesian ridgeback and other large breeds of dogs. It is important that any animal used for guard animals must be compatible with PV panels.

Guard animals should also be large to deter these dog packs from entering into paddocks. A couple of different types of guard animals are dogs or llamas.

Guard dogs should be introduced to their flock around 7-8 weeks of age and an assessment can be done as early as 6 weeks to determine if they will be aggressive towards sheep. They should not be treated as pets but instead a member of the flock. Guard dogs are not the same thing as herding dogs. Border collies are not recommended for guard animals because they are better suited for herding sheep upon command while their owner is present.

Dog rearing is also very important and vital to the way a guard dog behaves around sheep. Upon purchasing a guard dog, it is important to determine a reputable breeder. Some breeders are willing to work with buyers on training and information.

One of the most commonly used breeds of dog is the Great Pyrenees. They are well known for their aggressive nature toward predators but their attentiveness to their flock which is important for a guard animal. When selecting a guard dog, it is also important to take into consideration the types of predators an animal will be aggressive towards. Great Pyrenees are not known for attacking people but will attack other dogs.

Llamas are also a very useful guard animal. Being that they are flock animals, they stay close to the sheep and will not attack them. If a predator is nearby, they first sound an alarm to the other animals and then will attack predators. They have been known to bite, kick, chase and even kill coyotes as coyotes are a danger for mainland herds of sheep. As these animals are considerably taller than sheep, they may not be compatible with PV panels.

Animal Welfare Issues

When working with livestock animals, the primary concern should always be animal welfare. When animals are treated humanely throughout their lifetime, it shows in the carcass quality and the meat that is produced from these animals. Improper handling can cause stress to the animal which can inhibit growth. If an animal is struck in an effort to herd them, bruising will show up in the carcass, creating less yield. Buyers want tenderness, uniformity in size and cuts of meat that are not bruised or damaged. Having good relations with buyers lead back to good animal welfare practices.

Because sheep are flight and flock animals, they will run away from danger as a collective group which means they can easily be herded from one area to the next. If they are balking at something when handlers are trying to move them, it should be obvious to the handler there is a reason for such behavior. Animals will balk at things as simple as a flag waving in the wind or a new bucket that was not in the same area the day before.

Keeping all of these aspects in mind when working with sheep will produce quality lambs and the benefit of knowing that the animal was treated well throughout its lifetime from day one until processing.

Veterinary Care and Vaccination

Sheep should be kept on a vaccination system allowing handlers to ensure that animals are healthy and to keep veterinary visits to a minimum. Hair sheep are less likely to experience diseases than wooled sheep which is a huge benefit of hair sheep. Another aspect of having sheep in Hawai‘i is that diseases which are common in the continental U.S. are not as much of a problem here. The downside of that is because the island is so small, if one sheep becomes infected, the problem can be spread rapidly throughout the flock.

Iodine is a necessity on farms where breeding and parturition will be occurring. When a lamb is first born, dipping their umbilical cord in iodine solution will allow the cord to heal and fall off. This will also help to prevent infection of the area.

Foot rot and hoof care

If animals will be kept in an area that has high rain volume and where the ground never has a chance to dry out, hoof treatments are essential for the care and management of sheep. Without treatment, animals may suffer from foot rot, a disease caused by two different types of bacteria: *Dichelobacter nodosus* and *Fusobacterium necrophorum*. This can cause lameness in the animal and will spread easily throughout the herd. Infected animals need treatment causing an increased labor cost and material costs. This can be deterred with the use of a vaccination for *D. nodosus* and control measures such as hoof trimming and antibiotic foot baths.

Alternative or Joint Enterprises with Solar Arrays

Grazing Low line cattle might be an option. Low Line cattle are a breed of small, polled beef cattle developed in Australia, out of Angus breeds. These cattle are not dwarfs but a small breed, usually around 3 ½ to 4 feet tall and around 1300 lbs. as an adult. They tend to be very docile. There is one rancher in Hawaii raising Australian Low Line cattle.

Sheep flocks should be compatible with beekeeping as long as there are certain expectations within the parties. First, the hives need to be fenced off from the sheep flock to keep the sheep away from the hives. Some sheep are curious and may rub against the hives agitating the bees. If the hive is aggressive, it could potentially result in bee stings, for the sheep and potentially to the shepherds. Some sheep do have allergies to bee stings. Beekeepers and shepherds need to coexist. Gates must not be left open, if grazing is being restricted and hives must be easily accessed within the entire paddock.

Due the land required for solar arrays, soil cropping is not really feasible. The ability to put small tractors to manage the soil, plant crops, harvest, would be difficult. Moving in between solar arrays might be difficult. One possibility might be fruit trees but the growth of trees and the shading of the solar arrays might reduce compatibility.

PVC solar arrays and aquaponics gardens might also be a compatible cropping systems. There are a few commercial aquaponics systems on Oahu, e.g. Mari's Gardens which are growing leaf lettuce, cucumbers, beets, green onions and other produce along with tilapia and Chinese catfish. There are many references to powering pumps and aquaponics gardens with solar power. However, the compatibility of co-existing lettuce or other produce production using commercial aquaponics systems and solar arrays is not known.

Summary

Grazing sheep among solar arrays is happening all over the world. It is compatible. It brings two important ideas together – sustainable energy production and sustainable food production. There is, in our estimation, a growing demand for lamb meat in Hawaii and producing electricity and edible protein can be a "win-win" on Oahu. Careful planning in advance, establishing goals for the entire enterprise as well as those that will be keeping the sheep, a clear understanding

what inputs are available, the costs of the infrastructure and inputs and the expected outcomes are all necessary for this enterprise to succeed. Open communication and a strong business sense are pre-requisite to success. Since the agricultural side of the equation appears to be new for First Wind, you might considering seeking the advice of the CTAHR Agribusiness Incubator Program.

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Appendix 1

Examples of sheep handling facilities. This does not include perimeter fencing or fencing within the solar arrays. Taken from Temple Grandin, Humane Livestock Handling: Understanding livestock behavior and building facilities for healthier animals.

Though perimeter fencing is a necessity it is not the only aspect of fencing that should be completed. Below are two figures of possible facilities that will allow for low stress handling of the animals when vaccinations need to be given, if sorting needs to occur when weaning lambs off of ewes or if the veterinarian needs to come by and work with the animals at all. It is important to keep in mind that these facilities should be strong and that details are kept in mind. For example, ensure that all boards are nailed tightly in place and there are no nails sticking out for any reason that could harm a person or an animal.

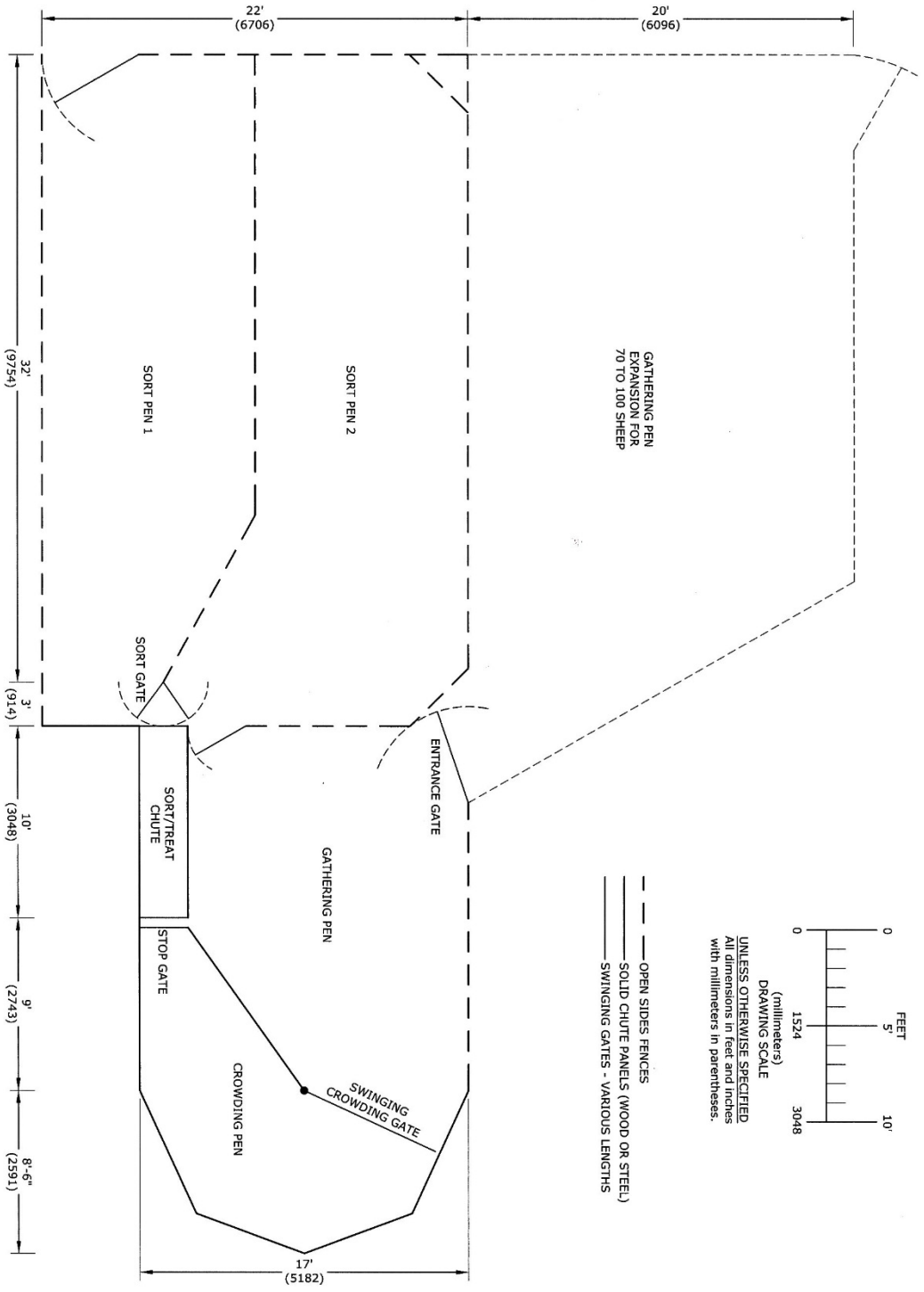
Large dashes in the figures show the areas where hog wire fencing/chain link fencing can be used. However, solid lines mean that it is best to put up boards. In this area, it is helpful to have boards put up so that the animal focuses on what is in front of them as opposed to what is all around him. Keep boards to one uniform color so that animals do not balk every time they see a new color.

In the second figure, notice that the chutes are curved and not in a straight line. This is because sheep want to go back to where they started from when being herded. By curving the area at which they move, it causes the sheep to believe they are going back to where they started, making the forward process much easier. This is something that can be kept in mind with herding into the corrals and in general. If the animals are moving in a curved pattern but continuing in the direction of where a handler wants them to end up, it is not necessary to force them to move in a straight line. This will only cause stress to the animal and will not necessarily speed up the process of moving the animals.

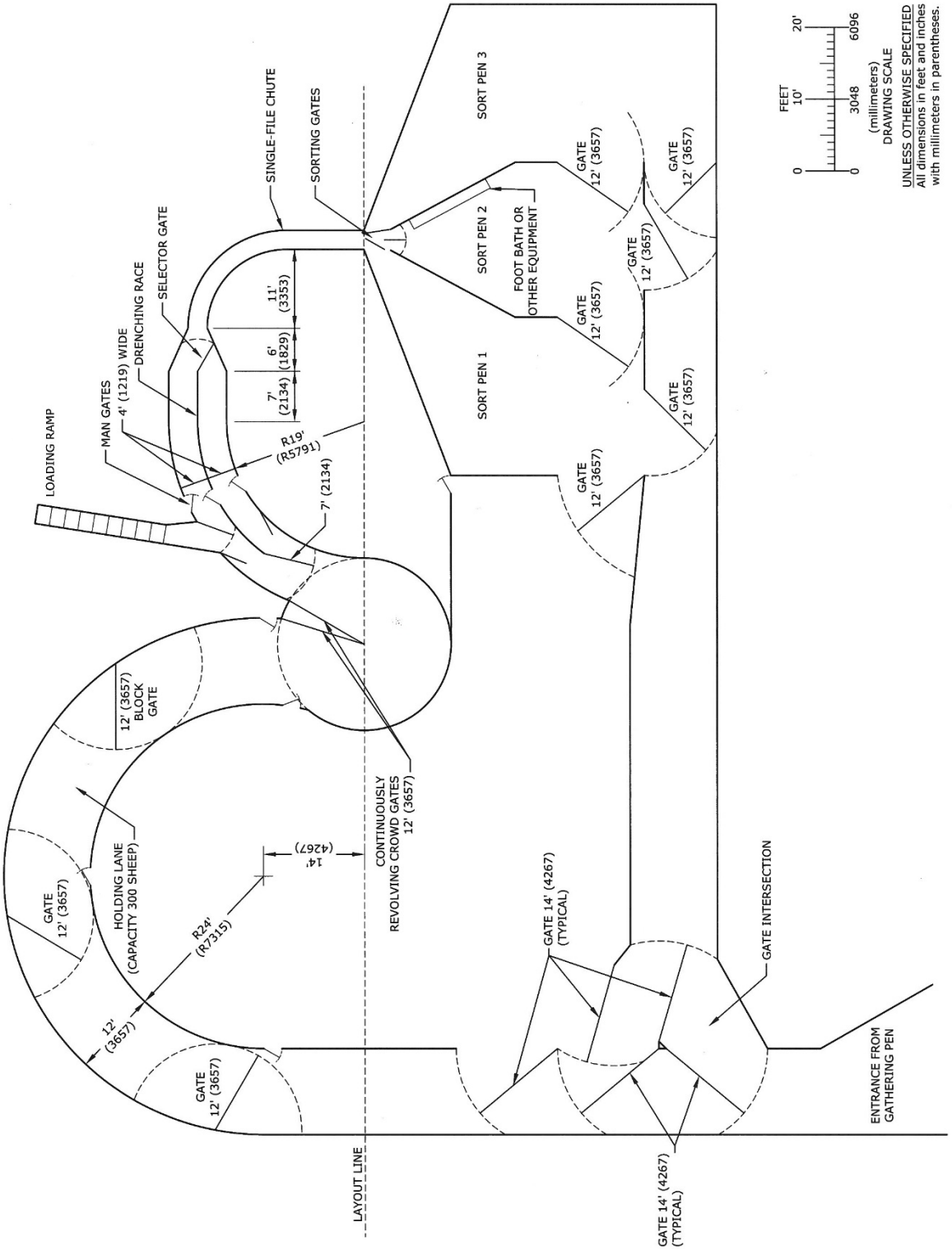
Though these figures are for large herds versus small herds, it is possible to combine the two to make a gathering place that best suits the needs of the rancher.

▶ SMALL-SCALE SHEEP-HANDLING FACILITY

This design accommodates 30 to 40 sheep per day but can be expanded to work 70 to 100 sheep per day by adding an additional gathering pen attached to the entrance gate, or by lengthening the chute and gathering pen. This design is adapted from *Sheep Production Handbook,* American Sheep Industry Association.



▶ SHEEP CORRAL FOR A LARGE FLOCK



Attachment 7. Decommissioning Plan

Decommissioning Plan

The design life of the Kawailoa Solar Farm Project (project) is 35 years. Industry standards assume that module end-of-life occurs when output is reduced to 70% of new value or at the end of 35 years, whichever comes first. The contract with Hawaiian Electric Company, Inc. (HECO) is expected to last 22 to 27 years, with an option for continuing operation beyond the initial contract term if the project is still productive. At the end of the project's useful life, the solar panels and related facilities will be disconnected from the HECO grid and decommissioned within 12 months. Most of the component materials will be reused or recycled, and the land will be restored to substantially the same condition that existed prior to the solar project and any associated agricultural activities (e.g., sheep pasture). Decommissioning is paid for by the project's owner, with some type of financial security established to cover long-term decommissioning costs prior to the date of commencement of commercial generation.

Removal, Recycling and Restoration

After the project's useful life, all solar facilities will be removed within 12 months. By design, most of the project components can be either reused or recycled, and the plant will not contribute significantly to the landfill stream. The solar modules and racking will be dismantled and removed, along with the vertical posts. Underground cabling and any below-grade concrete foundations will be removed to a depth of 36 inches.

The solar plant consists of many components and materials that can be returned to the manufacturers, sold on secondary markets or recycled. Standard practice is to sell substation/switchyard equipment "where-is as-is," in which all of the equipment would be sold and removed by the refurbisher and shipped to a facility on the mainland. Fabricated structures would likely be dismantled and removed for recycling, either by the refurbisher or the owner of the facility. With more than 200 MW of photovoltaic panels installed on rooftops across Hawaii, and another 300 MW expected to be installed over the next few years, it is possible that a PV recycling facility will be opened in the next 25-30 years, as all the panels reach the end of their useful life. Such facilities have opened in Europe, and it is anticipated that similar operations will open in the Southwestern US and in Hawaii as the installed PV systems age out and are replaced.

After the project's solar facilities are removed, the ground will be cleared and re-seeded as needed, to return it to essentially the same condition as existed prior to the project. In this case, the land is currently used as cattle pasture and will be converted to solar and sheep pasture during the life of the project. After decommissioning, restoring the land to pasture conditions will be straightforward.

Financial Security for Decommissioning

Prior to beginning commercial operation, the Applicant will put financial security in place to cover the estimated cost of decommissioning. The purpose of posting security is to ensure that at the end of the project's useful life, sufficient funds are available to pay for the removal of equipment and restoration of the land. Based on industry estimates of removal costs and salvage value of recycled materials, the projected cost to decommission the project is approximately $4M. Decommissioning security would be provided in the form of a parent guaranty, letter of credit, or some other acceptable form of security.

Attachment 8. Archaeological Inventory Survey

An Archaeological Inventory Survey for First Wind's Kawailoa Solar Power Project

Portions of TMKs: (1) 6-1-05:001, (1) 6-1-06:001, and (1) 6-1-07:001

Kawailoa Ahupua'a
Waialua District
Island of O'ahu

DRAFT VERSION

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Kawailoa Ahupua‘a
Waialua District
Island of O‘ahu

ASM affiliates

EXECUTIVE SUMMARY

At the request of First Wind, ASM Affiliates, Inc. has prepared this Archaeological Inventory Survey for the proposed development of a solar power generation project (First Wind Kawailoa Solar Project) on roughly 360 acres (portions of TMKs: (1) 6-1-05:001, (1) 6-1-06:001, and (1) 6-1-07:001) within Kawailoa Ahupua‘a, Waialua District, Island of O‘ahu. The proposed solar project will occupy land that is owned by Kamehameha Schools and leased to First Wind for the specific purpose of the development of alternative energy. First Wind has already developed portions of this land as a wind power energy facility, and already has much of the needed baseline infrastructure (i.e., roads, drainage, and power connections) in place. First Wind will obtain a Special Use Permit in compliance with new legislation that requires solar energy projects on Class B or C agricultural lands that are larger than 20 acres to obtain such permitting. As well, this report is intended to fulfill the requirements of the Department of Land and Natural Resources with respect to permit approvals for land-altering and development activities. The current study was undertaken in accordance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai‘i Administrative Rules 13§13-284.

Located northeast of Hale‘iwa Town and *mauka* of Kamehameha Highway (Hwy 83), the current project area (see Figures 1 and 2) includes a series of tableland formations on which the proposed solar panels will be constructed within four arrays (Waimea 5, 6, 8, 26) named for the former plantation fields within which they are situated (Figure 3). A corridor for the placement of a new collector line was also surveyed. For construction, operation, and maintenance purposes, these tableland locations will be accessed using old plantation roads (Ashley Road and other unnamed secondary roads) that were improved (widened and reinforced) to support the existing wind farm activities. There will be no Solar Project associated development activities planned for any portions of the involved parcels outside of the defined solar project area; a new solar substation is proposed within the existing wind power project area, for which an archaeological inventory survey (Rechtman et al. 2011) has already been submitted and approved.

As a result of the current study, two archaeological sites were identified; one new archaeological site (SIHP Site 7716) and one previously recorded site (SIHP Site 7171) were identified within the current proposed *makai* Collector Line Corridor. This latter site (Site 7171) is along the *makai* edge of a road that borders the *makai* edge of the Waimea 6 survey area (within the footprint area for the *makai* solar substation) and extends all the way to the Waimea 5 solar array survey area. SIHP Site 7171 (another abandoned and remnant irrigation ditch) was encountered roughly 2/3 the way down to the Makai Interconnection Facility. The tablelands within all four of the survey areas were extensively transformed by modern plantation agricultural and intensively used for the cultivation of sugarcane and pineapples until the 1990s. Remnant modern plantation infrastructural elements, including field roads, PVC waterlines, and bulldozer berms, were noted throughout all of the survey areas and, despite the thick vegetation currently blanketing the project area, it was evident that most of the former plantation fields surveyed for the proposed Kawailoa Solar Power Project, prior to being abandoned, were covered in black plastic weed matting, and had parallel lines of black plastic drip line extending through them at regular intervals.

Site 7171, although non-functional, does retain sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O‘ahu. This site was recorded and investigated during an earlier study (Rechtman et al. 2011) and further documented during the current study. It is suggested that a reasonable and adequate amount of information has been collected from and about this site as a result of the past the current studies to warrant a continued no further work recommendation; and thus, a no historic properties affected determination for this site with respect to the proposed Kawailoa Solar Power Project. Site 7716, also non-functional and in many places intentionally buried, and like Site 7171 does retain sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O‘ahu. Two small portions of this site may be impacted by the construction of an access and maintenance road servicing the *makai* collector line, however it is suggested that a reasonable and adequate amount of information has been collected from and about this site as a result of the current study to warrant a no further work recommendation; and thus, a no historic properties affected determination for this site with respect to the proposed Kawailoa Solar Power Project.

It is further recommended, with respect to the overall development, that a program of archaeological monitoring be maintained during the construction activities associated with the Kawailoa Solar Power Project. Such a program will help to ensure that any inadvertently discovered resources would receive immediate attention and protection, while their ultimate disposition is being determined by DLNR-SHPD. A monitoring plan in compliance with HAR 13§13-279 should be prepared and submitted to DLNR-SHPD for review and approval.

CHAPTERS

Page

FIGURES

Page

Page

Page

TABLES

Page

1. INTRODUCTION

At the request of First Wind, ASM Affiliates, Inc. has prepared this Archaeological Inventory Survey for the proposed development of a solar power generation project (First Wind Kawailoa Solar Project) on roughly 360 acres (portions of TMKs: (1) 6-1-05:001, (1) 6-1-06:001 and (1) 6-1-07:001) within Kawailoa Ahupuaʻa, Waialua District, Island of Oʻahu (Figures 1 and 2). The proposed solar project will occupy land that is owned by Kamehameha Schools and leased to First Wind for the specific purpose of the development of alternative energy. First Wind has already developed portions of this land as a wind power energy facility, and already has much of the needed baseline infrastructure (i.e., roads, drainage, and power connections) in place. First Wind will obtain a Special Use Permit in compliance with new legislation that requires solar energy projects on Class B or C agricultural lands that are larger than 20 acres to obtain such permitting. As well, this report is intended to fulfill the requirements of the Department of Land and Natural Resources with respect to permit approvals for land-altering and development activities. The current study was undertaken in accordance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawaiʻi Administrative Rules 13§13-284.

This report contains a physical description of the project area, a discussion of the regional culture-historical context, and a presentation of prior archaeological studies. This background information is used to develop a set of archaeological expectations for the study area as well as provide the contextual information with which to assess the significance of historic properties identified within the project area.

PROJECT AREA DESCRIPTION

Located northeast of Haleʻiwa Town and *mauka* of Kamehameha Highway (Hwy 83), the current project area (see Figures 1 and 2) includes a series of tableland formations on which the proposed solar panels will be constructed within four arrays (Waimea 5, 6, 8, 26) named for the former plantation fields within which they are situated (Figure 3). A corridor for the placement of a new collector line was also surveyed. For construction, operation, and maintenance purposes, these tableland locations will be accessed using old plantation roads (Ashley Road and other unnamed secondary roads) that were improved (widened and reinforced) to support the existing wind farm activities. There will be no Solar Project associated development activities planned for any portions of the involved parcels outside of the defined solar project area; a new solar substation is proposed within the existing wind power project area, for which an archaeological inventory survey (Rechtman et al. 2011) has already been submitted and approved.

Natural Environment

The project area is located within the coastal lowlands of the *ahupuaʻa* of Kawailoa in the District of Waialua on the northwest shore of the Island of Oʻahu. It is situated along the western edge of the Koʻolau Mountains at the shoreward end of a saddle-like plateau that stretches west to the Waiʻanae Mountains (Figure 4). The Waiʻanae Mountains are slightly younger than the Koʻolau Mountains, which were formed by the Koʻolau volcanic series roughly 2.2 million years ago (Stearns and Vaksvik 1935). This area receives a median annual rainfall of approximately 1,000 millimeters, mostly falling during the winter months (Foote et al. 1972), and it has an annual temperature range of 65 to 85 degrees Fahrenheit. Elevation within the project area varies from 20 feet above sea level near the coast to 1,200 feet above sea level at the upper ends of the tableland arrays.

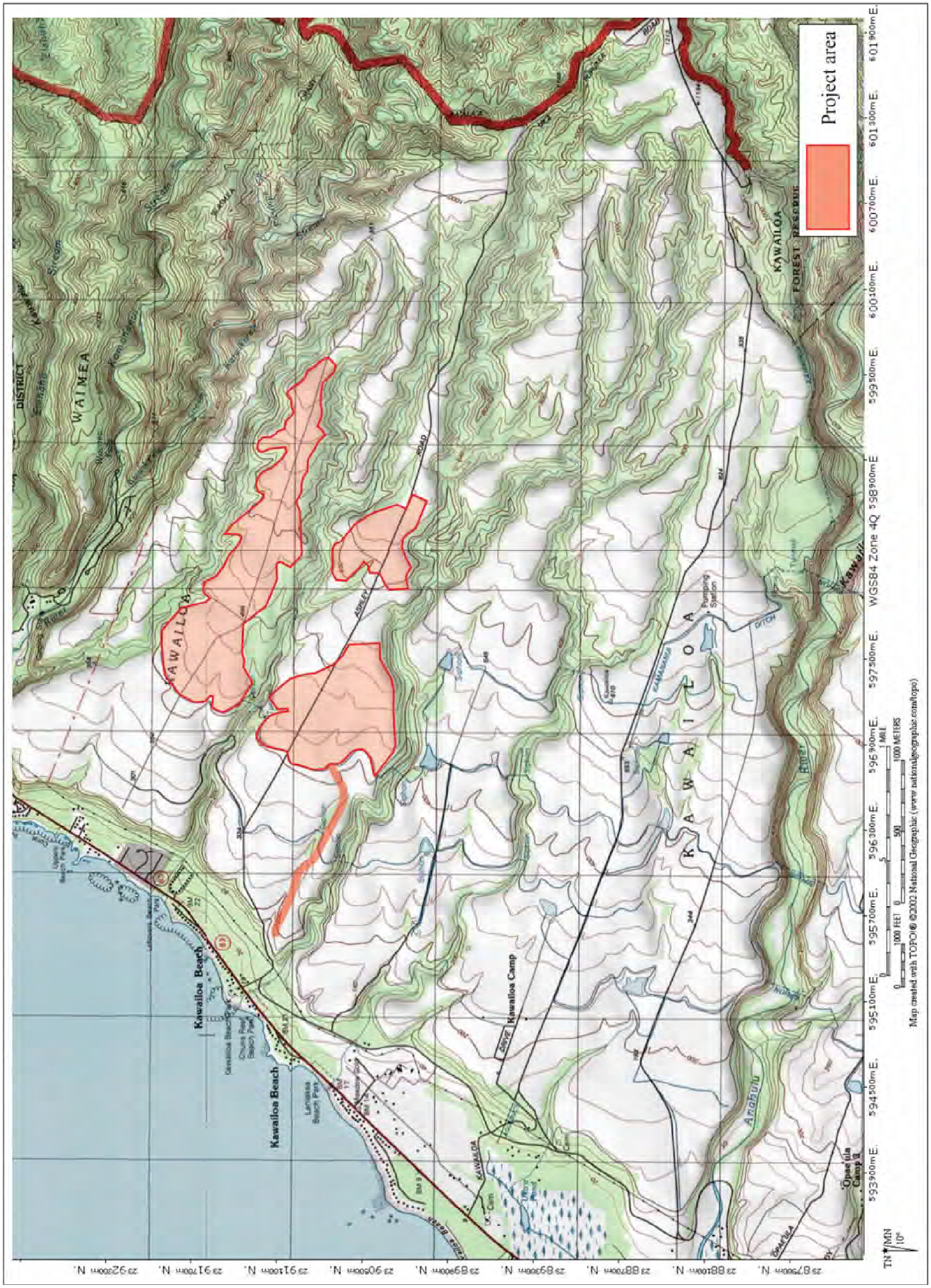

Figure 1. Project area location.

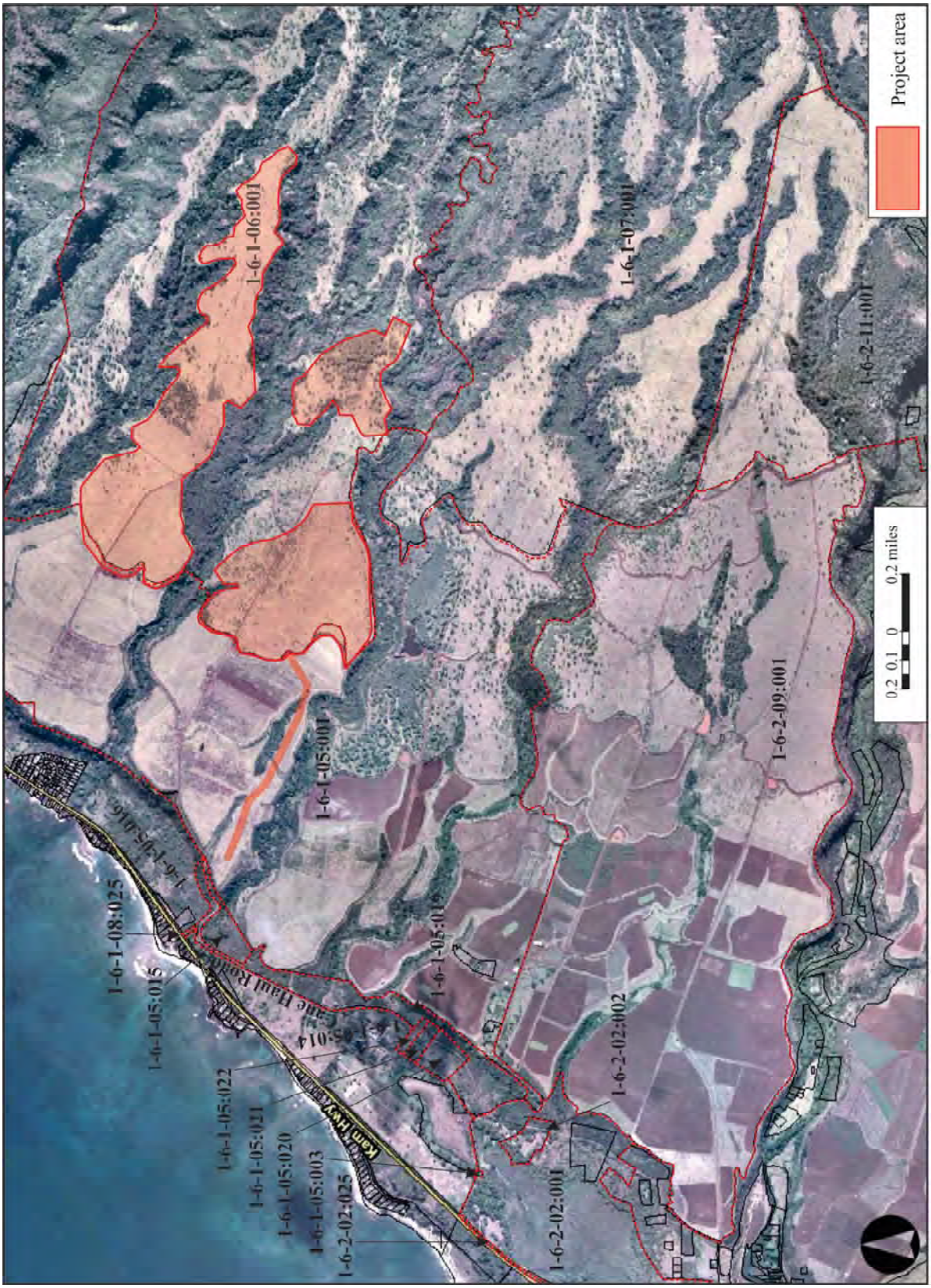

Figure 2. Tax Map parcels and project area.

Figure 3. Kawailoa solar site plan.

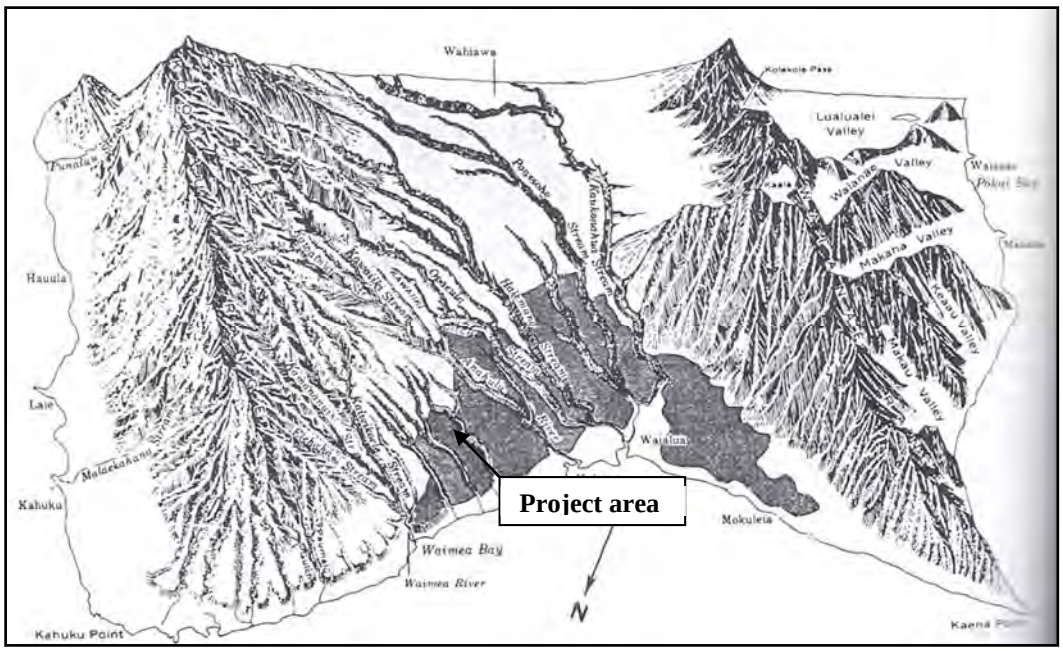

Figure 4. Oblique view of Waialua District (from Kirch 1992:6).

At the coast, Kawailoa Ahupua‘a has a flat littoral plain fronted by coral reefs and a long narrow sandy beach interspersed with rocky outcrops. The plain is widest at the southern end of the *ahupua‘a*, but quickly narrows to the north as it approaches Waimea Bay. Inland of Kamehameha Highway, brackish ponds and swampy areas are present on the plain between the project area and Hale‘iwa Town. The largest pond, ‘Uko‘a Pond, is situated well to the southwest of the current project area near the existing wind farm’s Kawailoa Drive access road. Inland of ‘Uko‘a Pond a low, but steep, escarpment rises above the littoral plain. The escarpment increases in height as it progresses northwards and the littoral plain narrows, becoming a coastal cliff by the time it reaches Waimea Bay. Inland of the escarpment, Kawailoa Ahupua‘a gives way to dissected tablelands that rise gently toward the Ko‘olau mountain range. The tablelands are flat lands separated from one another by deeply eroded gulches and valleys that were formed by rivers and streams flowing to the ocean. The current project area lies between Kaiwiko‘ele Stream (to the east) and Anahulu River (to the west). Several smaller drainages, with intermittently flowing streams that parallel the permanently flowing streams, dissect the project area, generally running in a northwesterly/southeasterly direction (see Figure 4). Elevation within the current project area ranges from 400 to 680 feet (122 to 207 meters) above sea level.

Most of the tablelands consist of deep and well-drained, but acidic, red soils with fine-textured subsoil (Foote et al. 1972). These silty clays are a product of weathered igneous bedrock. Within the current project area silty clays of the Paaloa (PaC) and Leileihua Series (LeB, LeC) occur in the broad upper reaches of the tablelands, while the middle elevations are dominated by of the Wahiawa silty clays (WaB, WaC), and the lower elevations are comprised, above the coastal escarpment, primarily of Lahaina silty clays (LaB, LaC) and, on the littoral plain, of Waialua silty clay (WkA, WkB), Ewa stony slity clay (EwC), and Waialua stony silty clay (WlB). The steep sided gulches adjacent to the survey areas contain predominantly rough mountainous land (rRT) and Helemano silty clay on 30 to 90 percent slopes (HLMG) (Foote et al. 1972).

Vegetation across the project area consists primarily of a thick growth of Guinea grass (*Panicum maximum*) and Albizia trees (*Acacia lebbek*) interspersed with *koa-haole* (*Leucaena glauca*), Christmas-berry (*Schinus teribinthifolius*), guava (*Psidium guajava*), *waiawī* (*Psidium cattleianum*), stands of ironwood trees (*Casuarina equisetifolia*), formosa koa (*Acacia confusa*), and various other non-native shrubs, vines, ferns, and grasses. The perennial Guinea grass (*Panicum maximum*), which covers virtually all of the former sugarcane/pineapple lands within the study area, was introduced from Africa to counteract erosion. Dense tussocks of this grass conceal the ground surface, and in some areas stand as tall as ten feet. Large Indian Banyan (*Ficus benghalensis*) can be found growing against cliff faces in the lower and *makai* portion of the project area as well as on the steeper slopes that border the higher *mauka* tablelands. Also, Kamehameha Schools has re-introduced *koa* trees (*Acacia koa*) in certain sections of the tablelands. These endemic trees, traditionally used for a variety of purposes, including canoe production, are gradually spreading and appear to be thriving. Other endemic plants observed during the field study included *‘ōhia*,

kī, alahe‘e, pukeawe, kukui, ‘iliahi, uluhe, and *hāpu‘u*. These plants are mostly confined to isolated areas along the upper edges of the deep gullies and valleys that dissect the tablelands. The predominant vegetation within the gulches is *waiawī* (*Psidium cattleianum*).

Built Environment

Traditionally, in the general vicinity of the project area, Hawaiians lived, practiced aquaculture, and cultivated taro, bananas, and sugarcane on the more *makai* lands, and gathered forest resources from the more *mauka* lands. Historically, the project area was converted into vast plantations of sugarcane and pineapple. Most recently, modern and historic period alteration of the landscape for continued agricultural use has virtually obliterated all material traces left by both traditional Hawaiian and early historical modification and use of the project area lands. Only the gulch areas were left relatively untouched by this last period of mechanized agriculture.

The current project area environment is largely a result of more than a century of use as sugarcane and pineapple fields. The sugar and pineapple companies modified and utilized most of the land within the current project area, clearing original vegetation, leveling original landforms, digging ditches, constructing reservoirs, and building roads and railroads. Substantial amounts of foreign laborers (mostly Chinese, Filipino, and Japanese) were imported to work the fields, and labor camps dotted the landscape. The 1929 U.S.G.S. quadrangle maps for Hale‘iwa and Kaipapa‘u (Figure 5) show irrigation ditches emptying into reservoirs, following contours at roughly every 100-foot change in elevation; railroad tracks running across the plantation lands; numerous roads traversing the length of the tablelands, bounding field edges, and crossing gulches; and workers’ camps scattered throughout. A review of aerial photographs taken on June 4, 1951 (Figure 6), December 4, 1962 (Figure 7), February 9, 1977 (Figure 8), and September 22, 1993 (Figure 9) shows the former extent of the plantation fields and how they developed over time. Virtually all of the project area tablelands were formerly cultivated in pineapple. An undated map of the Waialua Sugar Company fields shows the field numbers that the current project area corresponds to (Waimea 5, 6, 8, 26, and Kawailoa 15), which are also the names of the four proposed solar arrays (Figure 10). The western fields are within the Waimea section of the plantation, and the eastern fields are within the Kawailoa section of the plantation.

When the Waialua Sugar Company closed its doors in 1998, the lands were reclaimed by Kamehameha Schools. After the closure of the sugar company, most of the upper tableland areas in the Kawailoa and Waimea sections of the plantation (above the 400 foot contour) were allowed to go fallow. These upper lands were extensively modified during the twentieth century, prior to the abandonment of the fields, however, to accommodate agricultural use. Many of the gulch edges are lined with push piles created by bulldozers during field clearing activities, and old roads follow nearly all of the gulch edges and cross the tablelands at field boundaries. Weed matting and plastic drip lines are still evident in many of the old pineapple fields. In recent years (beginning in 2011), the lands above the 400 foot contour have been fenced to create cattle pasture for a Kamehameha Schools cattle lease. The lands below the 400 foot elevation contour (and below the current project area) are currently farmed (Figure 11). These lands are leased to individuals by Kamehameha Schools for diversified agriculture purposes. Crops grown on the leased lands include corn, lettuce, asparagus, plumeria, banana, tuberose, taro, and *noni*. Rechtman et al. (2011) documented an irrigation system, consisting of a series of interconnected ditches, flumes, and reservoirs that were originally created by the Waialua Agricultural Company (during the early to middle twentieth century) to water the sugarcane fields. At the time of the Rechtman et al. (2011) study the old irrigation system was still maintained in the vicinity of the current project to supply water to the diversified agricultural fields. Recently, however, the irrigation water has been diverted from the ditches, flumes, and reservoirs into buried water pipes that carry it to the fields.

Survey Areas

The proposed First Wind Kawailoa Solar Project, because of the dissected terrain and the nearby infrastructure of the existing wind farm, will include four distinct arrays of solar panels named for the former pineapple fields within which they are located (see Figure 3). Each of the arrays proposed for the solar project (Waimea 5, 6, 8, 26) constituted a separate survey area for the current archaeological fieldwork. They have also proposed to construct two solar substations, one at the *makai* end of Waimea 6 and one within the wind farm development area between between Waimea 8 and Waimea 6. Additionally, a roughly 100-foot wide corridor that extends between the *makai* solar substation and the Kawailoa wind farm’s existing *makai* interconnection facility was surveyed for the placement of new collector lines (Collector Line Corridor). A proposed *mauka* overhead collector line will be placed between Waimea 26 and Waimea 8, but wide span the intervening gulch with poles located on the tablelands within the respective solar array survey areas. All of the survey areas include only the flat tablelands that the infrastructure will be built on, and not the steep sided gulches that they border or in the case of the *mauka* collector line, span. Each of the survey areas is described below.

Figure 5. Portion of the 1928 USGS Haleiwa and Kaipapau quadrangles showing the current study area.

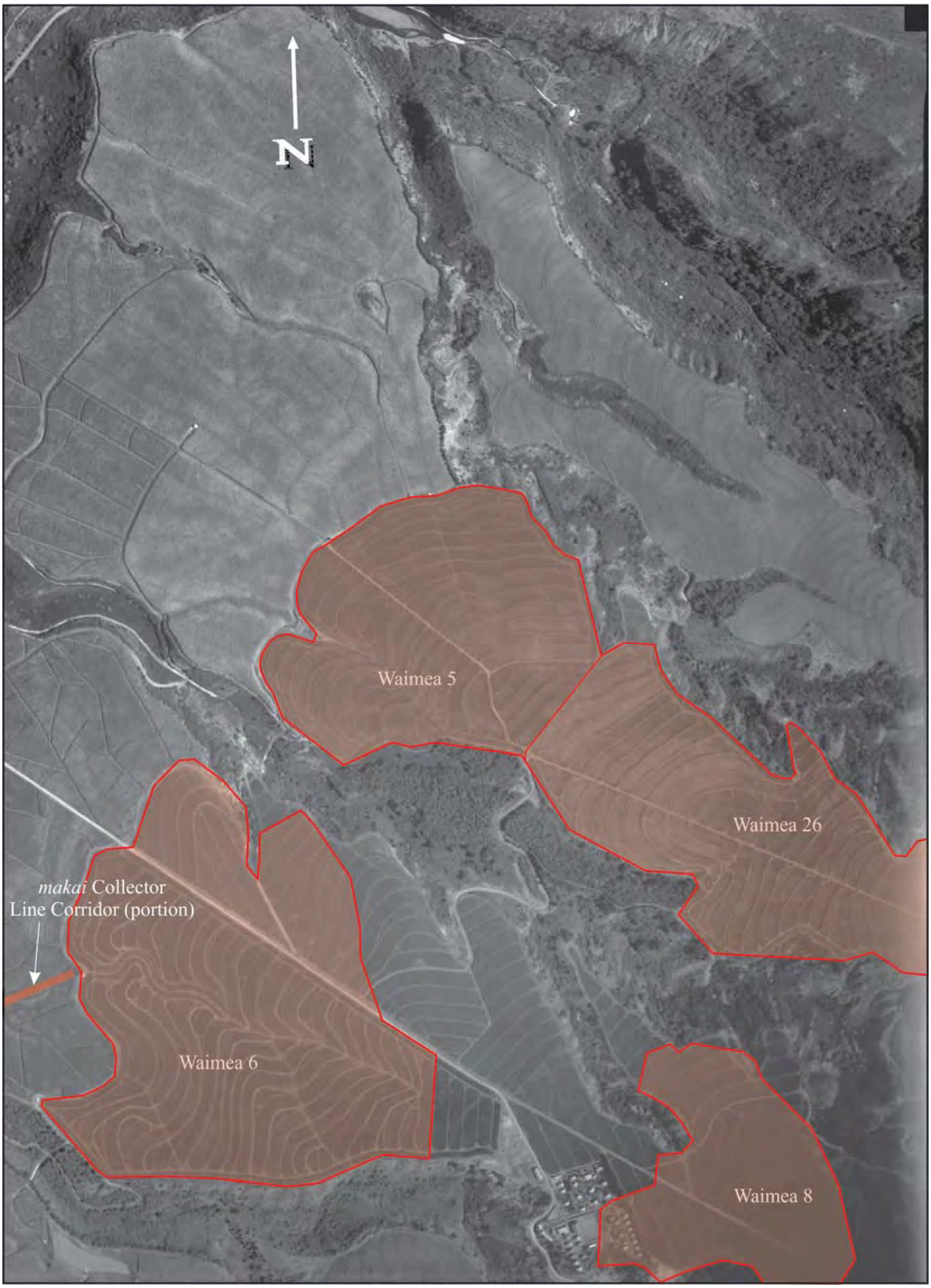

Figure 6. June 4, 1951 aerial photograph showing a portion of the current project area (outlined in red).

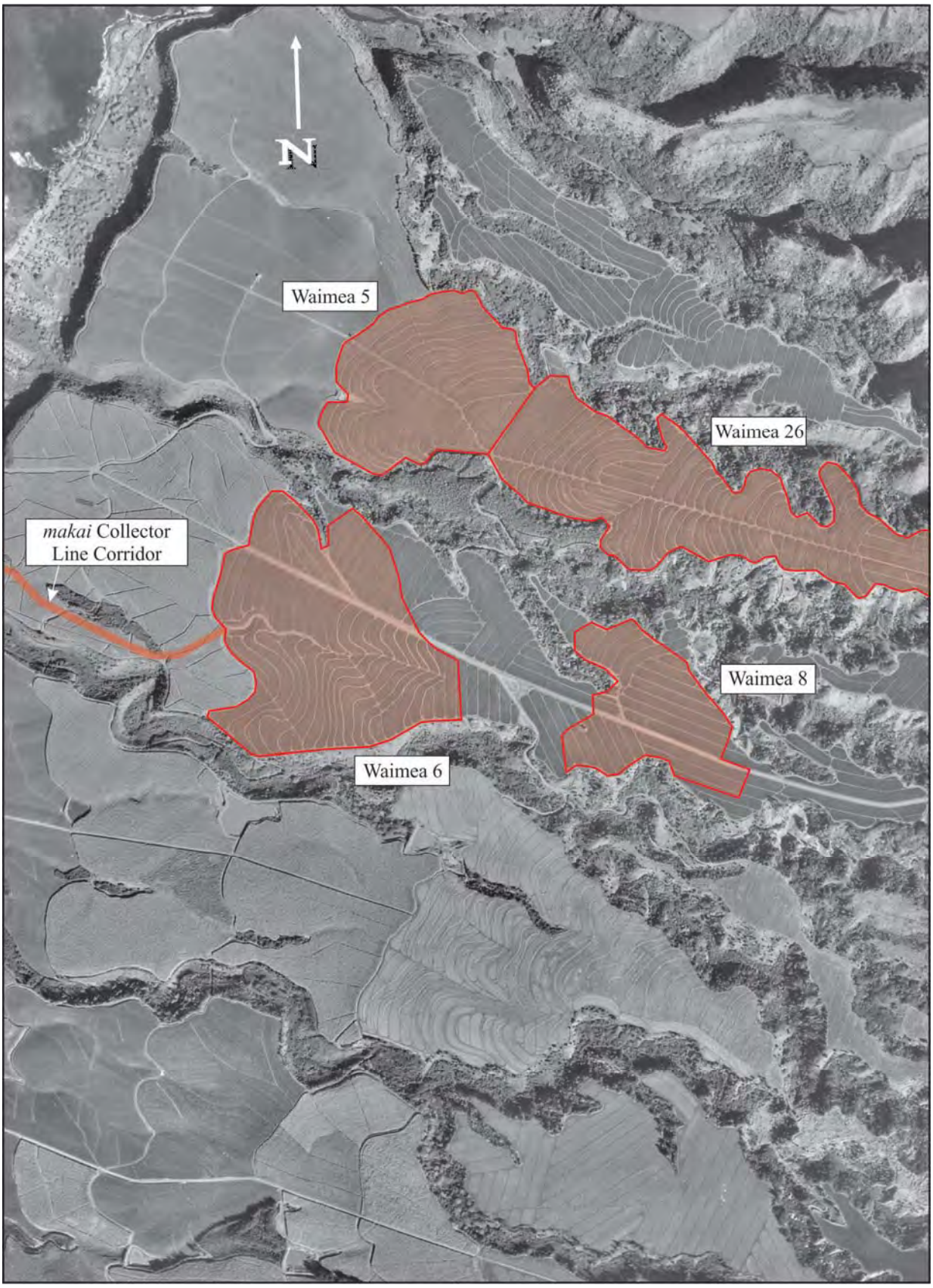

Figure 7. December 4, 1962 aerial photograph showing the current survey areas (outlined in red).

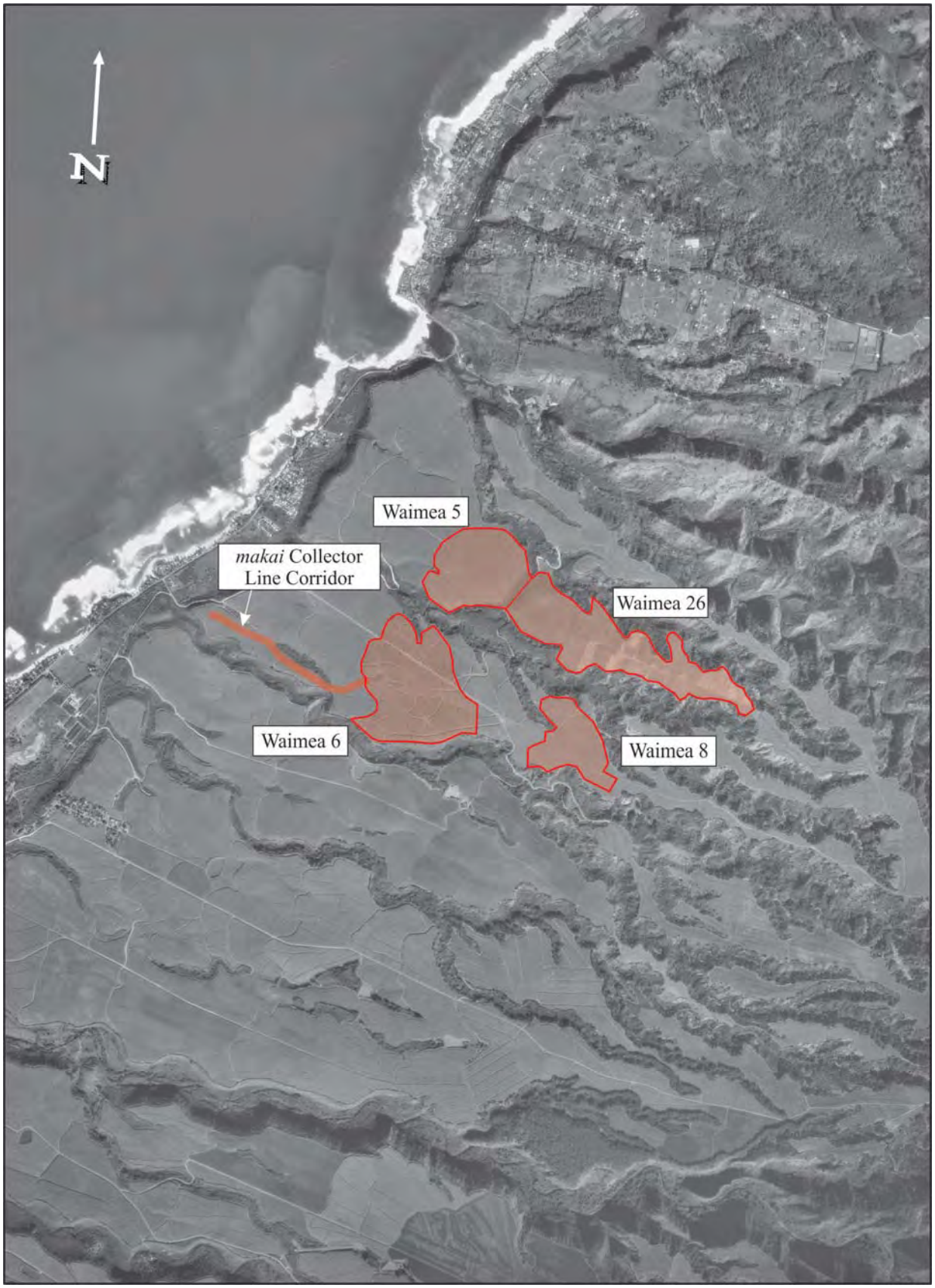

Figure 8. February 9, 1977 aerial photograph showing the current survey areas (outlined in red).

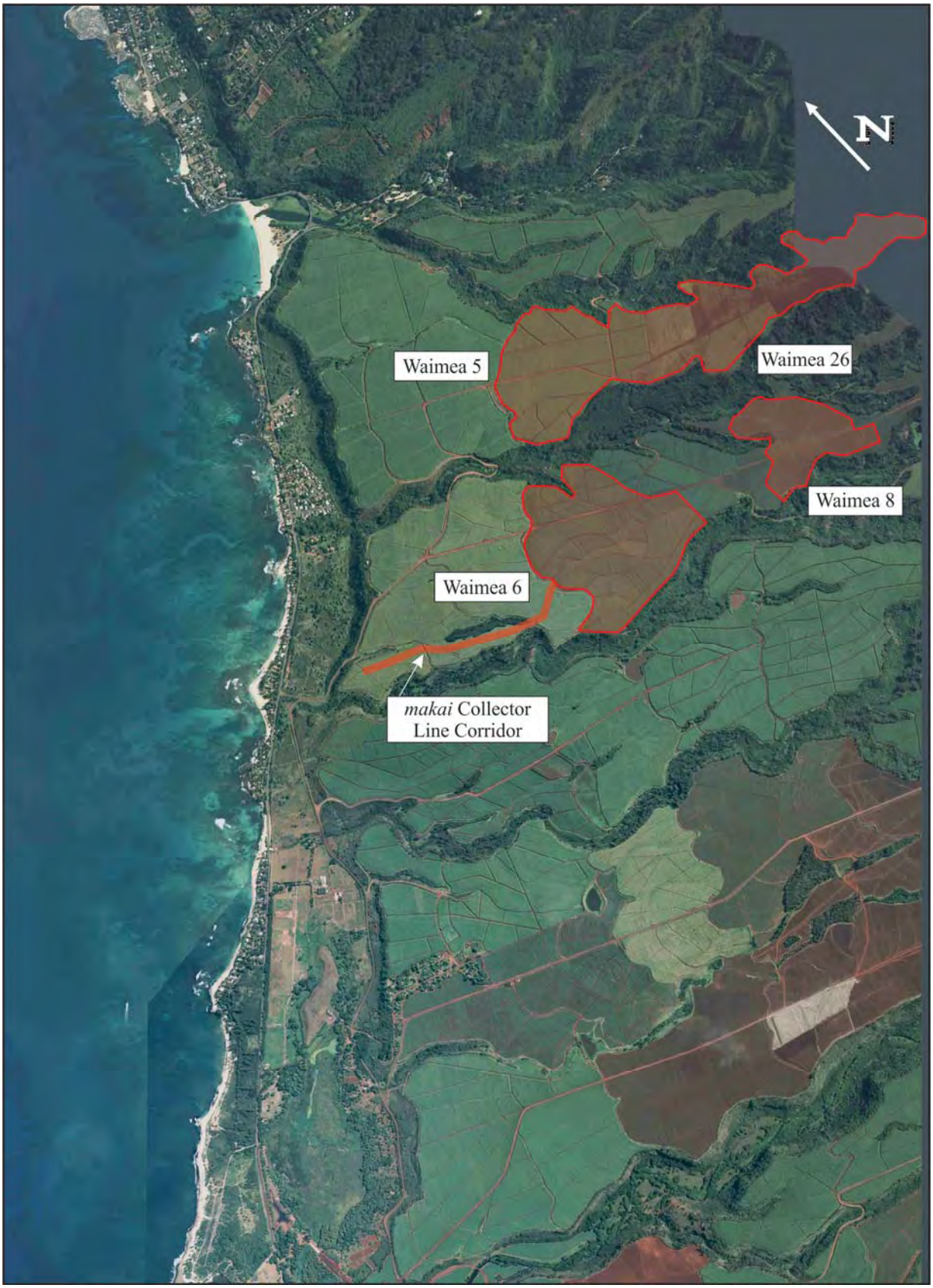

Figure 9. Aerial photograph taken on September 22, 1993 showing apportion of the current project area.

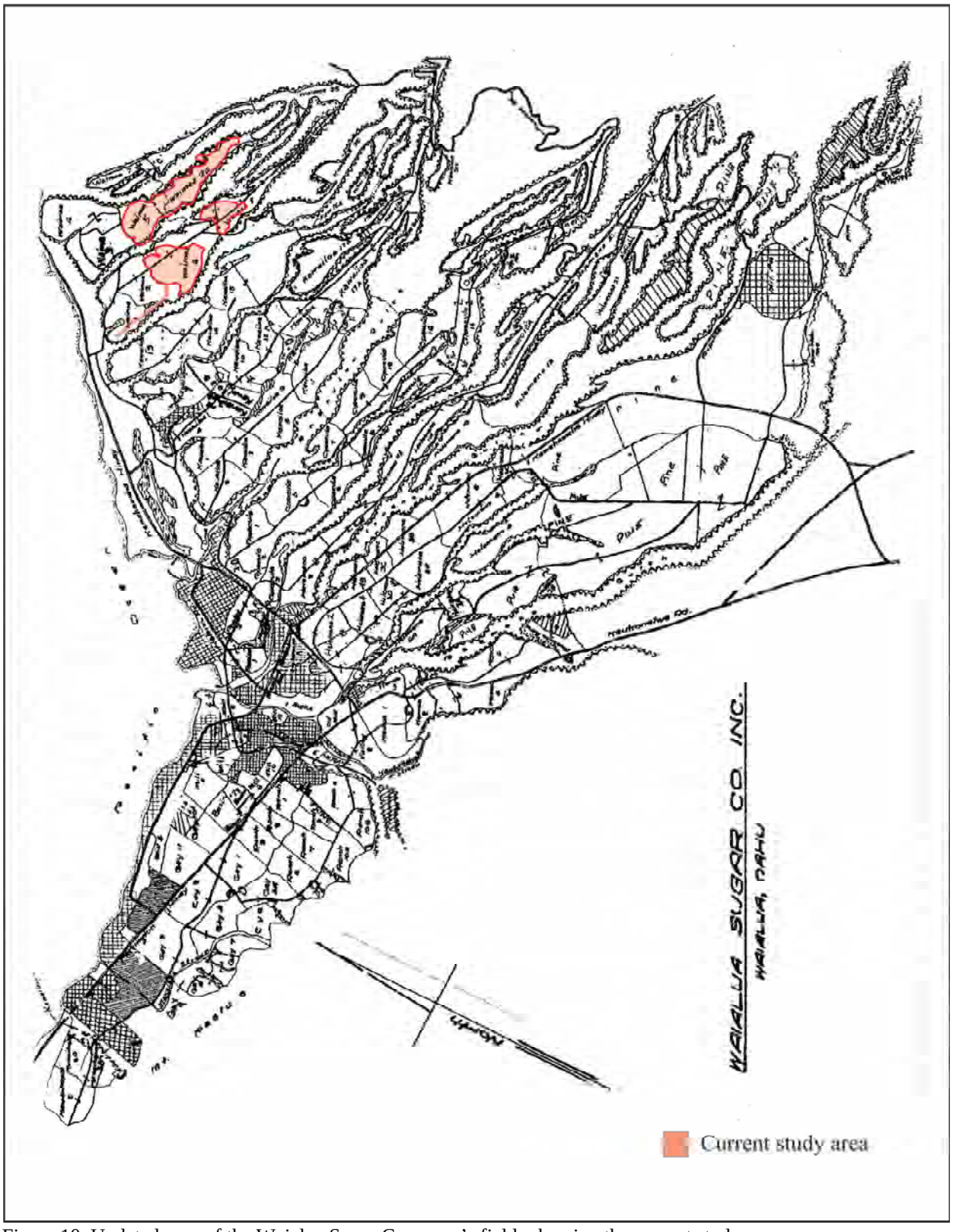

Figure 10. Undated map of the Waialua Sugar Company's fields showing the current study area.

Figure 11. Current aerial view of the project area (from Google Earth).

The Waimea 5 survey area (Figure 12) consists of approximately 82 acres of tableland located in the northwestern portion of the project area on TMK: (1) 6-1-06:001 (see Figures 1 and 2). This irregularly shaped area, which extends from roughly 400 to 500 feet above sea level, is bounded to the north and south by steep sided gulches and to the east and west by dirt roads. Another dirt road (an unnamed plantation road) extends from northwest to southeast through the Waimea 5 survey area (Figure 13). No prior wind farm development has occurred within this portion of the project area tablelands, but existing wind turbines, separated from the Waimea 5 survey area by the intervening gulch lands, are located on the adjacent tablelands to the north (Turbines 12-14) and to the south (Turbines 27-30). An existing wind farm road that extends from Ashley Road between Turbine 29 and Turbine 14, and separates the Waimea 5 survey area from the Waimea 26 survey area (Figure 14), will provide access to the Waimea 5 solar array (see Figure 3). A fence line has been recently erected along the western edge of this road. A staging area for construction materials is proposed for the southeastern corner of the Waimea 5 survey area (adjacent to the existing access road) when development of the First Wind Kawailoa Solar Project begins. The Waimea 5 survey area, which corresponds to the former pineapple field Waimea 5 (see Figure 10), is currently fallow and contains a thick growth of tall Guinea grass (*Panicum maximum*) interspersed with a few albizia trees (*Acacia lebbek*) and other less frequently occurring plant species (Figure 15).

Figure 12. Waimea 5, view to the east from the western boundary of the survey area.

The Waimea 6 survey area consists of approximately 113 acres of tableland located in the western portion of the project area on TMK: (1) 6-1-06:001 (see Figures 1 and 2). This irregularly shaped area, which extends from roughly 410 to 520 feet above sea level, is bounded to the north and south by steep sided gulches (Figure 16) and to the west by a dirt road (Figure 17). The eastern boundary is an unmarked straight line, and a portion of the northeastern boundary adjoins a previously developed area of the wind farm containing Turbines 27-30 (see Figure 3). Ashley Road (Figure 18), which extends from Kamehameha Highway to the existing wind farm office and maintenance building, passes through the northern portion of the Waimea 6 survey area and will be used to access the Waimea 6 solar array. The areas along either edge of Ashley Road and in northeastern corner of the Waimea 6 survey area adjacent to Turbines 27-30 were previously surveyed during the Rechtman et al. (2011) archaeological study of the wind farm (see Figure 1). The Waimea 6 survey area, which corresponds to the former pineapple field Waimea 6 (see Figure 10), is currently fallow and contains a thick growth of tall Guinea grass (*Panicum maximum*) interspersed with a few albizia trees (*Acacia lebbek*) and other less frequently occurring plant species.

Figure 13. Dirt road extending through the Waimea 5 survey area, view to the northwest.

Figure 14. Dirt road between the Waimea 5 and Waimea 26 survey areas, view to the northeast.

Figure 15. Vegetation within the Waimea 5 survey area, view to the southwest.

Figure 16. Gulch between the Waimea 6 and Waimea 5 survey areas, view to the northeast (from the northern edge of the Waimea 6 survey area).

Figure 17. Waimea 6, view to the north from the road along the western boundary of the survey area.

Figure 18. Ashley Road extending through the Waimea 6 survey area, view to the southeast.

The Waimea 8 survey area consists of approximately 38 acres of tableland located in the eastern portion of the project area on TMK: (1) 6-1-06:001 (see Figures 1 and 2). This irregularly shaped area, which extends from roughly 615 to 670 feet above sea level, is bounded to the north and south by steep sided gulches, to the west by a previously developed area of the wind farm containing the electrical sub-station and the office and maintenance (O&M) building, and to the east by a narrowing of the tableland formation (Figure 19). Ashley Road extends southeast from the O&M building through the Waimea 8 survey area to Turbine 15(see Figure 3), and will be used to access the Waimea 8 solar array (Figure 20). The eastern boundary of the survey area to the north of Ashley Road occurs at a lower elevation (roughly 660 feet above sea level) than the eastern boundary to the south of Ashley Road (roughly 680 feet above sea level); both legs of the eastern boundary are straight lines that extend from (perpendicular to) Ashley Road to the gulch edges on either side of the road. The areas along either edge of Ashley Road and western portion of the Waimea 8 survey area adjacent to the electrical sub-station and the O&M building were previously surveyed during the Rechtman et al. (2011) archaeological study of the wind farm. The Waimea 8 survey area, which corresponds to former pineapple field Waimea 8 (see Figure 10), is currently fallow and contains a thick growth of tall Guinea grass (*Panicum maximum*) and albizia trees (*Acacia lebbek*) interspersed with *koa-haole* (*Leucaena glauca*), Christmas-berry (*Schinus teribinthifolius*), guava (*Psidium guajava*), formosa koa (*Acacia confusa*), and other less frequently occurring plant species.

Figure 19. The existing wind farm electrical sub-station and O&M building west of the Waimea 8 survey area, view to the east along Ashley Road.

The Waimea 26 survey area consists of approximately 130 acres of tableland located in the northeastern portion of the project area (east of the Waimea 5 survey area) on TMK: (1) 6-1-06:001 (see Figures 1 and 2). This irregularly shaped area, which extends from roughly 500 to 780 feet above sea level, is bounded to the north and south by steep sided gulches (Figure 21) and to the west by a dirt road that divides it from Waimea 5 (see Figure 14). The eastern boundary of the Waimea 26 survey area is not marked. A dirt road (an unnamed plantation road that is a continuation of the road through Waimea 5) extends from northwest to southeast through the Waimea 26 survey area (Figure 22). No prior wind farm development has occurred within this portion of the project area tablelands, but existing wind turbines, separated from the Waimea 26 survey area by the intervening gulch lands, are located on the adjacent tablelands to the north (Turbines 12-14) and to the south (Turbines 27-30). An existing wind farm road that extends from Ashley Road between Turbine 29 and Turbine 14 will provide access to the Waimea 26 solar array (see Figure 3). A fence line has been recently erected along the western edge of this road. A corridor for an overhead collector line was previously surveyed across the Waimea 26 survey area during the Rechtman et al. (2011) archaeological study of the wind farm. The Waimea 26 survey area, which corresponds to the former pineapple field Waimea 26 (see Figure 10), is currently fallow and contains a thick growth of tall Guinea grass (*Panicum maximum*) interspersed with albizia (*Acacia lebbek*), *koa-haole* (*Leucaena glauca*), Christmas-berry (*Schinus teribinthifolius*), guava (*Psidium guajava*), formosa koa (*Acacia confusa*), and other less frequently occurring plant species.

Figure 20. Ashley Road extending through the Waimea 8 survey area, view to the southeast.

Figure 21. Gulch along the north edge of the Waimea 26 survey area, view to the north (with Turbines 13 and 14 in the background).

Figure 22. Dirt road extending through the Waimea 26 survey area, view to the southeast.

The *makai* Collector Line Corridor consists of a 100-foot wide corridor that extends approximately 1,300 meters (4,265 feet) between the Waimea 6 survey area and the Kawailoa wind farm's existing Makai Interconnection Facility (see Figure 1). In the *mauka* portion of this corridor, poles will placed that will hold an overhead power line, and in the *makai* portion the line will be placed in an underground conduit. The corridor begins at the *makai* side of the Waimea 6 survey area in the vicinity of SIHP Site 7171 where the *makai* solar substation will be located (Figure 23) at an elevation of roughly 410 feet above sea level and follows a former field road along a narrow ridge formation to an elevation of about 240 feet above sea level, where it joins (Figure 24) an existing power line corridor (previously surveyed by Rechtman et al. 2011) and continues to the Makai Interconnection Facility at an elevation of 160 feet above sea level (see Figure 11). The entire corridor crosses TMK: (1) 6-1-05:001 (see Figure 2) and passes through the former Waialua Sugar Company's fields Waimea-1 and 2 (see Figure 10). The entire area is overgrown with Guinea grass (*Panicum maximum*).

Figure 23. General location of proposed *makai* Solar Substation, note abandoned irrigation ditch Site 7171.

Figure 24. Location where proposed *makai* collector line joins existing electrical infrastructure.

2. BACKGROUND

Whereas at least the deeply dissected and flat-bottomed Waimea River valley to the north and the Anahulu River valley to the south contain intact remnants of Prehistoric and Historic Period Hawaiian occupation and use, the archaeological integrity of the interceding tablelands and the coastal plain behind Waialua Bay have for the most part been compromised by Historic Period ranching, cultivation, silviculture, military activities, and modern habitation. To generate a set of expectations regarding the nature of historic properties that might be encountered within the project area and to establish an environment within which to assess the significance of any such resources, a general historical context for the region and the findings of previous archaeological studies conducted in the vicinity of the project area are summarized.

CULTURE-HISTORICAL CONTEXT AND AHUPUA‘A SETTLEMENT PATTERNS

In an effort to provide a comprehensive and holistic understanding of the current study area and to generate a set of archaeological expectations, *ahupua‘a* specific archival and historical data along with the general settlement patterns for the Waialua District are presented. The current project area falls within Kawailoa Ahupua‘a (Figure 25), however Dega (1996:7-10) suggests that prior to the *Māhele*, the area comprised by Kawailoa was traditionally identified as six *ahupua‘a* (listed from north to south): Kapaeloa, Punanue, Kuikuiloloa, Lauhulu, Kawailoa, and Pa‘ala‘a. Sahlins (1992:18) refers to the other five land units as *‘ili*. The *Māhele* of 1848 was an event marked by complex land transactions that often resulted in changed names and configurations; this report will refer to the single post-*Māhele* Kawailoa Ahupua‘a (Figure 26). Archaeologically and historically, Kawailoa Ahupua‘a contained important locations that were occupied both in the long and short-terms, and an outline of O‘ahu’s overall prehistory and history highlights the unique characteristics of Kawailoa Ahupua‘a.

A Brief Overview of Hawaiian Settlement

A critical review of radiocarbon dates from the windward coast of O‘ahu suggest that significant settlement may not have begun until A.D. 1000, with a steady and rapid expansion up until the time of Western contact (A.D. 1778) (Kirch 2010; c.f. Stride et al. 2003). Settlement likely occurred from the Marquesas and Society Islands (Emory in Tatar 1982:16-18). In these times, Hawai‘i’s inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy and Handy 1972:287). The Settlement Period was a time of great exploitation and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order. Order was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1969), the Hawaiians brought from their homeland certain universal Polynesian customs: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *‘aumakua* concept; and various beliefs, including the concept of *mana*.

Following initial settlement, communities in O‘ahu were clustered along the shores which offered sheltered bays from which deep sea fisheries could be easily accessed. The near shore fisheries and coastal fishponds, which were enriched by nutrients carried in the fresh water, also offered opportunities for resource extraction and stewardship. It was in these coastal areas that clusters of houses were found, and where agricultural production first became established. Over a period of several centuries, these areas became populated and perhaps even crowded, and inland elevations began to be used for agriculture and some habitation. Taro would have been the dominant crop in this area with sweet potatoes planted only as a supplement for it (Handy and Handy 1972:282-283). Other crops grown in this area would have included *wauke*, *noni*, gourds, sugarcane, *‘awa*, breadfruit, bananas, coconuts, and *ti* (Stride et al. 2003).

The period between A.D. 1400–1650 was characterized by increased social stratification, major socioeconomic changes, and intensive land modification (see Kirch 1985). Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. The concept of the *ahupua‘a* was established during this period (Kirch 1985). This land unit became the equivalent of a local community, with its own social, economic, and political significance. *Ahupua'a* were ruled by *ali‘i ‘ai ahupua‘a* or lesser chiefs; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land, which was managed by a *konohiki*. *Ahupua‘a* were usually wedge or pie-shaped, incorporating all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base (Hommon 1986).

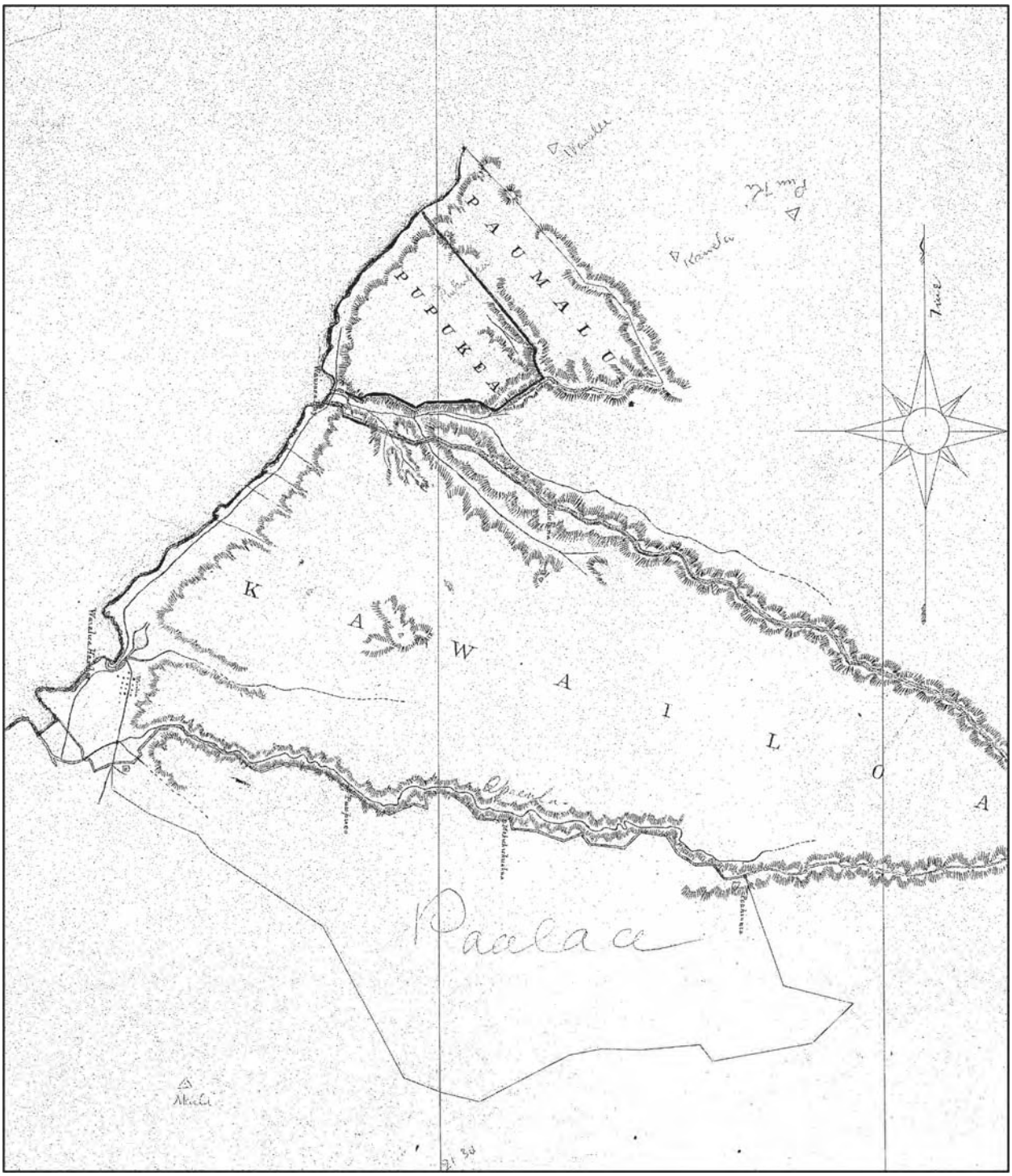

Figure 25. Portion of Hawai‘i Registered Map No. 320 dated 1876.

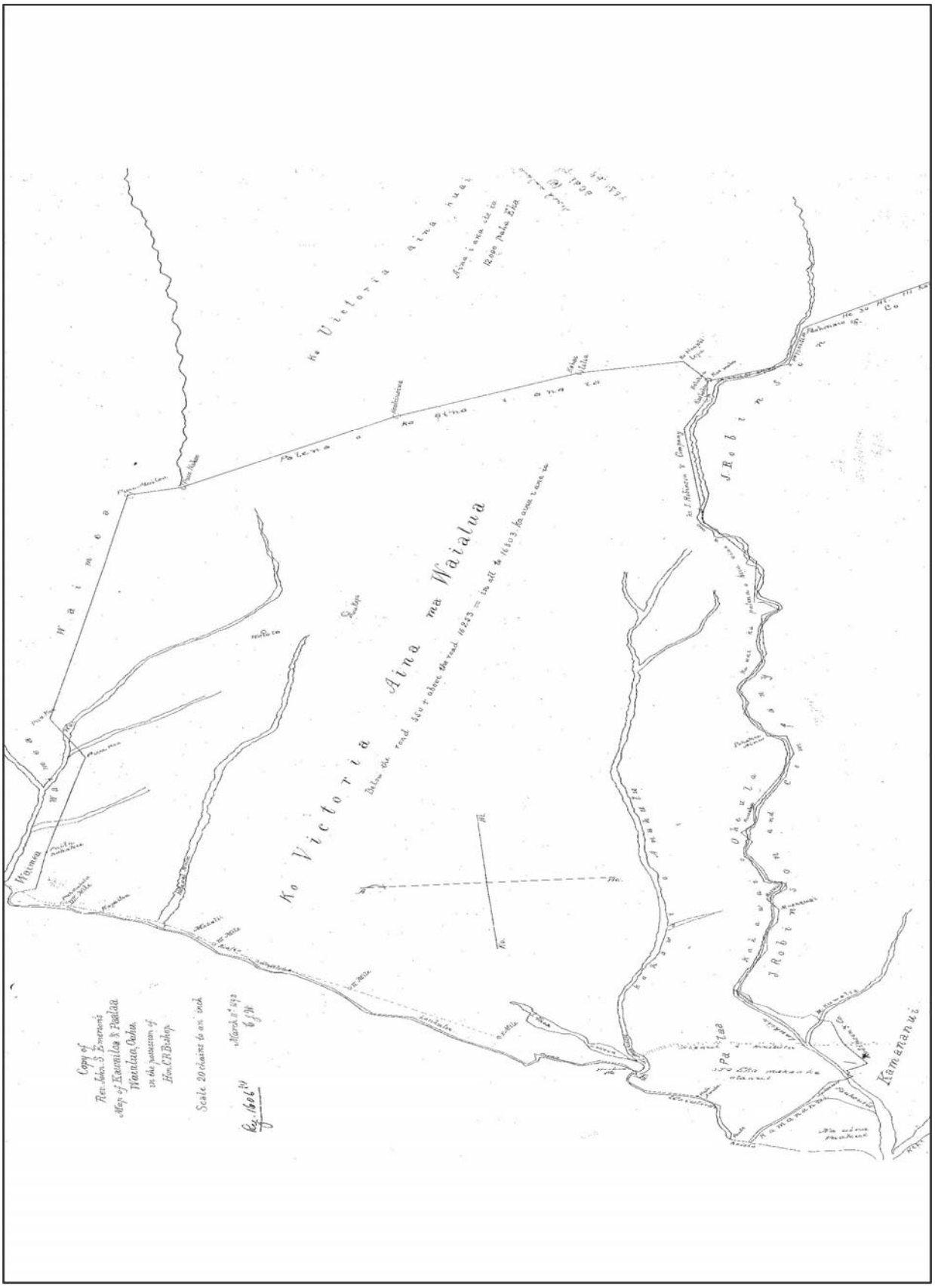

Figure 26. Portion of Hawai‘i Registered Map No. 1606 prepared by J. S. Emerson in 1892.

The *aliʻi* and the *makaʻāinana* (commoners) were not confined to the boundaries of the *ahupuaʻa*; when there was a perceived need, they also shared with their neighbor *ahupuaʻa ʻohana*. The *ahupuaʻa* was further divided into smaller sections such as the *ʻili*, *moʻoʻaina*, *paukuʻaina*, *kihapai*, *koele*, *hakuone*, and *kuakua* (Hommon 1986, Pogue 1978). The chiefs of these land units gave their allegiance to a territorial chief or *moʻī* (king). *Heiau* building flourished during this period as religion became more embedded in a sociopolitical climate of territorial competition. Monumental architecture, such as *heiau*, "played a key role as visual markers of chiefly dominance" (Kirch 1990:206).

The *aliʻi-ʻai-ahupuaʻa* was subject to an *aliʻi ʻai moku* (chief who claimed the abundance of the entire district). Accordingly, *ahupuaʻa* resources supported not only the *makaʻāinana* and *ʻohana*, who lived on the land, but also contributed to the support of the royalty. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resources management planning. In this system, the land provided fruits and vegetables and some meat in the diet, and the ocean provided a wealth of protein resources. Also, in communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in procurement of marine resources) came to be strictly adhered to. It is in the general cultural setting outlined above, that we find the *ahupuaʻa* of Kawailoa at the time of European contact.

Indigenous Accounts of Kawailoa and Neighboring Ahupuaʻa

The current study area is located in the *ahupuaʻa* of Kawailoa, District of Waialua, Island of Oʻahu. Kawailoa is a large *ahupuaʻa* that occupies the northwestern corner of Oʻahu, stretching from the ocean to the Koʻolau mountains. It includes coastal areas rich in fish, a fertile coastal plain, and prominent river valleys (the coastal plain and river valleys are mostly *mauka* of the present day Kamehameha Highway) with numerous rivers, wetlands, and ponds. ʻUkoʻa and Lokoʻea are two well-known ponds located on the coastal flats *makai* (southwest) of the project area. A low escarpment juts up above the coastal flats *mauka* of the ponds and increases in height northwards in the direction of Waimea Bay, where it becomes a sizeable rock cliff with numerous caves. *Mauka* of this basalt ridge, dissected tablelands rise gently toward the Koʻolau mountain range, the ridge line of which serves as a border with the neighboring district of Koʻolau Loa.

Kawailoa Ahupuaʻa, and many of the places named within it, have traditional legends and historical accounts associated with them. The Waimea River valley to the north and the ʻUkoʻa pond to the southwest of the project area are particularly associated with legends. The prolific legends most likely relate to this area's long-standing association with very old lines of prominent priests on Oʻahu. Whereas the story of the Waimea River valley is one based mainly on accounts of the royalty and priestly class, that of the Anahulu River valley to the south is one based primarily on archaeological remains and mid-eighteenth century historical documents. This does not imply, however, that no archaeology or historical documentary research has been done in the Waimea area or that no traditional accounts exist for the Anahulu area. The following discussion starts with a broad historical background of the Waimea area (north of the project area) before moving to the record that exists for the Anahulu River valley and areas farther west and south.

In the legends of the *aliʻi*, the Waimea area is connected originally with the Pāʻao class of *kahuna*. A pig-like deity, known as Kamapuaʻa, first gave the Waimea lands to a *kahuna*, known as Lono-a-wohi (Kamakau 1961:230-231). Later on, a certain Kahi-ʻula and the older brothers of a certain Kanauaʻa, gave the land to the Pāʻao *kahuna* of the area in perpetuity. However, with the reign of Chief Kahahana, the lands went to the *kahunanui* who were selected by Kahekili in 1783 and later by Kamehameha in 1795. Following King Kamehameha's conquest of Oʻahu Island, he gave Waimea to his own high priest, Hewahewa. Hewahewa was the only priest to practice at the Waimea *heiau* who came from outside the area. He was also the last high priest of the Hawaiian kingdom (Mitchell 1986:8).

By the seventeenth century, King Kualiʻi asserted his power over the priests at Waimea as part of his successful campaign to unify the entire Island of Oʻahu. Following unification, Kualiʻi continued to rule with the aid of the *kahunanui*. *Kalaimoku* was a special category of *kahunanui* that advised chiefs concerning secular matters. A well-known *kalaimoku* from Waimea, known as Kaepulupulu, became a prominent adviser to powerful rulers, first to Chief Kamahana and later to Chief Kahahana from the Island of Maui. However, the prophetic abilities of the charismatic Kaepulupulu lead to his fall-out with both these corrupt chiefs; by 1773 Chief Kamahana was removed in a bloodless coup, while later on the new Chief Kahahana had Kaepulupulu executed (Fornander, II 1969:129). During all this political intrigue that affected the entire Island of Oʻahu, Kaopulupulu officiated at both of the prominent *heiau* at Waimea; one being Puʻu o Mahuka on a high bluff north of where the river enters the ocean and the other being Kupopolo near the beach south of the river mouth (Takemoto 1974:5).

Of the two *heiau*, more orally-transmitted information is available for the massive Puʻu o Mahuka than for the smaller Kupopolo. Bingham (McAllister 1933:148) recorded a tradition that huge fires lit on an altar at PuuʻOʻMahuka can be seen as far as the Island of Kauai. The same tradition also claims that this *heiau* was the birthplace of prominent *aliʻi*. It is said that the much smaller Kupopolo Heiau, like Puʻu o Mahuka, was used for human sacrifices, among other activities (Cluff 1968).

Considering that many stories centered on fishing in the adjacent ocean, many of them mentioning the fishing deity Kaneaukai, it is conceivable that at least some sacrifices at Kupopolo Heiau related to fishing deities. There are two stones, one on each bluff above Waimea Bay, named after fishing deities known as Ku and Ahuena (McAllister 1933:150). Being variations around a common theme, the stories related to Kaneaukai, Ku, and Ahuena, all mention fishermen either dreaming of or actually netting a stone from the nearby ocean. In exchange for offerings of *ʻawa* and/or pigs to the stones, the stones reciprocated by ensuring that the fishermen, including commoners and priests, will be successful in their acquisition of fish (see selected stories in Takemoto 1974:18, 22-27, 29-32, 41). Whereas fish from the ocean supplied life to those working the land, shrines, or *koʻa*, were constructed on land to increase the number of fish in the ocean. Being located at the transition between fertile agricultural soils within the Waimea Valley and rich fishing waters of Waimea Bay, the *heiau* and *koʻa* were physical expressions of the reciprocal relationship between the land, sea, and the Hawaiians.

Numerous caves within the high cliffs that separate the bluff-sides of Waimea Valley from the ocean below contained human remains and associated burial goods, including canoes and *tapa* cloth (Takemoto 1974:38-40). The sea-side cliffs marked the line of transition between the land of the living and the land of the dead, the latter being the ocean, also known as *Pō*. The fertile soils of the valley and the water of the river could be modified through human action to form cultivatable terraces and irrigation channels. Prior to the arrival of Europeans to the area, the valley was known for its taro, sweet potatoes, *ʻawa*, and breadfruit. Following his visit to the Waimea River Valley, McAllister (1933:147) reported the remains of agricultural terraces on both sides of the river for up to a distance of two miles inland from the bay. Irrigation ditches and numerous habitation enclosures support Historic Period observations that the valley around Waimea Bay was once heavily populated. Based on claims made to the Land Commission in the mid-nineteenth century, most of the *kuleana* were within the level bottomlands, not far from the coast, although a few occurred near the elevated tablelands over a mile inland from Waimea Bay (Handy and Handy 1972:463).

The narrow coastal plain at Waimea Bay, around 250 meters wide, broadens to approximately 1.5 kilometers wide farther south behind Waialua Bay. According to the records of Thrum (1906) and McAllister (1933), the broader and flatter landscape around Waialua Bay was marked by ponds, irrigated pond fields, irrigation ditches, various *heiau*, and *akua* stones (Kirch 1992:18). Indigenous Hawaiian accounts mention a lizard-like female deity, known as Laniwahine, that used to dwell in the ʻUkoʻa pond. The pond was her "long house," connected to the ocean via a narrow tunnel.

Farther south, in Kaiaka Bay, a prominent legendary *heiau*, known as Kapukapuakea, was reputedly the place where high priests inaugurated Maʻilikūkahi as paramount chief over the area. If Waimea Bay is primarily remembered for its line of indigenous priests, Waialua Bay is known for its line of indigenous chiefs. Traditional orally transmitted accounts from the Waialua area claim that the Kapukapuakea Heiau was constructed by *menehune*, the little people of legend (Sahlins 1992:21). Normally seen in visions and dreams, these imaginary people were believed to have built numerous other monumental structures on Oʻahu and neighboring islands within the Hawaiʻi Archipelago.

It was in the highlands southeast of Waialua that the original and indigenous Nanaulu line of chiefs (from which Chief Maʻilikūkahi was an early one), is believed to have been born. On the watershed near the present-day Schofield military base, was the Kūkaniloko temple, a place that contained a sacred birth stone against which royal women gave birth to future chiefs (Sahlins 1992:23). The line of indigenous chiefs came to an end when King Kahekili from Maui killed Chief Elani of Waialua at Puaʻena Point on the northern edge of Waialua Bay (Sahlins 1992:25). The new rulers from the Windward Islands, such as Kahekili and later Kamehameha, continued to use the places sacred to the indigenous population in their ceremonies, including the *heiau* in the vicinity of Waialua and Waimea bays.

Historical and Archaeological Accounts of Kawailoa and Neighboring Ahupuaʻa

Soon after going ashore at Waimea Bay in 1779, Captain Clerke walked up the Waimea River valley, which he described as "well cultivated and full of villages" (Kuykendall 1938:12-20). When the crew of Captain Vancouver went ashore at Waimea Bay to replenish their water supply in 1792, they allegedly saw an "amphitheater, with hamlets, trees, and plantations" (Brigham 1849: 295). According to local oral traditions, the bodies of two of the crew members of Vancouver's, who were killed by Waimea Bay inhabitants, were taken to Puʻu o Mahuka Heiau where they were burned and de-boned (Thrum 1912). The chief at Waimea at the time of this incident was the warrior priest Koi.

Roughly 1.5 miles southwest of Waimea Bay are the well-known fish ponds of ʻUkoʻa and Lokoʻea. Unlike the fairly densely populated Waimea Bay area, the ponds, being located nearby to Waialua Bay, had no prominent habitation sites associated with them (Athens et al. 1995:21). Two separate boulders on the nearby coastline are the closest archaeologically recorded sites; one was used to block the mouth of the Anahulu River and the other was believed to possess curative powers. Moore et al. (1993:70) found three isolated fire pits at the Haleʻiwa Beach Park, the charcoal radiocarbon dates averaging to the mid-sixteenth century. This post-dates, by roughly six centuries, charcoal evidence from ʻUkoʻa, pond for initial human clearing of the surrounding indigenous coastal forests (Athens et al. 1995:iii). Fish, ducks, and bulrushes used to be abundant within ʻUkoʻa pond. Although it contained abundant fish, there is no mention in the historical record or any archaeological evidence that the pond was ever enhanced or modified through the construction of walls, gates, or canals (see discussion in Athens et al. 1995). Historic sources dating back to 1815 describe ʻUkoʻa pond as the property of the *aliʻi*; fish could only be taken out with the local chief's permission (Athens et al. 1995:23-24). However, Land Commission Award documents suggest that by the time of the *Māhele* in 1848, royal control over fishing rights in the pond were virtually non-existent. At this time, the *makai* edge of the pond contained seven small house sites and communally cultivated sweet potato plots (Athens et al. 1995:26). Four households made claim to aquatic resources in the pond, which included goby, surgeon, mullet, fresh water shrimp, and seaweed.

Generally speaking, the coastal lands southwest of the project area and southeast of Waimea Bay were occupied by houses, occasional fishponds, and small cultivation plots containing taro and sweet potato (e.g., Pfeffer and Hammatt 1992:27). *Mauka* of the coastal plain, irrigated taro fields were created in the bottoms of river valleys, such as those within the Anahulu River valley. Higher up the valley slopes were hillside, or *kula*, cultivation of crops and trees. Isolated pockets of planted areas occurred even higher up in the narrower confines of the valleys and their numerous tributaries. Families owned plots in these different zones so that they could utilize the diverse resources. At the very high end of the river valleys, Hawaiians collected a variety of wild plants and hunted birds.

Kirch (1992) originally suggested that it is only after the armed forces of Kamehameha I permanently occupied Oʻahu in 1804 that the interior of the Anahulu River valley became used and modified more intensively, which included the construction of irrigation canals and terraced fields for as much as three miles up the valley that had up until then only experienced low-intensity cultivation and resource extraction. However, in a more recent reevaluation of dates and sites in Anahulu valley (Dega and Kirch 2002), it is suggested that during the late A.D. 1700s the upper portions of Anahulu valley were abandoned and the middle and lower portions of the valley were the loci of agricultural and residential activity.

By 1810, some 20 years after sandalwood was first exploited on the Hawaiian Islands, King Kamehameha I, and subsequently various powerful chiefs, gained monopoly over the sandalwood trade. Judging from historical documents, people living in the Waialua area were known for cutting sandalwood in the interior mountain forests. In a scramble to obtain foreign goods, chiefs in the area had commoners work very hard to cut and transport the sandalwood to the coast (Kirch 1985:314). Preoccupation with sandalwood extraction resulted in the abandonment of several residential homesteads in the upper Anahulu valley. The return of Kamehameha I with his court to Hawaiʻi Island in 1812 lead to additional abandonment; by 1820 the upper valley was almost deserted.

With the complete collapse of the sandalwood trade in 1829, chiefs who accumulated debt fell back to an earlier strategy of supplying provisions and other materials, such as *wauke* bark for caulking, to visiting ships, especially whalers (Kirch 1985:314). In the early 1830s the *konohiki* in the Waialua area gave land to cultivators with the aim of once again increasing the agricultural output of the area. Archaeological evidence suggests that previously abandoned terraces and canals were re-used and re-arranged to accommodate the newly placed cultivators. Taro, yams, bark cloth, and sweet potatoes were important products aimed to supply ships.

A variety of stone features have been identified on the colluvial and talus slopes of the Anahulu valley uplands. Among these are stone piles, stone walls, stone-lined planting circles, small stone-walled garden plots, and terraces cleared of talus. Judging from *Māhele* documents, these features were probably related to the growing of sweet potato, paper mulberry, yam, and banana (Kirch 1992:174). Handy and Handy (1972:86) maintain that the dry gulches between Anahulu and Waimea Rivers (those within the project area) probably never watered taro.

It is likely that cultivators within the Anahulu valley used the rich tablelands on both sides for shifting cultivation even prior to the settlement of Europeans in the area. In *Māhele* land claims, for example, some of the upper valley claimants refer to swidden-like garden plots in the flat portions of mountains, which could refer to the surrounding tablelands (Kirch 1992:23). Moreover, maps of land claims in upper portion of the valley, known as Kawailoa-uka, show winding trails connecting valley bottom residences and terraced fields with tableland top ridge spurs (Kirch 1992:51). By 1832 missionaries were operating from near the mouth of the Anahulu River. The increased influence and presence of European ideas and material culture is testified by recovery of glass bottles, musket balls, and iron tools from excavations from the inland house sites (Kirch 1985:314).

The *Māhele* of 1848 marked irreversible changes in the make-up of the traditional Hawaiian political-economy. By the middle of the nineteenth century the ever-growing population of Westerners forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership, and the *Māhele* became the vehicle for determining ownership of native lands. During the *Māhele*, land interests of the King (Kamehameha III), the high-ranking chiefs, and the low-ranking chiefs, the *konohiki*, were defined. The chiefs and *konohiki* were required to present their claims to the Land Commission to receive awards for lands provided to them by Kamehameha III. They were also required to provide commutations to the government in order to receive royal patents on their awards. The lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission (Chinen 1961:13). During the *Māhele* all lands were placed in one of three categories: Crown lands (for the occupant of the throne), Government lands, and *konohiki* lands. All three types of land were subject to the rights of the native tenants therein, who could make claims for property they occupied and/or farmed. The native tenant awarded lots are referred to as *kuleana* parcels.

As a result of the *Māhele*, Kawailoa Ahupua‘a was a *konohiki* award to Victoria Kamamalu as Land Commission Award (LCAw.) # 7713:33, thus ownership eventually fell to the Bishop Estate (now Kamehameha Schools). According to the Waihona ‘Aina database, there were ninety-five *kuleana* claims made for Kawailoa Ahupua‘a. Most of these were for land southwest of the project area and in Anahulu Valley (Figure 27), however five small *kuleana* parcels (LCAw. # 2727, TMK: (1) 6-2-02:002; LCAw. # 10364:2, TMK: (1) 6-1-05:020; LCAw. # 8419:1, TMK: (1) 6-1-05:021; LCAw. # 7417:1, TMK: (1) 6-1-05:022, LCAw. # 7169, TMK: (1) 6-2-02:3 (por.) (see Figure 2) are located along Cane Haul Road *makai* (west) of the study area. All five of these *kuleana* were house lots obtained during the time of Kamehameha I (post 1795). The locations of all five of these lots afforded the residents access to fishpond resources as well as *kula* planting areas.

The change from a labor-based barter system to one based on taxes and money accompanied the division of land during the *Māhele*. The formerly close socio-economic ties between the *ali‘i* and the *maka‘āinana*, that revolved around land rights and tribute, rapidly dissolved. The *maka‘āinana* cultivators increasingly entered the cash economy to pay taxes and meet other obligations. This disintegration of the traditional socio-economic fabric is reflected by the abandonment of house sites, terraced plots, and irrigation ditches in the middle and upper Anahulu valley by 1890.

The fact that the project area has been used for a variety of purposes, including pasture for cattle, becomes evident when historical records are reviewed. Whereas pigs, dogs, and fowl were the main supply of meat for Hawaiians, cattle were brought to the islands in 1798 to supply visiting whaling ships with meat. During the 1830s and 1840s, numerous cattle herds grazed the uplands of the Waialua District (Wyllie 1848:23), most belonging to Robinson and Company. Cattle became a scourge by 1845, damaging houses and garden plots within the Anahulu River valley and degrading indigenous plant life on the adjacent tablelands (Kirch 1992:169).

If the history of the coastal areas of Waimea Bay and Waialua Bay focus on priests and rulers, that of the Anahulu Valley concerns commoners. The *Māhele*-era records show that many of the *maka‘āinana* cultivators were awarded core taro lands within their ancestral estates, the Land Commission generally did not consider the commoners’ dispersed dry land plots (*kula*) or their swidden garden sites (‘*okipū*). This loss of “peripheral” land holdings following the *Māhele* was exacerbated by the emergence of a cash-based economy. Commoner land owners now had to pay cash for land surveys, annual taxes, and implements. It is accordingly not surprising that commoner households in the middle and upper Anahulu valley faded during the 1860-80s (Kirch 1992:167). Most indigenous Hawaiians did not stay on the land after 1900. Intermittent, but severe floods, such as those that occurred in 1894 and 1898, wiped out numerous features in the lower river valleys, particularly above Waimea Bay (Takemoto 1974:12-13).

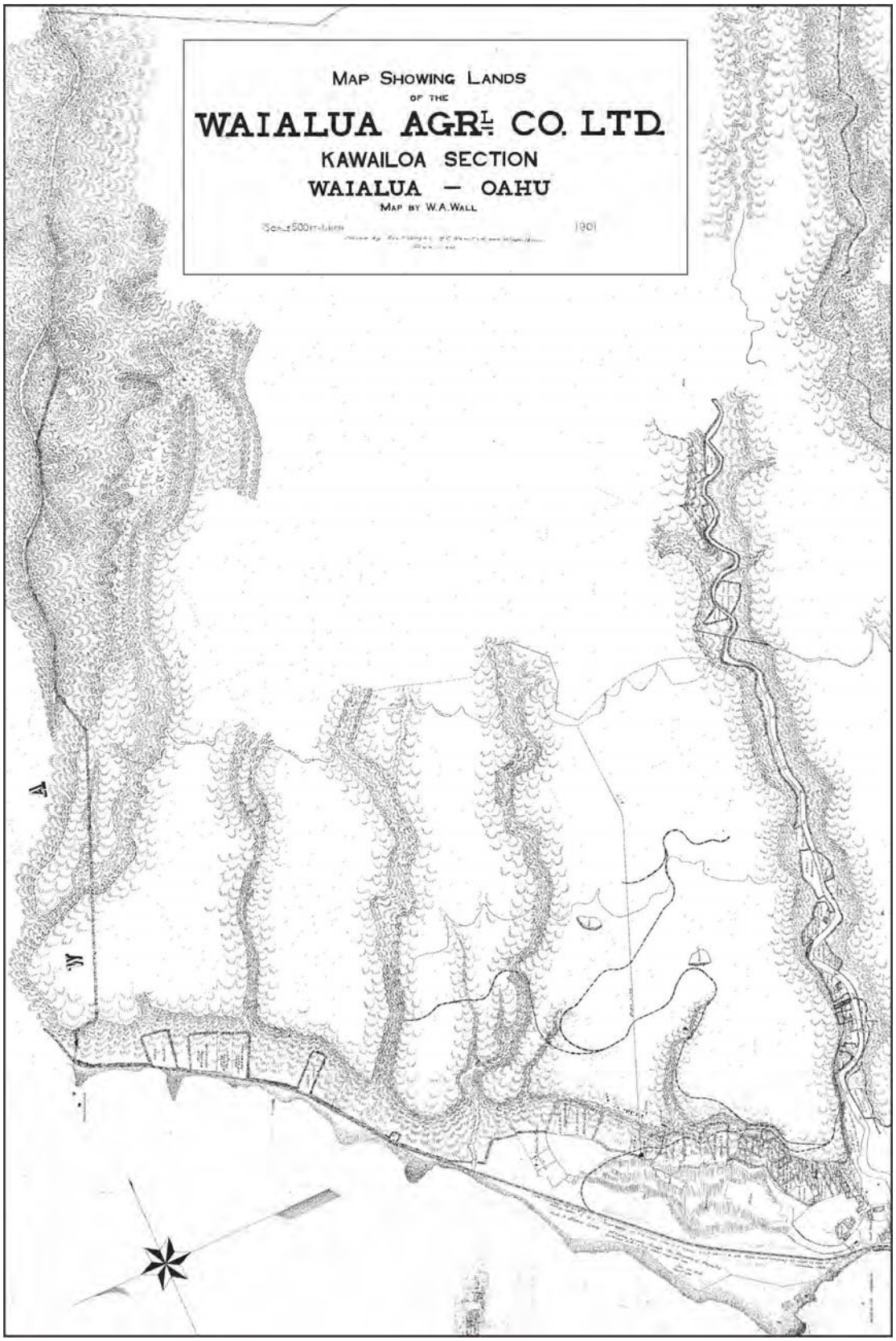

Figure 27. Portion of 1901 Hawaii Registered Map No. 2054 showing the *kuleana* parcels and the plantation infrastructure in the vicinity of the current project area.

The Sugar Era in Kawailoa Ahupua‘a

A Chinese merchant is credited with the first making of sugar in the Hawaiian Islands in 1802 (Deerr 1949). The first sugarcane milled in the Waialua area dates to ca. 1840 and the missionary Rev. John Emerson, who set up a small mill powered by horses that made sugar and molasses for the natives on shares (Kuykendall 1938). The first commercially grown sugar in Waialua can be traced back to the Levi and Chamberlain Sugar Company in ca. 1865 (Wilcox 1996). In 1875, the sugar plantation at Waialua was purchased by R. Halstead and Gordon, and later owned by the Halstead brothers. In 1898 when the O‘ahu Railway and Land Company’s (O. R & L. Co.) railroad reached the Halstead brother’s plantation at Waialua, the small mill did not produce much freight and large tracts of the surrounding land remained uncultivated (Dorrance and Morgan 2000). Benjamin Dillingham, who founded the O. R & L. Co., encouraged Castle & Cooke to purchase the Halstead brother’s plantation. In that same year, Castle & Cooke formed the Waialua Agricultural (later changed to Sugar) Company primarily on lands leased from the Bishop Estate and Dillingham (Dorrance and Morgan 2000). Castle & Cooke hired William Goodale from the Onomea Plantation on Hawai‘i Island as the first plantation manager.

Goodale described the plantation's humble beginnings in his final report as manager, writing that, “at the time Waialua Agricultural Co., Ltd., was organized in October, 1898, it took over the old Halstead Plantation with about 600 acres of cane, certain leases of large tracts of unimproved land covered with lantana and stones, several hundred acres of rice and ranch land, a small mill, one five million gallon pumping station, no reservoirs or railroads, one small set of steam plows and other equipment of a small plantation” (Goodale in Clark 2007:57). Early in the plantation’s history sugarcane did not extend higher than the 200-foot contour above sea level.

In the first years of ownership, Castle & Cooke expanded the acreage of the plantation, built a new mill, put in a railway system, and developed a reliable water supply, utilizing both ground and surface water (see Figure 27). The strategy resulted in sugar yields increasing from 5,000 tons in 1900 to nearly 20,000 tons in 1905 (Wilcox 1996). The northern portion of the project area was part of the plantation’s Waimea fields, and the southern portion was part of the plantation’s Kawailoa fields. A 1901 map of the Waialua Agricultural Company’s lands in Kawailoa (Hawaii Registered Map No. 2054B; see Figure 27) shows ditches paralleling the 300-foot and 500-foot contours, a railway extending from the main O. R & L. Co. line along the coast into the Kawailoa fields, a collection of buildings and water tanks (an early plantation camp) located above the *pali* and along the railroad tracks in the vicinity of Kawailoa Road, a pump house (Pump # 4) with a waterline running to the upper ditch line (following Kawailoa Road), and two reservoirs.

Above the sugarcane fields in Kawailoa pineapples were grown, and below the *pali*, in the swampy areas surrounding ‘Uko‘a Pond, rice was grown. The sugar and pineapple companies modified and utilized most of the land within the project area, clearing original vegetation, leveling original landforms, digging ditches, constructing reservoir walls, and building roads and railroads. Substantial amounts of foreign laborers (mostly Chinese, Filipino, and Japanese) were imported to work the fields, with labor camps dotting the landscape (e.g., Pfeffer and Hammatt 1992:36). Many of the *mauka* lands were leased to the Hawaiian Pineapple Company, which was founded by James Dole in 1901. The Waialua Agricultural Co. and Hawaiian Pineapple Co. operated in such close proximity to one another that the field boundaries often changed. Castle & Cooke purchased a 21% share of the pineapple company in 1932, and the entire company in 1961. The name of the company was changed to Dole Food Company, Inc. in 1991.

Waialua Agricultural Company had the largest water storage capacity in Hawai‘i, and arguably the most efficient irrigation system. The distribution system was especially flexible with interconnected ditches that allowed water to be sent to any part of the plantation (Wilcox 1996). The Waialua Agricultural Company also had steam and electric powered pumping stations that sent groundwater from wells in the lower elevations of the plantation to the ditches in the upper elevations (Wilcox 1996). Developed between 1902 and 1911, the plantation had four surface water collection systems — the Wahiawa, Helemano, Opaeula, and Kamananui systems. The lower fields in the vicinity of the current project area were initially watered by Pump # 4 and the Opaeula ditch system, but were later watered by the Kamananui ditch system. The Opaeula Ditch, which carried water from the tree main tributaries of the Anahulu River (Kawainui, Opaeula, and Kawaiiki Streams) to the Opaeula and lower Kawailoa fields, was completed in 1903. Construction of the Kamananui Ditch, which tapped Kawainui Stream at a higher elevation and carried water to the lower Waimea and upper Kawailoa fields, began in 1903, but was not completed until 1911 (Goodale 1911, 1912).

On February 3, 1911, in the Waialua Agricultural Co. annual report for the year 1910, W. W. Goodale, reported that:

> [Kamananui Ditch], referred to in the Annual reports of the years 1902, 1904 and 1909, was commenced in 1903, but abandoned in 1904. At that time 1,068 feet of tunnels had been excavated. On June 10, 1910 we began work again and have carried it on as rapidly as possible since that time.
>
> The ditch will deliver the water of the Kamananui stream at a point at a point 669 feet above sea level on the upper lands of Kawailoa and on the line of the ditch that crosses the plantation carrying the water from the Wahiawa reservoir.
>
> The ditch is 20, 175.5 feet long, with 17,852.5 feet of tunnels, 325 feet of flume and 1,998 feet of open ditch.
>
> On December 31, 1910, 13,832.5 feet of total length, had been completed leaving 6,343 feet unfinished. The entire cost of the work will be about $69,628.00, of which amount $35,561.00 had been paid on December 31, 1910. Water should be running in the ditch on or about May 1, 1911. (Goodale 1911:4)

The Kamananui Ditch was actually completed on December 7, 1911 at a total cost of $76,963.81. From the outset it carried an average of 2,188,471 gallons of water a day to the Kawailoa fields (Goodale 1912). For the year 1910, it was reported that "the Opaeula Ditch system delivered during the year 2,112,401438 gallons of water, used entirely on Kawailoa" (Goodale 1911:4). The Kamananui ditch system was redesigned and realigned in the mid-1920s to increase its water carrying capacity and to allow it to function independent of the Opaeula ditch system (Wilcox 1996). Due to the innovative efforts of Goodale, a self-propelled drag-line excavator was digging new ditches by 1920. The same machine could also lift harvested cane bundles onto railway cars in the field (Dorrance and Morgan 2000).

When William Goodale retired in 1923, after 25 years as the plantation's manager, he summarized the growth of the Waialua Agricultural Company in the annual report for that year, writing "we now have 70 million gallons per day pumping capacity, 30 miles of permanent railway, the Wahiawā reservoir, capacity 2,540,000 gallons, and 33 other reservoirs, ditches to bring the water to Poanoho, Halemano, Opaeula, Kawaiiki, Kamananui and Waimea gulches, a good mill, six locomotives, cane cars, six plow engines and plows, tractors, trucks, buildings, and about 9,000 acres of cane" (Goodale in Clark 2007:57-58). Goodale had also installed a 450-kilowatt hydroelectric plant in the uplands of Kawailoa that supplied not only plantation's needs, but when excess energy was produced, it was sold to the Hawaiian Electric Co. (Dorrance and Morgan 2000). Goodale's management had made the Waialua plantation one of the most productive in the Hawaiian Islands. In 1925, shortly after his retirement, sugar production had grown to 32,585 tons annually (Dorrance and Morgan 2000).

A 1924 Hawai'i Territory Survey map of the Kawailoa Forest Reserve prepared by C. Murray (HTS Plat 2069; Figure 28) shows the upper limits of the sugarcane fields near the 650-foot contour in the Kawailoa fields and the 400-foot contour in the Waimea fields. The upper Waimea and Kawailoa fields in the northern section of the plantation are shown as planted in pineapples and the upper fields in the southern section of the Kawailoa tablelands (along the Kawailoa Road Corridor) are shown as a eucalyptus forest. Eucalyptus was first introduced from Australia by the Waialua Agricultural Company in the late nineteenth century to counteract deforestation and erosion caused by cattle (Kirch 1992:169). Eucalyptus and other trees were also planted by the plantation as sources of lumber, fencing, and firewood (Goodale 1911, 1912). Portions of the project area roads appear on the HTS Plat 2069 map (see Figure 28) including Ashley Road, which closely matches its current alignment, and Mid-Line Road, which is present to the first crossroad near the 440-foot contour.

Plantation camps were spread across the company's lands to allow workers to walk to the fields. Three camps are shown to the southwest of the current project area on the 1924 map (see Figure 28). The largest camp is shown in the Kawailoa section of the plantation between Mid-Line Road and Ashley Road along a spur of the Waialua Plantation Railroad (see Figure 28). This camp is not shown on the 1901 map of the Waialua Agricultural Company's Kawailoa Lands (see Figure 27). Other camp buildings, part of (what would eventually become known as) the Kawailoa Japanese Camp, are shown to the south of the larger camp in the bend of another spur of the Waialua Plantation Railroad (near Kawailoa Drive). The camp buildings in this area are located inland of the buildings depicted on the 1901 map. More camp buildings are shown to the east of the Kawailoa Japanese Camp along the same railroad spur.

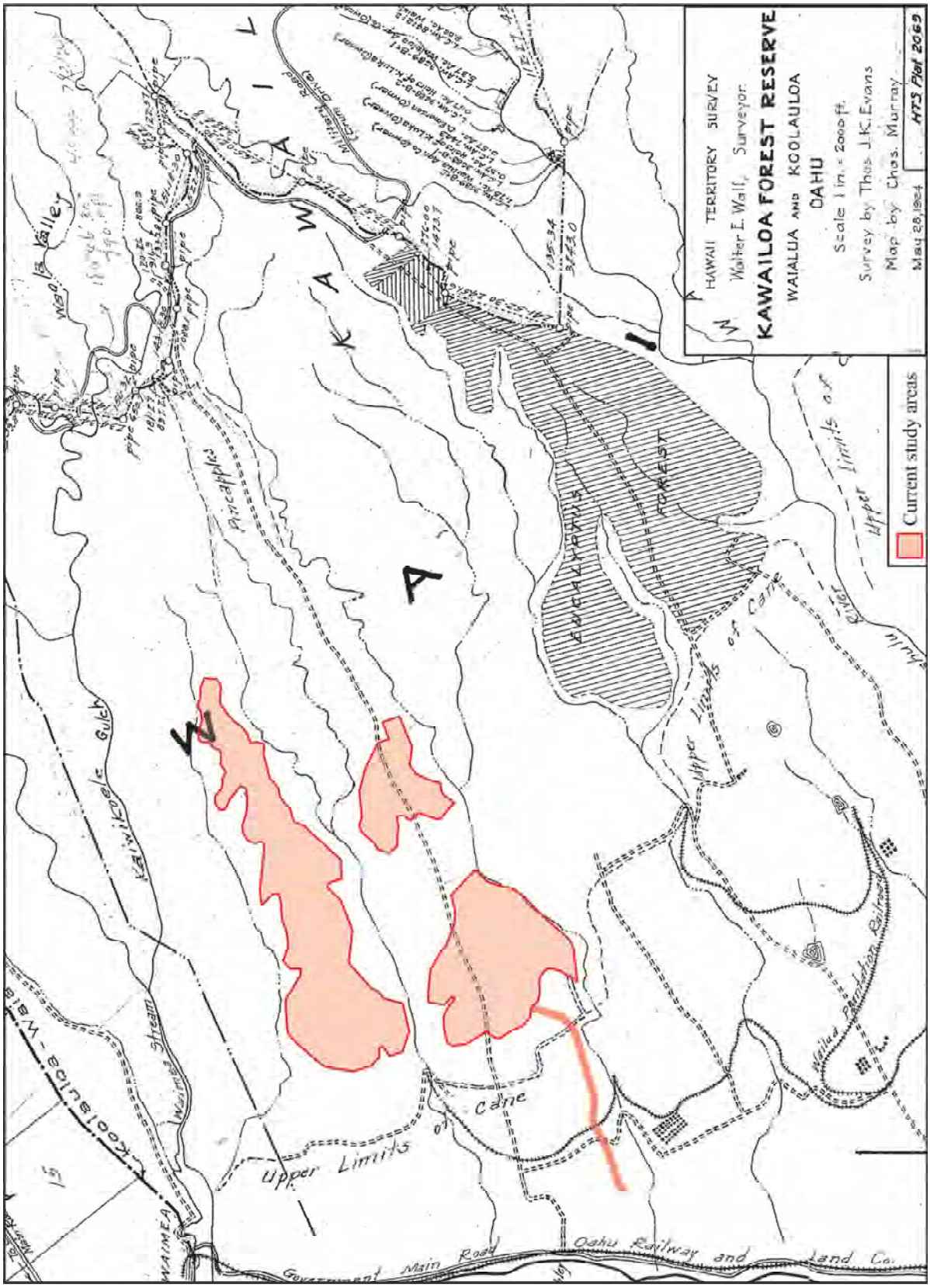

Figure 28. 1924 Hawai'i Territory Survey map of the Kawailoa Forest Reserve prepared by C. Murray (HTS Plat 2069) showing

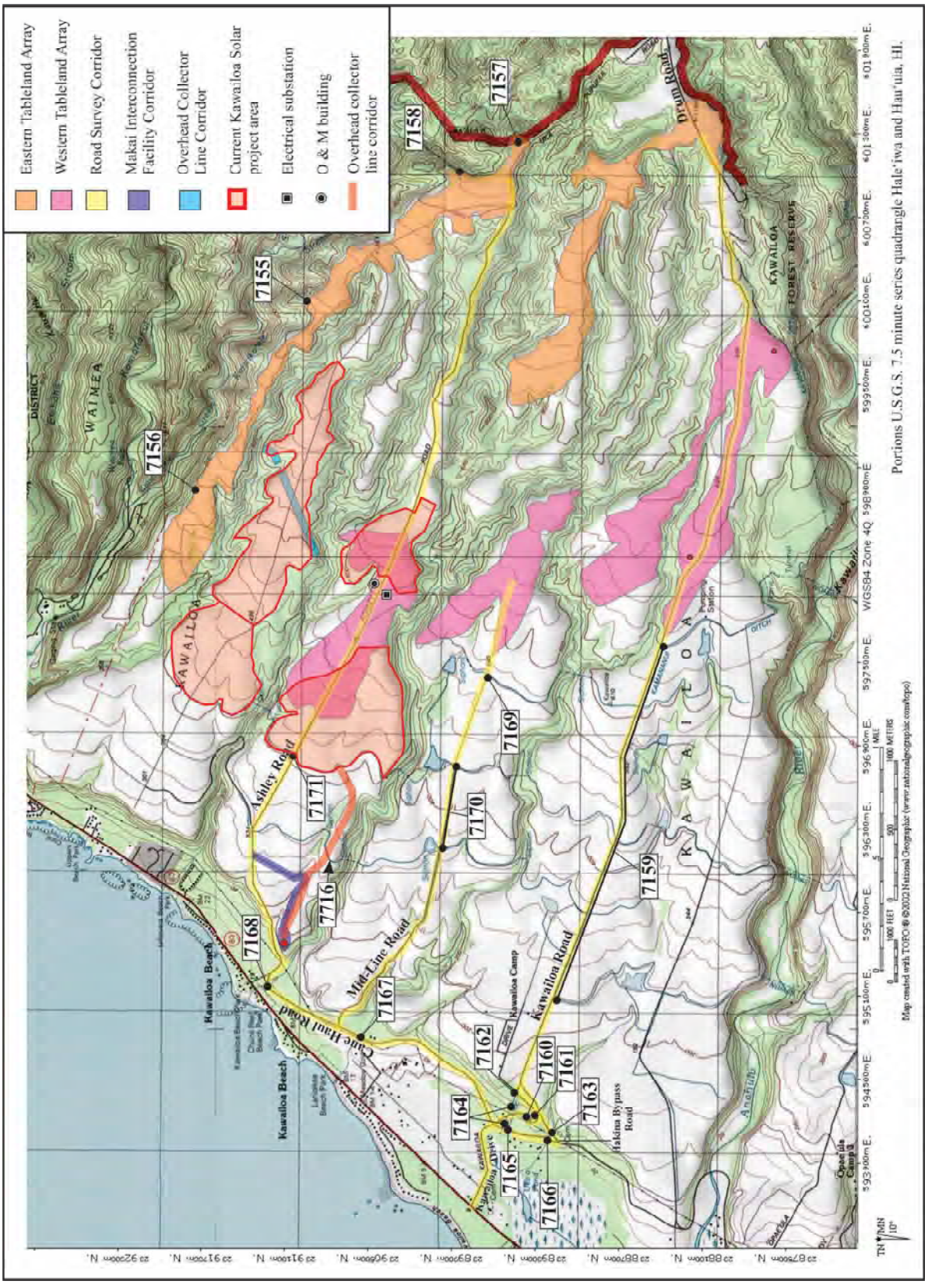

Figure 31. Rechtman et al. (2011) site location map showing the current project area.

the O. R & L. Co. railroad (north of Kawailoa Drive), consisted of four 8-inch railway guns with alternate firing positions, a projectile weight of 260 lbs. and a maximum range of 21,000 yds., and two 155mm GPF guns with a projectile weight of 96 lbs and a maximum range of 17,400 yds. that were added in 1944. Battery Ashley, located near Kawailoa Beach and Ashley Road, consisted of four 155mm GPF guns on Panama Mounts with a projectile weight of 96 lbs. and a maximum range of 17,400 yds. Battery Kawailoa, located near Kawailoa Camp (north of the Kawailoa Road), also contained four 155mm GPF guns on Panama Mounts, four buildings that made up Fire Control Station "T" of O'ahu's command and fire control cable system, and after 1941 a mobile SCR-270 radar station (Bennett 2002).

The Waimea Military Reservation originally consisted of two concrete machine-gun pillboxes that were built on either shore of Waimea Bay in 1934. In 1941-1942 four 75mm field guns were emplaced around the bay, and four additional 75mm guns were emplaced inland, along Ashley Road, at Waimea Camp. Construction on a third gun emplacement (Waimea Battery) that was to contain three Panama Mounts with a 180-degree field of fire began in 1942, but was never completed. The earthworks for the Waimea Battery are located three miles inland from Waimea Bay along Kaiwiko'ele Stream to the north of the current project area (Sugimoto 1996). Inland of Battery Waimea, located northeast of the current project area along Kamananui Stream, was Battery Pupukea II which contained four 155mm GPF guns on Panama Mounts.

Following the Japanese bombing of Pearl Harbor on December 7, 1941 and the United States involvement in WWII, the U. S. military drastically increased its coastal defenses on the north shore of O'ahu. Drum Road, which runs inland from Helemano to the Army's Kahuku training range and was constructed by the United States Army in the 1920s and 30s, was improved in the early years of the war to handle increased military vehicle traffic and to provide an alternative route to the north of the island in the event of potential damage to Kamehameha Highway.

In 1942, the United States Army built Battery Carroll Riggs (to the south of the project area) at the location of Opaeula plantation camp (see Figure 5) in an area that is currently known as Opaeula Ranch (Bennett 2002:49). Containing two 8-inch guns salvaged from the U. S. S. Lexington and U. S. S. Saratoga Navy ships, the battery was used to protect the north and west shores of O'ahu during World War II (Takamura 1995). Underground command posts and ammunition supply rooms were complimented by above-ground observation posts and towers. A few anti-aircraft gun emplacements occurred on the periphery of the battery. After the war, the United States government acquired the property from the B. P. Bishop Estate, but returned it to the Estate in 1953.

Located on the level landform south of Battery Riggs and of the Opaeula River, Brodie Camp No. 4 had a cable hut and a 100-pair cable installed prior to 1939 (Bennett 2002:42, 49). This cable was part of a tactical network of subterranean communication cables, or trunk lines, through the northwestern interior portion of O'ahu. Numerous cable huts, concrete pedestals, manholes, and actual cables are physical testimony of this circum-island command and fire control communication system. A map prepared by Bennett (2002) shows that the two main lines of the cable in the vicinity of the project area ran (1) along the coast, and (2) from Brodie Camp No. 4 across the tablelands and gulches to Waimea Valley and then down to Fire Control Station "O" to the north of Waimea Bay. In 1939 an extension from the main cable was connected to Fire Control Station "T' at Battery Kawailoa (Bennett 2002). Other extensions likely connected to Batteries Hale'iwa, Ashley, Waimea, and Pupukea, as well. The cable network was designed so that if any of the trunk lines were cut or damaged, they could be rerouted through other circuits to prevent total shut down of communications while they were fixed (Bennett 2002:44). Although many of the coastal defenses along the north shore were dismantled after 1945, intact segments of this robust command and fire control cable system infrastructure are currently used by Verizon Hawaii. Rechtman et al. (2011) also recorded abandoned features of the former cable system along the edge of the Waimea River valley to the north of the current project area.

Following the war, by the end of 1947, the O'ahu Railway and Land Company, with its ailing infrastructure, went out of business, and by 1950 much of the railroad infrastructure had been dismantled. The Waialua Agricultural Co. also dismantled its plantation railways and began hauling the sugarcane by truck. During the modern era, the plantation would eventually grow to include over 12,000 acres of cultivated lands. By 1991, the renamed Waialua Sugar Company, which had merged with the Hawaiian Pineapple Company (in 1961), and was now operated by the Dole Food Co., Inc., the successor to Castle & Cook, produced 62,255 tons of sugar (Dorrance and Morgan 2000). By this time sugar production in the Hawaiian Islands had become largely unprofitable. In 1996 the Waialua Sugar Company, the last sugar plantation to operate on O'ahu, harvested its final crop of sugarcane. In 1998, after 100 years of operation, the company closed its doors for good.

When the Waialua Sugar Co. shut down it voluntarily surrendered its lease of 24,000 acres of agricultural and conservation land to Kamehameha Schools (IMUA 2005). Currently Kamehameha Schools operates the Kawailoa Plantation on this land, leasing plots to individual farmers for diversified agricultural purposes. Roughly 3,600 acres of land, mostly below the 400-foot elevation contour, is suitable for crops that are currently grown there including corn, lettuce, asparagus, plumeria, banana, tuberose, taro, and *noni*. Above the agricultural areas Kamehameha Schools has planted *koa* trees in some areas, and large areas (mostly above the 650-foot contour) have been fenced for a cattle lease. Some of the water and electrical services on the leased lands are still provided by the infrastructure installed by the Waialua Agricultural Co. between 1898 and 1950 (IMUA 2005).

PREVIOUS ARCHAEOLOGICAL RESEARCH

The earliest published descriptions of archaeological sites near the project area were compiled by Thrum (1906) and McAllister (1933). These early descriptions were of sites on O‘ahu that were readily visible on the surface, such as stone *heiau* platforms, stone mounds, caves, ditches, ponds, and unusual-looking stones (Tables 1 and 2). McAllister (1933) compiled, from various sources, stories concerning the sites and plotted them on maps based on actual surface remains or remembered former locations (Figure 30). Smaller and less dramatic stone-walled enclosures or buried structures made from perishable materials were for the most part overlooked in the early studies on the coastal plain. With the exception of a few prominent *heiau* structures of stone and ponds, most archaeological sites on the coastal plain behind Hale‘iwa and Waialua Bay (see Table 1) had been destroyed by sugar mill construction activities and housing for plantation workers by the 1930s. McAllister accordingly had to base his site descriptions mostly on statements made by old Hawaiians who were born and raised in the Waialua and Hale‘iwa area. With additional housing and commercial development since the 1930s, only a handful of the sites witnessed and/or described by McAllister survived (see Table 2; see thorough summary in Hommon 1982).

Instead of being based on excavated features and analyses of excavated materials, McAllister described the sites and features in terms of ethnographic accounts that he and Thrum collected from people familiar with local history. The orally transmitted traditions recall interesting information on chiefs, priests, fishing, cultivation, deities, myths, rituals, and site functions. Among other things, the stories show how interconnected different parts of the landscape were in the minds of the people and how certain rituals were deemed necessary for subsistence purposes. One story recalls a stone near Pump Station 4 of the Waialua Agricultural Company that local people used to leave offerings for the female deity, known as Lehuanui (also known as Laniwahine). Among other things, this deity ensured abundant fish in the nearby pond. According to McAllister (1933) the stone was gone by the time of his visit.

Makai of the current project area, McAllister (1933:197) also mentions a small *heiau*, reputedly destroyed, near Kawailoa Gorge (the Anahulu River valley). According to local spokespeople, the small *heiau* was for the purposes of “husbandry,” or, agricultural productivity. Another *heiau*, known as ‘Ili‘ilikea (Site 237) (Sterling and Summers 1978:121), was located northeast of ‘Uko‘a pond in a sugarcane field. This *heiau*, with its well-defined walls, was reputedly destroyed in 1916 by the Waialua Agricultural Company. A third *heiau*, called Puupea (Site 238), which was not well remembered by old Hawaiians during McAllister’s time, was described by Sterling and Summers (1978:121) as a few scattered stones located at Punanue Point not more than fifty feet from the beach. An *akua* stone called Punanue (Site 239) was said to be located at the point near Puupea Heiau. Kohokuwelowelo (Site 240), located on an oval-shaped elevation inland of Cane Haul Road south of its intersection with Ashley Road (see Figure 30), was described by McAllister (1933) as a former dwelling place of priests that the commoners never approached. The site had a steep approach from the north, west and south, but from the east it was gradual. McAllister prepared a sketch map of the site (in Sterling and Summers 1978:122) showing several interconnected, partially enclosed, terraces with dirt floors and a number of small rock platforms. He also noted the presence of low walls and a pavement 200 feet seaward of Kohokuwelowelo at a lower elevation (Sterling and Summers 1978:122).

With the advent of Cultural Resource Management (CRM) work in the 1970s (e.g., Barrera 1979), archaeologists started to record less noticeable sites. Among the sites assessed by Barrera (1979) were a 1880s post-*Māhele* Hawaiian midden, a stone-walled remnant of a *heiau*-like structure, stone-walled cultivation terracing, a nineteenth-century house structure, and an old church (see Table 2). In 1982 Hommon reported a partial enclosure with an attached pavement on top of a bedrock outcrop near the intersection of Kawailoa Drive and Cane Haul Road. Two long walls that Hommon (1982) interpreted as a possible enclosure remnant, connected to the southeastern and northwestern sides of the platform-like pavement structure and terminated at mechanical disturbance near the edges of both roads. Hommon (1982) interpreted the pavement as a possible foundation for a surface structure that was no longer present, but was not able to determine the age or function of the site based solely upon the surface remains.

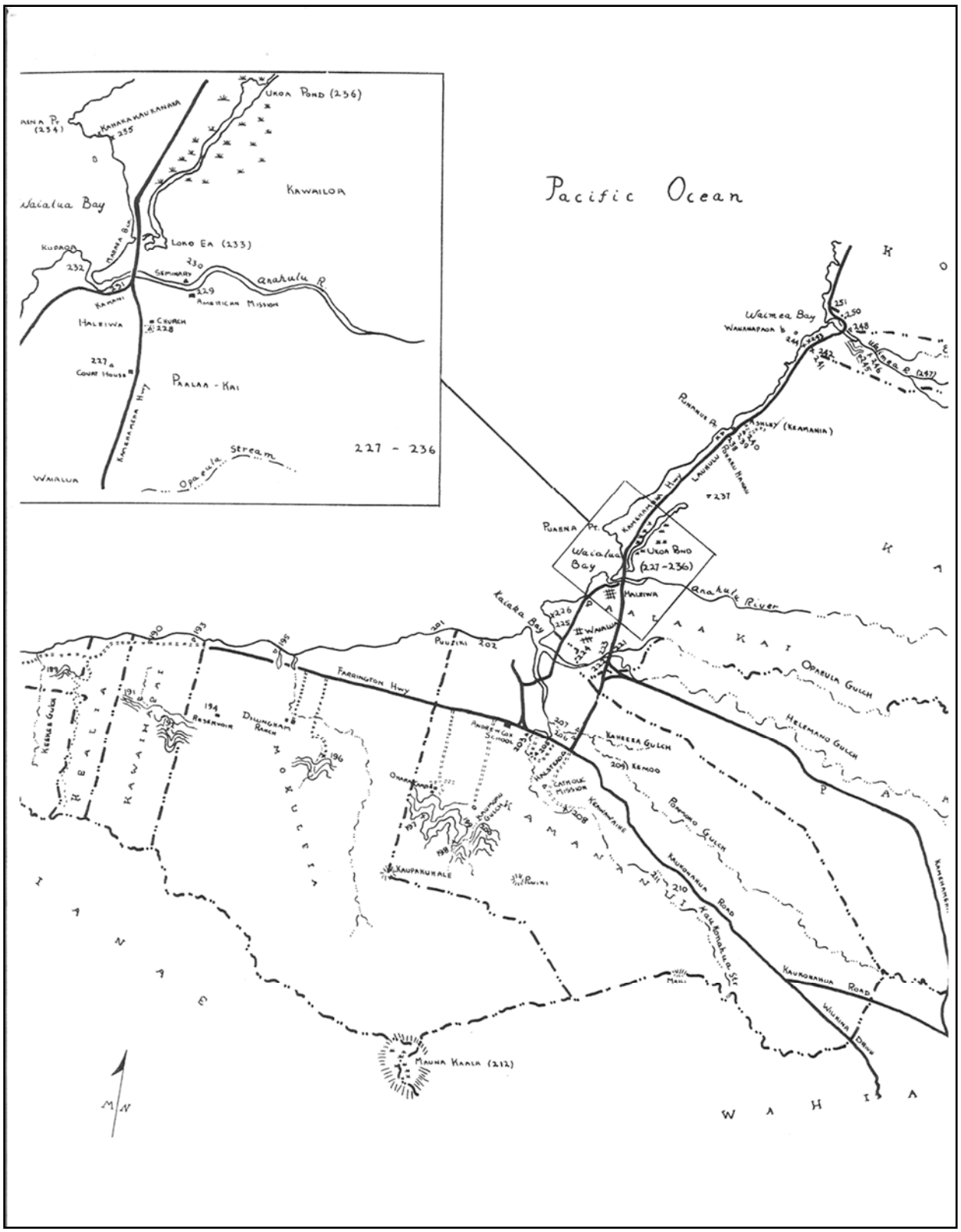

Figure 30. Portion of McAllister's (1933) map of sites located in the vicinity of the current project area (from Sterling and Summers 1978).

Table 1. Sites located southwest of the project area.

Site Number	*Site Type*	*Area/Ahupua'a*	*Author (date)*
197	Kalakiki Heiau	Waialua/Kamananui	McAllister (1933)
198	Burial Cave	Waialua/Kamananui	McAllister (1933)
199	Stone Mounds	Waialua/Kamananui	McAllister (1933)
200	Burial Cave	Waialua/Kamananui	McAllister (1933)
201	Keauau Fishing Shrine	Waialua/Kamananui	McAllister (1933)
202	Sand Dune Burials	Waialua/Kamananui	McAllister (1933)
203	Heiau	Waialua/Kamananui	McAllister (1933)
204	Oahunui Stone	Waialua/Kamananui	McAllister (1933)
205	Akua Stone	Waialua/Kamananui	McAllister (1933)
206	Kahakahuna Heiau	Waialua/Pa‘ala‘a	McAllister (1933)
207	Kawai Heiau	Waialua/Pa‘ala‘a	McAllister (1933)
208	Irrigation Ditch	Waialua/Kamananui	McAllister (1933)
211	Burial Cave	Waialua/Kamananui	McAllister (1933)
223	Hekili Heiau	Waialua/Kawailoa	McAllister (1933)
225	Kapukapuakea Heiau	Waialua/Kawailoa	McAllister (1933)
226	Pohaku Lanai Stone	Waialua/Kawailoa	McAllister (1933)
227	Puupilo Heiau	Waialua/Kawailoa	McAllister (1933)
228	Kepuwai Heiau	Waialua/Kawailoa	McAllister (1933)
229	Kawaipuolo Spring	Waialua/Kawailoa	McAllister (1933)
231	Anahulu Heiau	Waialua/Kawailoa	McAllister (1933)
232	Akua Stone	Waialua/Kawailoa	McAllister (1933)
235	Stone for Healing	Waialua/Kawailoa	McAllister (1933)
236	‘Uko‘a Pond	Waialua/Kawailoa	McAllister (1933)

Increasingly detailed CRM surface inspections and excavations on the flat coastal plain behind Waialua Bay resulted in the discovery of highly fragmented surface features and buried remains. Avery and Kennedy (1993), for example, unearthed disturbed human remains near Kawailoa Beach, while Moore et al. (1993) discovered a number of human burial sites, three fire pits, a historic house site, and a posthole with charcoal lens at the Hale‘iwa Beach Park (see Table 2). Charcoal from a buried fire pit yielded a radiocarbon assay that calibrated to between A.D. 1400 and 1670. Borthwick et al. (1998) conducted a survey and testing of the area immediately north of Hale‘iwa Beach Park. Among the sites they recorded were a prehistoric coral ledge, a human burial, WWII-era concrete features, and disturbed prehistoric cultural layers. During archaeological excavations south of Hale‘iwa Beach Park, on the shore of Loko‘ea pond, McGerty and Spear (2000) found a stacked basalt boulder wall and a charcoal layer. Charcoal from the layer yielded a radiocarbon assay that calibrated to between A.D. 1420 and 1530. Two charcoal samples collected from a buried feature associated with a posthole, cooking pit, and human burial at the Ali‘i Beach Park *makai* of Hale‘iwa, dated to between A.D. 1430 and 1680 (McDermott et al. 2001). Directly north of the Anahulu River, not far from where it empties into the ocean, Yeomans (2001) unearthed 11 features that contained charcoal. An un-calibrated assay of a charcoal sample from one feature dated to A.D. 1500-1590. Borthwick et al. (2001) reported a foundation of an O‘ahu Railway and Land Company’s wooden tank and base of the railway line’s right-of-way within the Hale‘iwa Beach Skate Park. Nearby, Borthwick et al. (2001) excavated a basalt boulder structure and a cultural layer. In 2005 Pantaleo and Titchenal (2005), during backhoe testing at a parcel south of Ashley Road across the highway from Kawailoa Beach, found the remains of a late nineteenth century female burial in an unmarked pit. In 2007 Moore and Kennedy reported on a traditional modified outcrop and a shrine that were probably associated with agricultural activities in the flatlands south of ‘Uko‘a pond.

To summarize then, radiocarbon dates of charcoal from buried excavated occupation layers on the fairly narrow coastal plain *makai* of the project area range in age between A.D. 1400 and 1670, which falls well within the so-called Expansion Period prior to the arrival of Captain Cook (e.g., Kirch 1992). It is in this relatively active area of modern urban expansion, centered on Hale‘iwa and Waialua, that most CRM archaeological work has been done in the vicinity of the project area. Unfortunately, a clear picture of intra- and inter-settlement layout in the area has not emerged, due to three main reasons. First, only pockets of deposits seem to have survived land alterations in the area. Secondly,

only relatively narrow and deep backhoe trenches were used for sampling. And thirdly, no attempt has been made to try link up results from different trenches. Over and above this lack of synthesis has been the absence a coordinated attempt to combine the archaeological sequence with oral histories and documented historical developments in the area. The inter-disciplinary research of the Anahulu Valley hinterland *mauka* of coastal plain, instigated by Kirch and Sahlins, is perhaps a useful model to emulate for future CRM work on the coastal plain.

Table 2. Sites *makai* of the project area.

Site Number	*Site Type*	*Area/Ahupua'a*	*Author (date)*
237	Iliilikea Heiau	Waialua/Kawailoa	McAllister (1933)
238	Puupea Heiau	Waialua/Kawailoa	McAllister (1933)
239	Punanue Akua Stone	Waialua/Kawailoa	McAllister (1933)
240	Kohokuwelowelo	Waialua/Kawailoa	McAllister (1933)
241	Kupopolo Heiau	Waialua/Kawailoa	McAllister (1933)
242	Stone in Rock Shelter	Waialua/Kawailoa	McAllister (1933)
1439	Historic Midden	Waialua/Kawailoa	Barrera (1979)
1440	Stone Wall Remnant	Waialua/Kawailoa	Barrera (1979)
1441	Agricultural Terraces	Waialua/Kawailoa	Barrera (1979)
1442	House Structure	Waialua/Kawailoa	Barrera (1979)
1443	Old Church	Waialua/Kawailoa	Barrera (1979)
50-80-04-4670	Human Burials	Waialua/Kawailoa	Avery and Kennedy (1993)
4589	Historic House	Waialua/Kawailoa	Moore et al. (1993)
4590	Fire Pit	Waialua/Kawailoa	Moore et al. (1993)
4591	Fire Pit	Waialua/Kawailoa	Moore et al. (1993)
4592	Fire Pit	Waialua/Kawailoa	Moore et al. (1993)
4593	Human Burial	Waialua/Kawailoa	Moore et al. (1993)
4594	Human Burial	Waialua/Kawailoa	Moore et al. (1993)
4595	Human Burial	Waialua/Kawailoa	Moore et al. (1993)
4596	Human Burial	Waialua/Kawailoa	Moore et al. (1993)
4597	Human Burial	Waialua/Kawailoa	Moore et al. (1993)
4598	Human Burial	Waialua/Kawailoa	Moore et al. (1993)
4601	Posthole and Lens	Waialua/Kawailoa	Moore et al. (1993)
50-80-04-3400	Stone enclosure/pavement	Waialua/Kawailoa	Hommon (1982)
50-80-04-234	Coral Ledge	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-235	Stone	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-5495	Human Burial	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-5641	WWII Concrete	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-5642	WWII Airfield	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-5643	WWII Bunker	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-5644	Pre-WWII Midden	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-5661	Mixed cultural layer	Waialua/Kawailoa	Borthwick et al. (1998)
50-80-04-5795	Charcoal Layers	Waialua/Kawailoa	McGerty and Spear (2000)
50-80-04-5839	Stone Wall Remnant	Waialua/Kawailoa	McGerty and Spear (2000)
50-80-04-5850	Prehistoric Pits	Waialua/Kawailoa	McDermott et al. (2001)
50-80-01-5795	Charcoal Layers	Waialua/Kawailoa	Yeomans (2001)
50-80-04-5791	OR&L Rail ROW	Waialua/Kawailoa	Borthwick et al. (2001)
50-80-04-5915	Stone Foundation	Waialua/Kawailoa	Borthwick et al. (2001)
50-80-04-5916	Cultural Layer	Waialua/Kawailoa	Borthwick et al. (2001)
50-80-10-6768	Human Burial	Waialua/Kawailoa	Pantaleo and Titchenal (2005)
50-80-04-6867	Driveway and Structures	Waialua/Kawailoa	Moore and Kennedy (2007)
50-80-04-6868	C-shape Shrine	Waialua/Kawailoa	Moore and Kennedy (2007)
50-80-04-6869	Modified Outcrops	Waialua/Kawailoa	Moore and Kennedy (2007)

The earliest radiocarbon evidence for the occupation of sites in Anahulu Valley (Table 3), immediately *mauka* of the coastal plain, comes from the Keʻekeʻe rock shelter. Kirch (1992:47-48) found dating and subsistence evidence that this large rock shelter was used as an intermittent camp, sometime after A.D. 1300. By A.D. 1500 two other shelters in the valley, known as Kuolulo and Kēʻae, were also occupied intermittently. A radiocarbon date from an artifact and faunal rich earth oven within the Keʻekeʻe Nui rock shelter and from a similarly rich basal layer of the nearby Keʻekeʻe Iki rock shelter suggest that by A.D. 1650 these shelters were used as permanent residences. Kuolulo rock shelter shows similar artifact and feature evidence for permanent occupation sometime after A.D. 1700. Radiocarbon dates from Kawainui (upper) portion of the valley (Dega and Kirch 2002) indicate use of this area beginning in the middle A.D. 1400s and abandonment by the late A.D. 1700.

Radiocarbon dates and the lack of occupational refuse suggest that in the early nineteenth century the rock shelters in the Anahulu River valley were also abandoned (Kirch 1992:166). These were replaced by a series of open house sites that were constructed in the middle valley in association with taro irrigation terraces. A combination of radiocarbon, artifact, and documentary evidence, show that soon after A.D. 1804, six houses were built on alluvial terraces in the middle valley. Between A.D. 1804 and 1814, the six-kilometer previously barren stretch of interior valley was transformed to irrigated pond fields, associated with at least eight permanent houses. By 1820, with the return of Kamehameha and his retinue to Hawaiʻi Island, at least four of the houses and many terraced fields were abandoned. However, by 1830 two new houses appeared in the middle valley, most likely in response to supply whaling ships with taro, yams, sweet potato, hogs, and bark cloth. Physical evidence for restructuring the irrigation system occurs as late as 1845 (Kirch 1992:167). Following the *Māhele* in the late 1840s houses and fields in the valley were increasingly abandoned, so by the 1880s the area was virtually deserted.

Earlier CRM work conducted by Rosendahl (1977) showed that prehistoric sites occurred quite high up the Kawailoa and neighboring gulches; farther removed from the coastal plain than the sites subsequently excavated by Kirch (1992). All five sites reported by Rosendahl (Table 4) occurred either within or on the edges of gulches and at the confluences of streams. The sites included two platforms, a habitation complex, an agricultural complex, and an enclosure. These sites, all of which occur south of the current project area, within the US Army Kawailoa Training Area, represented the inland limits of Proto-historic and Historic Period occupation of the various stream gulches that open out onto the coastal plain (Dega 1996:32-33).

Partly overlooked or at least downplayed by archaeologists in the study area, is rock art. Apart from one incised name on a large boulder inserted into the boundary wall of a site (Kirch 1992:98), only one other rock art site is mentioned as being present in the Kawailoa Gulch area, through which the Anahulu River flows. Cox and Stasack (1970:97) mention three human figures and two dogs (Site D6-19) that were pecked above the opening of a rock shelter (Site D6-14) on the north side of the Anahulu River (see Table 3). As not all rock surfaces suitable for rock art production have actually been utilized and knowing that most rock art panels occur along trails, on *ahupuaʻa* boundaries, and on the edges of settlements and structures, the very choice of their placement may contain clues as to their cultural significance.

Near the bottom of a cliff line *makai* of the project area, Cluff (1968) found a series of rock art panels with pecked depictions of human figures and dogs (Table 5). This rock art rock shelter is not far from the coast and slightly southeast from the Kupopolo Heiau (Site 241), located on the narrow coastal plain south of Waimea River mouth. Pecked triangular-bodied human figures and dogs with curved tails are depicted within the shelter, as are some incised motifs. The chronological relationship between the rock art and the stacked rock walls in front of the shelter still needs to be researched. Whatever the date of the petroglyphs might turn out to be, they are almost certainly prehistoric in age, based on dates of similar motifs on the Island of Hawaiʻi (Lee and Stasack 2005, Rechtman et al. 2003).

Slightly to the northwest and across the Kamehameha Highway of Kupopolo Heiau (Site 241) and the petroglyphs, Athens and Shun (1982) discovered twelve sites on the coastline (see Table 5). The sites included two prehistoric midden areas, two stone-walled enclosures, two small rock shelters, a stone pile complex, a stone platform, a stone wall, a *heiau* platform, a natural water hole, and the Oʻahu Railway and Land Company's railroad bed. Taken together, the prehistoric sites recorded by Cluff (1968) Athens and Shun (1982) were probably a southern extension of the Waimea River settlement spilling out of the valley down the coast.

Table 3. Sites recorded in Anahulu Valley.

*Site Number**	*Site Type*	*Area/'Ili*	*Author (date)*
D6-14	Rock shelter	Anahulu Valley/‘Imi‘imi	Kirch (1992)
D6-19	Rock shelter petroglyphs	Anahulu Valley/‘Imi‘imi	Cox (1970)
D6-25	Habitation complex	Anahulu Valley/Kaloala	Kirch (1992)
D6-26	Irrigation complex	Anahulu Valley/Kaloala	Kirch (1992)
D6-27	Habitation terrace	Anahulu Valley/Kaloala	Kirch (1992)
D6-28	Rock shelter	Anahulu Valley/Haka'ai	Kirch (1992)
D6-29	Stone structure	Anahulu Valley/Haka‘ai	Kirch (1992)
D6-30	Upright stone	Anahulu Valley/Haka‘ai	Kirch (1992)
D6-31	Stone-walled house site	Anahulu Valley/Lahuimoho	Kirch (1992)
D6-32	Earthen terraces	Anahulu Valley/Pulepule	Kirch (1992)
D6-33	Habitation terrace	Anahulu Valley/Pulepule	Kirch (1992)
D6-34	Habitation complex	Anahulu Valley/Pulepule	Kirch (1992)
D6-35	Habitation terrace	Anahulu Valley/Pulepule	Kirch (1992)
D6-36	Rock shelter	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-37	Habitation complex	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-38	Habitation terrace	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-39	Habitation terrace	Anahulu Valley/'Ua'u	Kirch (1992)
D6-40	Habitation complex	Anahulu Valley/Mikiai	Kirch (1992)
D6-41	Irrigation complex	Anahulu Valley/Mikiai	Kirch (1992)
D6-42	Irrigation complex	Anahulu Valley/Koilau	Kirch (1992)
D6-43	Irrigation complex	Anahulu Valley/Pulepule	Kirch (1992)
D6-44	Irrigation complex	Anahulu Valley/Kapuahilua	Kirch (1992)
D6-45	Irrigation complex	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-46	Irrigation complex	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-47	Irrigation complex	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-48	Irrigation complex	Anahulu Valley/'Ua‘u	Kirch (1992)
D6-49	Cliff burial	Anahulu Valley/'Ua‘u	Kirch (1992)
D6-50	Platform burial	Anahulu Valley/Kaloaloa	Kirch (1992)
D6-51	Habitation complex	Anahulu Valley/Kapuahilua	Kirch (1992)
D6-52	Rock shelter	Anahulu Valley/Ke‘ae	Kirch (1992)
D6-53	Irrigation complex	Anahulu Valley/Ke‘ae	Kirch (1992)
D6-54	Irrigation complex	Anahulu Valley/Ke‘ae	Kirch (1992)
D6-55	Burial Cave	Anahulu Valley/‘Imi‘imi	Kirch (1992)
D6-56	Rock shelter	Anahulu Valley/‘Imi‘imi	Kirch (1992)
D6-57	Rock shelter	Anahulu Valley/Kaha‘aloa	Kirch (1992)
D6-58	Rock shelter	Anahulu Valley/Ke‘kek‘e	Kirch (1992)
D6-59	Burial Cave	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-60	Rock shelter	Anahulu Valley/Ke‘eke‘e	Kirch (1992)
D6-61	Platform burials	Anahulu Valley/ Ke‘eke‘e	Kirch (1992)
D6-67	Stone enclosure	Anahulu Valley/ Ke‘eke‘e	Kirch (1992)
D6-68	Platform burial	Anahulu Valley/ Ke‘eke‘e	Kirch (1992)

* Bishop Museum Numbers

Table 4. Sites recorded by Rosendahl (1977) south of the current project area.

Site Number	*Site Type*	*Area/Ahupua'a*	*Author (date)*
50-80-05-9510	Platform	Waialua/Kawailoa	Rosendahl (1977)
50-80-05-9511	Agricultural Complex	Waialua/Kawailoa	Rosendahl (1977)
50-80-05-9512	Habitation Complex	Waialua/Kawailoa	Rosendahl (1977)
50-80-05-9513	Enclosure	Waialua/Kawailoa	Rosendahl (1977)
50-80-05-9514	Platform	Waialua/Kawailoa	Rosendahl (1977)

Table 5. Sites recorded by Cuff (1968) and Athens and Shun (1982) *makai* of the project area.

Site Number	*Site Type*	*Area/Ahupua'a*	*Author (date)*
D6-17	Kupopolo Heiau and Rock shelter Petroglyphs	Waialua/Kawailoa	Cluff (1968)
D6-62	Midden	Waialua/Kawailoa	Athens and Shun (1982)
D6-63	Enclosure	Waialua/Kawailoa	Athens and Shun (1982)
D6-64	Midden	Waialua/Kawailoa	Athens and Shun (1982))
D6-65	Stone Piles	Waialua/Kawailoa	Athens and Shun (1982)
D6-66	Stone Platform Complex	Waialua/Kawailoa	Athens and Shun (1982)
D7-2	*Heiau*	Waialua/Waimea	Athens and Shun (1982)
D7-48	Water Hole	Waialua/Waimea	Athens and Shun (1982)
D7-49	OR&L Rail Bed	Waialua/Waimea-Kawailoa	Athens and Shun (1982)
D7-50	Enclosure	Waialua/Waimea	Athens and Shun (1982)
D7-51	Wall	Waialua/Waimea	Athens and Shun (1982)
D7-52	Rock Shelters	Waialua/Waimea	Athens and Shun (1982)

Sites within the Waimea River Valley are among the first recorded within the vicinity of the project area, considering that many are prominent features and/or features recalled in local oral histories. McAllister (1933) recorded four *heiau*, two fishing shrines, two rock shelters with burials, one rock shelter with a sacred stone, a boundary stone, and a prominent stone-walled agricultural terrace complex within the valley (Table 6; see Figure 30). Moore and Luscomb (1974) recorded an additional 32 sites within the valley, indicating that it was densely populated in both Precontact and early Historic times. Reported excavation results of previously discovered sites within the Waimea River valley comes from two of Mitchell's excavations. The first set of excavations, on a *heiau*-like platform structure and associated walls and piles against the southern slopes of the valley, labeled Site D7-26, were reported by Mitchell (1977). In 1985 and 1986, Mitchell reported work on a separate stepped-platform structure, labeled Site D7-23, near its northern entrance. Whereas a radiocarbon assay of a coral fragment from the Site D7-23 platform yielded a calibrated date range of A.D. 1470 to 1700, the recovery of ceramic sherds, bottle glass, a nail, and a button from associated midden deposits suggests that the structure dates to the Historic Period.

Sites recently recorded within the Kaiwailoa Wind Farm Project Area (Rechtman et al. 2011) are the most proximate to the current study area (Table 7; Figure 31). As a result of the archaeological inventory of the Kawailoa Wind Farm, Rechtman et al. (2011) recorded seventeen archaeological sites (Sites 7155 to 7171) within eight defined survey areas (Western Tableland Array, Eastern Tableland Array, Kawailoa Road Corridor, Cane Haul Road Corridor, Mid-Line Road Corridor, Ashley Road Corridor, Makai Interconnection Facility Corridor, and Overhead Collector Line Corridor). No Precontact sites were found on the surface of the wind farm project area during the inventory survey nor were any subsurface sites (of any kind) discovered during subsequent archaeological monitoring of the wind farm development activities (Rechtman 2012). All of the sites recorded within the wind farm dated to the Historic Period and were associated with either former military operations (Site 7155, 7156, 7158), or former plantation activities (Sites 7157, 7159, 7160, 7161, 7162, 7163, 7164, 7165, 7166, 7167, 7168, 7169, 7170, 7171). The seventeen sites recorded by Rechtman et al. (2011) are summarized in general below. The site summary is followed by a presentation of the specific findings at each of the wind farm defined survey areas that include a portion of the current project area (the Western Tableland Array, the Mid-Line Road Corridor, the Ashley Road Corridor, and the Overhead Collector Line Corridor). The locations of all of the sites recorded within the wind farm project area (relative to the boundaries of the current project area) are depicted in Figure 31.

Table 6. Sites recorded in the Waimea River Valley.

Site Number	*Site Type*	*Area/Ahupua'a*	*Author (date)*
242	Rock Shelter Stone	Waialua/Waimea	McAllister (1933)
243	Boundary Stone	Waialua/Waimea	McAllister (1933)
244	Fishing Shrine	Waialua/Waimea	McAllister (1933)
245	Fishing Shrine	Waialua/Waimea	McAllister (1933)
246	Burial Cave	Waialua/Waimea	McAllister (1933)
247	Agricultural Terraces	Waialua/Waimea	McAllister (1933)
248	Heiau Kuhale	Waialua/Waimea	McAllister (1933)
249	Heiau Puu O Mahuku	Waialua/Waimea	McAllister (1933)
250	Kalaku and Kalakoi	Waialua/Waimea	McAllister (1933)
251	Burial Cave	Waialua/Waimea	McAllister (1933)
D7-7	Rock Shelter Burials	Waialua/Waimea	Moore and Luscomb (1974)
D7-8	Enclosure	Waialua/Waimea	Moore and Luscomb (1974)
D7-9	Terrace Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-10	Enclosure	Waialua/Waimea	Moore and Luscomb (1974)
D7-11	Walls	Waialua/Waimea	Moore and Luscomb (1974)
D7-12	Japanese Shrine	Waialua/Waimea	Moore and Luscomb (1974)
D7-14	Stone Pile	Waialua/Waimea	Moore and Luscomb (1974)
D7-15	Stone Pile	Waialua/Waimea	Moore and Luscomb (1974)
D7-16	Agricultural Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-17	Terrace Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-18	Terrace Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-19	Terrace Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-20	Stone Pile	Waialua/Waimea	Moore and Luscomb (1974)
D7-21	Terrace Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-22	Terrace Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-23	Shrine	Waialua/Waimea	Moore and Luscomb (1974)
D7-24	Wall	Waialua/Waimea	Moore and Luscomb (1974)
D7-25	Walls	Waialua/Waimea	Moore and Luscomb (1974)
D7-26	Walls and Piles	Waialua/Waimea	Moore and Luscomb (1974)
D7-27	Sandstone Pounder	Waialua/Waimea	Moore and Luscomb (1974)
D7-28	Basalt Adze	Waialua/Waimea	Moore and Luscomb (1974)
D7-29	Grinding Stone	Waialua/Waimea	Moore and Luscomb (1974)
D7-30	Ulu Maika Stone	Waialua/Waimea	Moore and Luscomb (1974)
D7-31	Terrace Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-32	Stone Pile	Waialua/Waimea	Moore and Luscomb (1974)
D7-33	Wall complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-34	Wall	Waialua/Waimea	Moore and Luscomb (1974)
D7-35	Rock Shelter Burials	Waialua/Waimea	Moore and Luscomb (1974)
D7-36	Wall	Waialua/Waimea	Moore and Luscomb (1974)
D7-37	Rock Shelter Burials	Waialua/Waimea	Moore and Luscomb (1974)
D7-38	Rock Shelter	Waialua/Waimea	Moore and Luscomb (1974)
D7-39	Agricultural Complex	Waialua/Waimea	Moore and Luscomb (1974)
D7-41	Historic House	Waialua/Waimea	Mitchell (1985)
D7-42	Burial	Waialua/Waimea	Mitchell (1985)

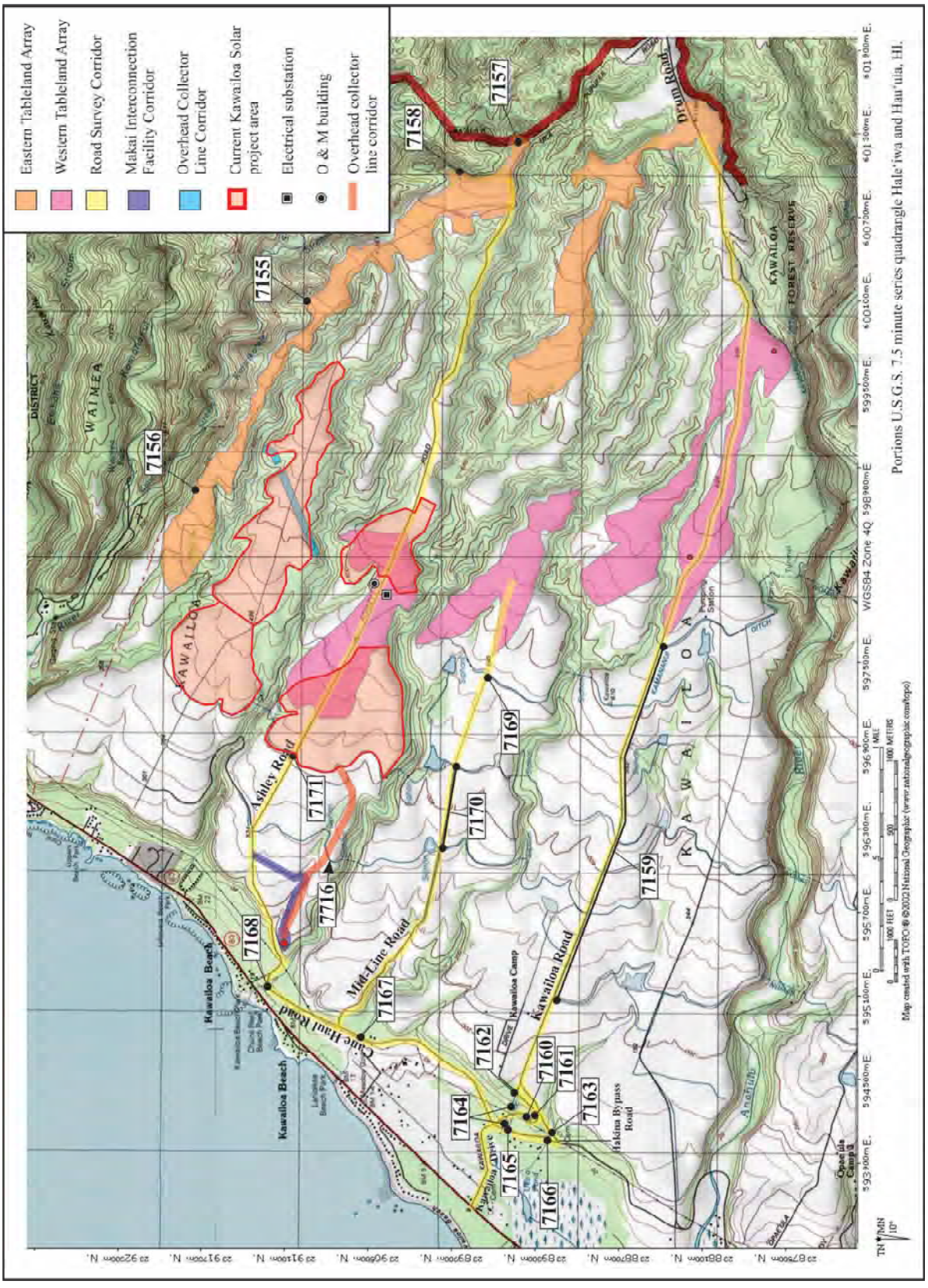

Figure 31. Rechtman et al. (2011) site location map showing the current project area.

Table 7. Sites recorded by Rechtman et al. (2011) within the Kawailoa Wind Farm.

*Site #**	*Description*	*Function*	*Association*	*Area***
50-80-04-7155	Concrete pillar	Military communication	WWII	ETA
50-80-04-7156	Concrete pillar	Military communication	WWII	ETA
50-80-04-7157	Concrete marker	Boundary marker	Plantation	ETA
50-80-04-7158	Metal pole/concrete base	Military communication	WWII	ETA
50-80-04-7159	Ditch complex	Agricultural irrigation	Plantation	KRC
50-80-04-7160	Stone abutments	Agricultural transportation	Plantation	KRC 1
50-80-04-7161	Concrete foundations	Stables	Plantation	KRC 1
50-80-04-7162	Kerbstone alignment	Agricultural transportation	Plantation	KRC 1
50-80-04-7163	Stone/concrete culvert	Drainage control	Plantation	KRC 2
50-80-04-7164	Metal pipeline	Agricultural irrigation	Plantation	CHRC
50-80-04-7165	Stone/concrete culvert	Drainage control	Plantation	CHRC
50-80-04-7166	Stone/concrete culvert	Drainage control	Plantation	CHRC
50-80-04-7167	Stone/concrete culvert	Drainage control	Plantation	CHRC
50-80-04-7168	Concrete bridge	Agricultural transportation	Plantation	CHRC
50-80-04-7169	Ditch complex	Agricultural irrigation	Plantation	MLRC
50-80-04-7170	Ditch complex	Agricultural irrigation	Plantation	MLRC
50-80-04-7171	Ditch complex	Agricultural irrigation	Plantation	ARC

*State (50-Hawai‘i)-Island (80-O‘ahu)-USGS quad (04-Hale‘iwa)-SIHP Site # (71xx)
**ETA-Eastern Tableland Array; KRC 1-Kawailoa Road Corridor (Alternative 1), KRC 2-Kawailoa Road Corridor (Alternative 2); MLRC-Mid-Line Road Corridor; CHRC-Cane Haul Road Corridor; ARC-Ashley Road Corridor (see Figure 31).

Of the fourteen plantation related sites recorded within the Rechtman et al. (2011) study area, five were associated with the irrigation of sugarcane including four ditch and pond complexes – Sites 7159 (Kawailoa Ditch Complex), 7169 (Upper Mid-Line Road Ditch Complex), 7170 (Lower Mid-Line Road Ditch Complex), and 7171 (Ashley Road Ditch Complex) – and a water pipe system, Site 7164, that connected the Kawailoa ditch complex (Site 7159) with Pump House 4. A sixth site (Site 7157) was a possible concrete field marker identifying the location of one of the *mauka*-most agricultural plots within the wind farm project area. Features associated with the transport of sugarcane within the Rechtman et al. (2011) study area included a concrete bridge along Cane Haul Road (Site 7168), four stone-walled road culverts (Sites 7165, 7166 and 7167 under Cane Haul Road, and Site 7163 under Hakina Bypass Road), and stone abutments (Site 7160) and a kerbstone alignment (Site 7162) along Kawailoa Road. An additional plantation-related site (Site 7161) recorded by Rechtman et al. (2011) within the Kawailoa Road Corridor appeared to be the location of a former stable.

Historical documentation presented in the Rechtman et al. (2011) study (e.g., see Dorrance and Morgan 2000; Wilcox 1996) indicates that plantation agricultural may have begun impacting the Kawailoa landscape as early as 1898, and that by the late 1920s irrigated fields and associated infrastructure (formal and informal ditches, pipes, tunnels, a few pump houses, several reservoirs, roads, and railway lines), identified as the Kamananui Ditch System, covered vast portions of the plantation lands in the vicinity of the wind farm. Dates incised into the cement capping of ditch and sluice gate walls of the four defined ditch complexes (Sites 7159, 7169, 7170, and 7171) (Figure 32) suggested that the Kamananui Ditch System existed by at least 1913, and dates incised in other concrete features suggested that by 1926 and 1927 the main channels were well established. Dates between 1935 and 1943 indicated ongoing maintenance activities, and an increased occurrence of the incised dates between 1950 and 1954 indicated that a spurt of activity occurred at the ditch system around that time. Further maintenance and update activities occurred between 1981 and 1990, and even though sugarcane cultivation was terminated at the end of 1996, the ditch complex continued to be used and maintained along certain sections, as attested by the 2008 and 2009 dates incised on portions of the lower Mid-Line Road and the main Kawailoa Road ditches.

Sites seemingly associated with World War II era (or slightly earlier) military activities included three separate concrete pillar foundations (Sites 7155, 7156, and 7158) along the northern *mauka*-most ridge of the wind farm study area (to the northeast of the current project area). Rechtman et al. (2011) interpret these three sites as being remnants of a military communication and fire control network. They note that in ca. 1939, as part of O‘ahu’s coastal defenses, gun emplacements and a military command and fire control communication system were established at key locations in and around the Kawailoa area including along the shore near Kawailoa Drive and Ashley Road, at Kawailoa and Waimea Camps, and along the upper ridges of the Waimea River valley (Bennett 2002; Gaines 2002; Sugimoto 1996; Takamura 1995). The defenses were mostly dismantled (in ca. 1945) immediately following World War II.

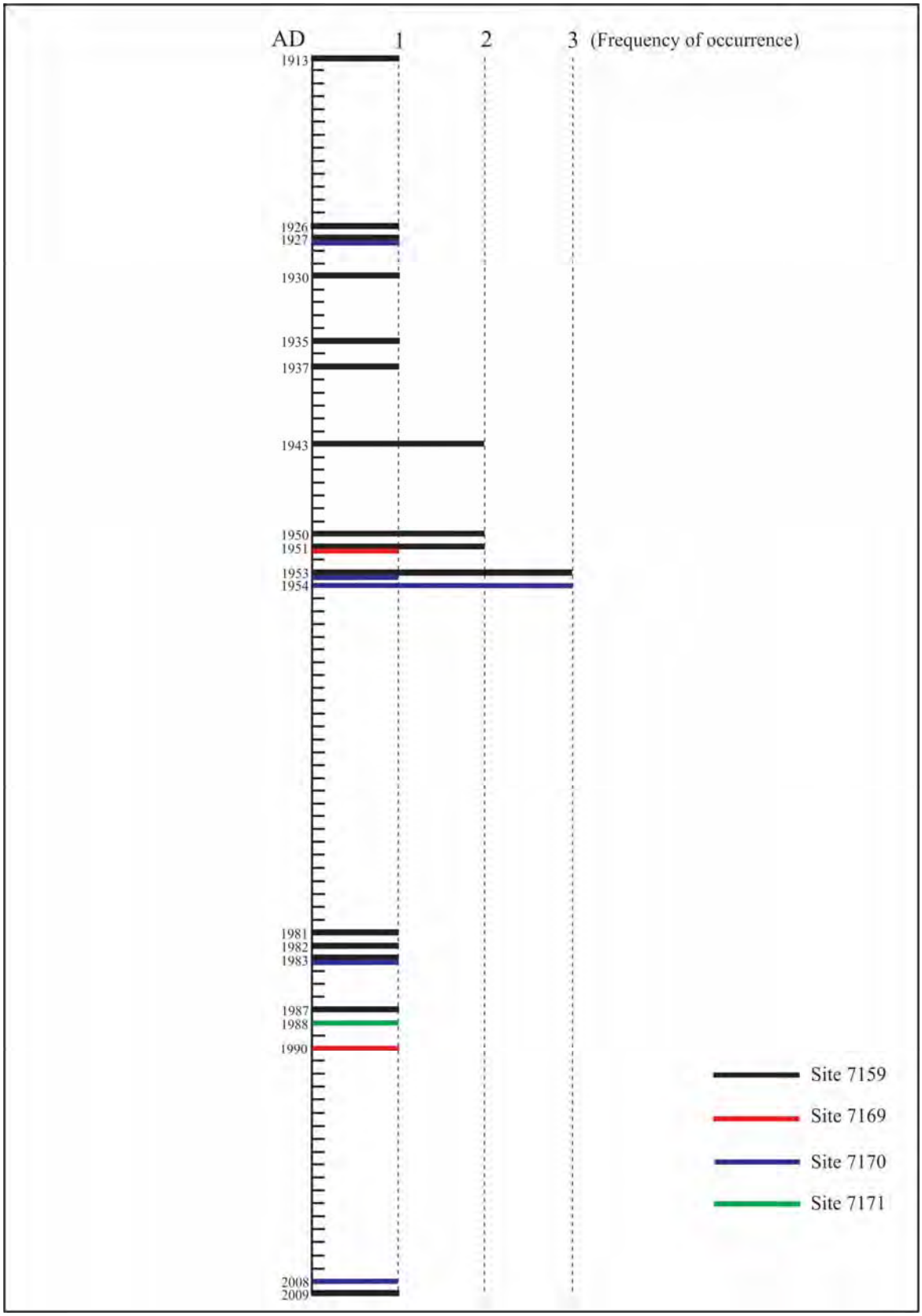

Figure 32. Diagrammatic representation of etched dates on the Kamananui Ditch System (from Rechtman et al. 2011:145).

Of the seventeen sites recorded by Rechtman et al. (2011), only three sites (Sites 7169, 7170, and 7171 – all plantation ditch complexes; see Table 7) were located within two of the four defined survey areas that included a portion of the current project area (within the Mid-Line Road and Ashely Road survey corridors; no sites were identified in either the Western Tableland Array or Overhead Collector Line Corridor; see Figure 31). Of these three sites Site 7169 and Site 7171 are situated in close proximity to (*makai* of) the current Waimea 6 and Kawailoa 15 survey areas, and Site 7171 crosses the current Overhead Collector Line Corridor.

No archaeological sites of any kind were identified within the Western Tableland Array survey area of the Kawailoa Wind Farm (see Figure 31). Rechtman et al. (2011) attribute the lack of sites in this large area, which corresponds to Waialua Sugar Company's former fields Kawailoa-15, 17a, 17b, 20, 24a, and Waiamea-6 and 8 (see Figure 10) and includes portions of the current Kawailoa 15, Waimea 6 and Waimea 8 survey areas, to the tablelands being completely cultivated in sugarcane and pineapple during the second half of the twentieth century. Rechtman et al. (2011) note that the Hawaiian Pineapple Company's (H. P. Co.) Waimea Camp (see Figure 5) was formerly located within the Western Tableland Array survey area (near the *makai* boundary of the current Waimea 8 survey area), but that they did not identify any surface remains of the former camp, likely because it was removed during the 1950s and later replanted in pineapples. Subsequent archaeological monitoring activities associated with the development of the wind farm (Rechtman 2012) revealed no subsurface cultural deposits at the former Waimea Camp or any of the turbine locations within the Western Tableland Array survey area.

Two sites (Sites 7169 and 7170) were recorded within the Mid-Line Road Corridor of the Kawailoa Wind Farm as a result of the Rechtman et al. (2011) inventory survey (see Table 7 and Figure 31). Mid-Line Road, which was built by the plantation during the early to mid-twentieth century, crosses former Waialua Sugar Company's fields Kawailoa-13, 14, and 15 (see Figure 10), and extends along the northern edge of the current Kawailoa 15 survey area. Rechtman et al. (2011) note that the fields crossed by Mid-Line Road were completely cultivated in sugarcane and pineapple during the second half of the twentieth century, and that the upper section of the road (built prior to 1929) was also planted over with pineapple during the second half of the twentieth century, and that the road alignments through the pineapple fields (including Mid-Line Road) shifted frequently. Given the extensive land modifications of the twentieth century along Mid-Line Road it is not surprising that the two archaeological sites recorded by Rechtman et al. (2011) were both portions of former plantation ditches. Site 7169 consisted of a feeder ditch that followed the 540-foot contour across the Mid-Line Road Corridor. Site 7170 consisted of a feeder ditch that crossed the road at the 440-foot contour and supplied a *mauka*/*makai* ditch that followed the southern edge of Mid-Line Road to a reservoir located near the 330-foot contour. At the time of the Rechtman et al. (2011) study Site 7170 still carried water, but Site 7169 no longer functioned. Both sites were impacted by the wind farm development activities, but are still extant along Mid-Line Road beyond the improved road corridor (Rechtman 2012). As a result of the wind farm development and the improvement of the Kawailoa water system, Site 7170 no longer carries water.

A single archaeological site, consisting of a north/south running ditch line (Site 7171) following the 410-foot contour along the *makai* edge of the Waimea 6 survey area, was recorded within the Ashley Road Corridor as a result of the Rechtman et al. (2011) inventory survey (see Table 7 and Figure 31). Ashley Road, which was built by the plantation during the early to mid-twentieth century, crosses former Waialua Sugar Company's fields Waimea-1, 2, 6, 8 and 25 (see Figure 10), passes by the location of the former Hawaiian Pineapple Company's (H. P. Co.) Waimea Camp, and includes portions of the current Waimea 6 and Waimea 8 survey areas. Rechtman et al. (2011) note that the fields crossed by Ashley Road were completely cultivated in sugarcane and pineapple during the second half of the twentieth century, with the exception of the Waimea Camp area, located at an elevation of 600 feet above sea level, which was not planted in pineapple until the 1960s after the camp was removed. No evidence of the former camp was identified by Rechtman et al. (2011) or Rechtman (2012). The ditch (Site 7171) recorded by Rechtman et al. (2011) as crossing Ashley Road, was part of the Kamananui ditch system that was created by the Waialua Agricultural Co. during the early to mid-1900s. Site 7171, which also included an elongated water-retention adjacent to the roadway, was no longer functioning at the time of the Rechtman (2011) study. It was described as being covered in re-deposited red soil and following the *makai* edge of a dirt road beyond the Ashley Road survey corridor to both the north and south along the western (*makai*) edge of the Waimea 6 field.

No archaeological sites of any kind were identified by Rechtman et al. (2011) within the Overhead Collector Line Corridor survey area of the Kawailoa Wind Farm (see Figure 31). This 50-foot wide corridor that stretched across the former field Waimea-26 (the current Waimea 26 survey area) at an elevation of roughly 600 feet above sea level was completely cultivated in pineapple during the second half of the twentieth century. Rechtman et al. (2011) note that the entire corridor had been mechanically cleared as a result of the former land use.

In addition to the sites identified within the wind farm study area, six previously identified archaeological sites and nineteen newly identified sites located nearby, but outside of the wind farm development area, were inspected by Rechtman et al. (2011). No detailed descriptions of these sites were included in the Kawailoa Wind Farm archaeological inventory survey report, but their locations, relative to the wind farm development areas, were plotted on a map (Figure 33) and brief descriptions were presented in table form (Table 8). These sites, given their formal attributes and locations, were interpreted by Rechtman et al. (2011) to represent both Precontact and Historic use of the general study area. Nearest the current Kawailoa Solar project area (in the vicinity of the coastal escarpment formation) reconnaissance level survey by Rechtman et al. (2011) of the accessible sections of the cliff face inland of Ashley Road revealed the presences of several areas of cobble modification (T-37; see Table 8 and Figure 33). The modification consisted of low walls, cobble alignments, leveled areas, filled areas, and cobble stacking. Some of the modification appeared to be modern and was associated with plastic grow pots and wire fencing, but some seemed to be older, dating to the Historic or Precontact Periods. Rechtman et al. (2011) note (citing Genz and Hammatt 2011) that locally transmitted oral traditions relate that the area of the *makai* escarpment below Ashley Road stretching to Waimea Bay was a favored place for burial during Precontact and early Historic times.

Table 8. Sites identified nearby, but outside, the Kawailoa Wind Farm study area.

Site #	***Description***	***Study***	***Proximity****
236	ʻUkoʻa Pond	McAllister (1933)	KRC
240	Kohokuwelowelo	McAllister (1933)	CHRC
3400	Stone enclosure/pavement	Hommon (1982)	KRC/CHRC
T-10	Stone and concrete pedestal	Rechtman et al. (2011)	KRC
T-13	Terraced platform	Rechtman et al. (2011)	KRC
T-14	Slab paved pathway	Rechtman et al. (2011)	KRC/CHRC
T-15	Concrete slab foundation	Rechtman et al. (2011)	KRC
T-16	Walled enclosure against cliff	Rechtman et al. (2011)	KRC
T-17	Walled enclosure	Rechtman et al. (2011)	KRC
T-18	Walled enclosure	Rechtman et al. (2011)	KRC
T-19	Wall on bedrock outcrop	Rechtman et al. (2011)	KRC
T-20	Wall on bedrock boulders	Rechtman et al. (2011)	KRC
T-21	Walled enclosures against cliff	Rechtman et al. (2011)	KRC
T-23	Parallel terrace walls	Rechtman et al. (2011)	KRC
T-24	Rock/soil terrace against cliff	Rechtman et al. (2011)	KRC
T-25	Soil-filled terraces (gardens?)	Rechtman et al. (2011)	KRC
T-26	Rock/soil terraces against cliff	Rechtman et al. (2011)	KRC
T-27	Concrete and rock foundation	Rechtman et al. (2011)	KRC
T-28	Concrete and rock foundation	Rechtman et al. (2011)	KRC
T-29	Concrete and rock foundation	Rechtman et al. (2011)	KRC
T-35	Old rail bed (?)	Rechtman et al. (2011)	KRC/CHRC
T-36	Japanese cemetery	Rechtman et al. (2011); Genz and Hammatt (2011)	KRC
T-37	Modified areas on cliff face	Rechtman et al. (2011)	ARC
-	Burials in cliff face	Genz and Hammatt (2011)	ARC
-	Concrete bunker	Beckett and Singer (1999)	CHRC

*ETA-Eastern Tableland Array; KRC-Kawailoa Road Corridor; CHRC-Cane Haul Road Corridor; ARC-Ashley Road Corridor (see Figure 33).

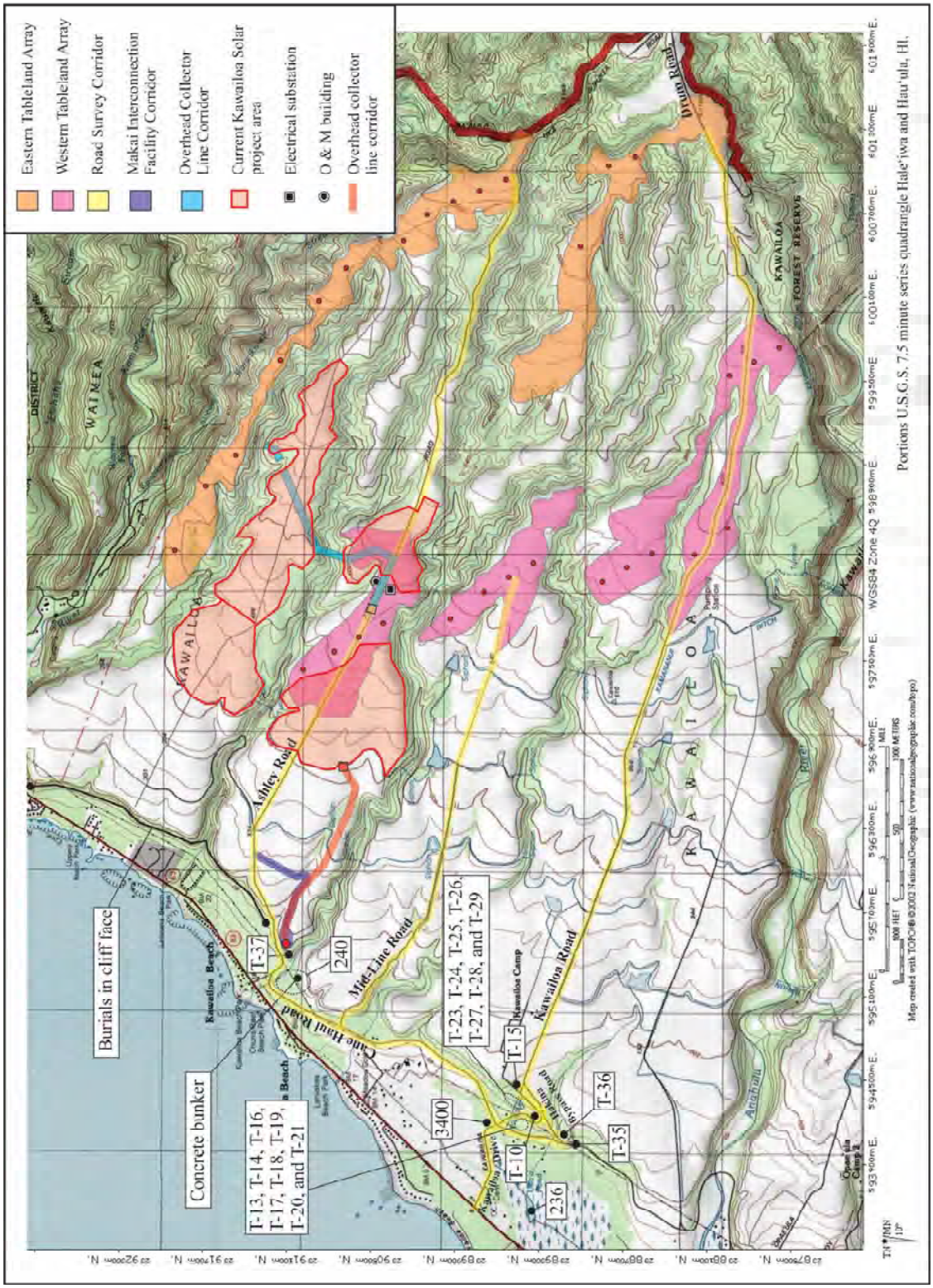

Figure 33. Map showing sites identified by Rechtman et al. (2011) nearby, but outside of the Kawailoa Wind Farm project

Subsequent to the archaeological inventory survey, and during the development of the Kaiwailoa wind farm archaeological monitors were present and observed the grubbing, mass excavation, and foundation trenching activities associated with the construction of 30 turbine pad locations; two locations were building compounds are to be located, the widening and improvement of roughly 17 miles of roadway; the excavation of roughly 13 miles of drainage control features and roughly 6 miles of underground utility trenches, and the removal of obsolete electrical infrastructure. While there was one instance where middle twentieth century refuse was encountered in a discrete cluster, during the course of this monitoring project there were otherwise no significant intact cultural deposits, archaeological features, or human skeletal remains observed (Rechtman 2012).

3. PROJECT AREA EXPECTATIONS

The results of previously conducted archaeological research (discussed in detail above) allow for an informed guess as to the types of earlier sites one would expect to encounter given the physical setting of the current project area. Judging from previous ethnohistorical and archaeological work (c.f. McAllister 1933; Sterling and Summers 1978; Hommon 1982; Kirch 1992; Pantaleo and Titchenal 2005; Genz and Hammatt 2011), it was anticipated and confirmed by Rechtman et al. (2011) that most Precontact sites in the vicinity of the Kawailoa Wind Farm would be located along the coastal escarpment (*makai* of the current Kawailoa Solar Power study area; see Figure 33 and Table 8). Locally transmitted oral traditions (Genz and Hammatt 2011) relate, and archaeological work (Pantaleo and Titchenal 2005) documents, that the area of the *makai* escarpment and below were a favored place for burial during Precontact and early Historic times. Additionally, McAllister (1933) and Sterling and Summers (1978) describe a priestly residential area (Site 240) located on an oval-shaped elevation inland of Cane Haul Road south of its intersection with Ashley Road; Rechtman et al. (2011) documented modified areas in the cliff face nearby this general location.

Further to the south, but at more proximate inland areas, Kirch (1992) suggests that cultivators within the Anahulu valley used the rich tablelands for shifting cultivation prior to European settlement. *Māhele* land claims from the valley refer to swidden-like garden plots in the flat portions of mountains, which could refer to the surrounding tablelands. Moreover, maps of land claims in upper portion of the valley show winding trails connecting valley bottom residences and terraced fields with tableland top ridge spurs (Kirch 1992:51). It is possible, however only remotely so, that Precontact features (possible trail routes and temporary habitations associated with forest resource extraction and swidden-like agriculture) have survived in the tablelands in spite of the more recent land use activities.

As for later Historic Period resources, late nineteenth and early twentieth century maps show several plantation camps located both below and above the *makai* escarpment along with an extensive network of irrigation features farther upslope. The plantation camps and the irrigation features were part of successive plantation efforts associated with large-scale sugarcane and pineapple cultivation. Historical documentation (e.g., see Dorrance and Morgan 2000; Wilcox 1996) indicates that plantation agricultural may have begun impacting the Kawailoa landscape as early as 1898, and that by the late 1920s irrigated fields and associated infrastructure (formal and informal ditches, pipes, tunnels, a few pump houses, several reservoirs, roads, and railway lines) covered vast portions of the Kawailoa lands (see Figure 5). Beginning in ca. 1939, gun emplacements and a military command and fire control communication system were established at key locations in and around the study area as part of O‘ahu’s coastal defenses (Bennett 2002; Gaines 2002; Sugimoto 1996; Takamura 1995). The defenses were mostly dismantled immediately following World War II. By the middle twentieth century, the plantation railway system was defunct and was replaced by roads for trucks to haul cane. Within the current study area, the formal plantation activities, primarily the cultivation of pineapple, persisted until 1996.

As documented by Rechtman et al. (2011) and Rechtman (2012) within the Kawailoa Wind Farm project area, the extensive and intensive plantation use of the tablelands in the general vicinity of the current study area has significantly impacted and in most cases completely destroyed any earlier archaeological features. It is the expectation that within the current Kawailoa Solar Power study area, Historic Period features related to plantation irrigation, transportation, and housing will make up the majority of the archaeological features observed. Rechtman et al. (2011) previously documented two archaeological sites, Site 7169 (the upper Mid-Line Road Ditch Complex) and Site 7171 (the Ashley Road Ditch Complex), *makai* of the current study area near the Waimea 6 and Kawailoa 15 survey areas. The Hawaiian Pineapple Co.’s Waimea Camp was formerly situated near the *makai* boundary of the Waimea 8 survey area (prior to the 1960s), but archaeological surface survey of the camp area (Rechtman et al. 2011) and subsequent archaeological monitoring of development activities at the former location of the camp during the construction of the Kawailoa Wind Farm (Rechtman 2012) failed to identify any remnants of the camp’s infrastructure.

4. FIELDWORK

Archaeological fieldwork for the current project was conducted November 12-30, 2013 by Robert Rechtman, Ph.D., Matthew Clark, B.A., Ashton Dircks Ah Sam, B.A., J. David Nelson, B.A., and Genevieve Glennon, B.A. Additional fieldwork was conducted October 1-2, 2014 by Robert Rechtman, Ph.D. and Samuel Plunkett, B.A.

METHODS

As described above, the study area consists of tableland ridges for the placement of five Kawailoa solar power arrays and appurtenant facilities. Given the negative findings of the Rechtman et al. (2011) study with respect to archaeological sites in the former plantation fields, a spacing interval of fifty meters was deemed adequate for inspecting the project area tablelands. The survey areas were traversed from gulch edge to gulch edge (north/south) or, when *mauka/makai* roads were present, between the roads and the gulch edges. Thick stands of Guinea grass limited visibility to a few meters in most areas on the tablelands, but the only un-mechanically disturbed portions on the tablelands appear to have been the outer edges beyond the proposed project area limits. The comparatively intact rims of the tablelands and the ridge fingers that spread out from them at the drop-off into the neighboring gulches were surface inspected in a *mauka*/*makai* direction independently of the pedestrian transects. These comparatively intact gulch edges and ridge fingers were inspected in the hope of finding features that once might have extended up onto the tablelands from the gulches. However, the upper plateaus on which the solar arrays are to be erected contained virtually no natural stone, which made the occurrence and identification of surface features unlikely. For the overhead collector corridor the survey spacing interval was reduced to 10 meters.

During the surface inspection of the survey areas, all encountered potential archaeological resources such as natural boundaries, survey markers, existing plantation and wind farm infrastructure, and land alterations (e.g., bulldozing, fence lines, roads, etc.) were plotted on a scaled map of the study area using Garmin Vista Hcx handheld GPS technology (set to the NAD 83 datum). All of the identified archaeological features were then mapped, photographed, and described using standardized description forms. During the fieldwork an attempt was also made to inspect those sites previously identified outside of the current study area but within the overall subject property to verify their locations relative to the current study area boundary. Archival cartographic material showing the old plantation infrastructure was also reviewed and correlated with the field findings.

FINDINGS

One new archaeological site (SIHP Site 7716) and one previously recorded site (SIHP Site 7171) were identified within the current proposed *makai* Collector Line Corridor (Table 9). This latter site (Site 7171) is along the *makai* edge of a road that borders the *makai* edge of the Waimea 6 survey area (within the footprint area for the *makai* solar substation) and extends all the way to the Waimea 5 solar array survey area (Figure 34). SIHP Site 7171 (another abandoned and remnant irrigation ditch) was encountered roughly 2/3 the way down to the Makai Interconnection Facility (see Figure 34). A description of the portion of this newly recorded site within the collector line survey corridor is presented below. There were no sites identified within any of the four solar array survey areas, which were extensively transformed by modern plantation agricultural and intensively used for the cultivation of sugarcane and pineapples until the 1990s (see Figures 6, 7, 8, and 9). Remnant modern plantation infrastructural elements, including field roads, PVC waterlines, and bulldozer berms, were noted throughout all of the survey areas and, despite the thick vegetation currently blanketing the project area, it was evident that most of the former plantation fields surveyed for the proposed Kawailoa Solar Power project, prior to being abandoned, were covered in black plastic weed matting, and had parallel lines of black plastic drip line extending through them at regular intervals (Figure 35). As suggested by the results of the Rechtman et al. (2011) and Rechtman (2012) studies, no evidence of the former Hawaiian Pineapple Company's Waimea Camp (see Figures 6 and 29) was identified on the surface of the current Waimea 8 survey area.

The ditch complex (SIHP Site 7171) recorded by Rechtman et al. (2011) *makai* of the Waimea 6 survey area (see Figure 31) was re-located and re-examined. This ditch complex appears to have been slightly impacted by construction activities associated with the development of the Kawailoa Wind Farm (i.e. the widening of Ashley Road), and is currently not functioning to carry water, as the antiquated ditch system in the vicinity of the current project area has been replaced by large diameter waterlines. SIHP Site 7171, however, extends well beyond the corridor surveyed by Rechtman et al. (2011), and it has the potential to be impacted by both the proposed *makai* collector line, the *makai* solar substation, and the development of the Waimea 5 solar array (see Figure 34). Accordingly, Site 7171 received additional recording during the current fieldwork and an updated description of the site is presented below.

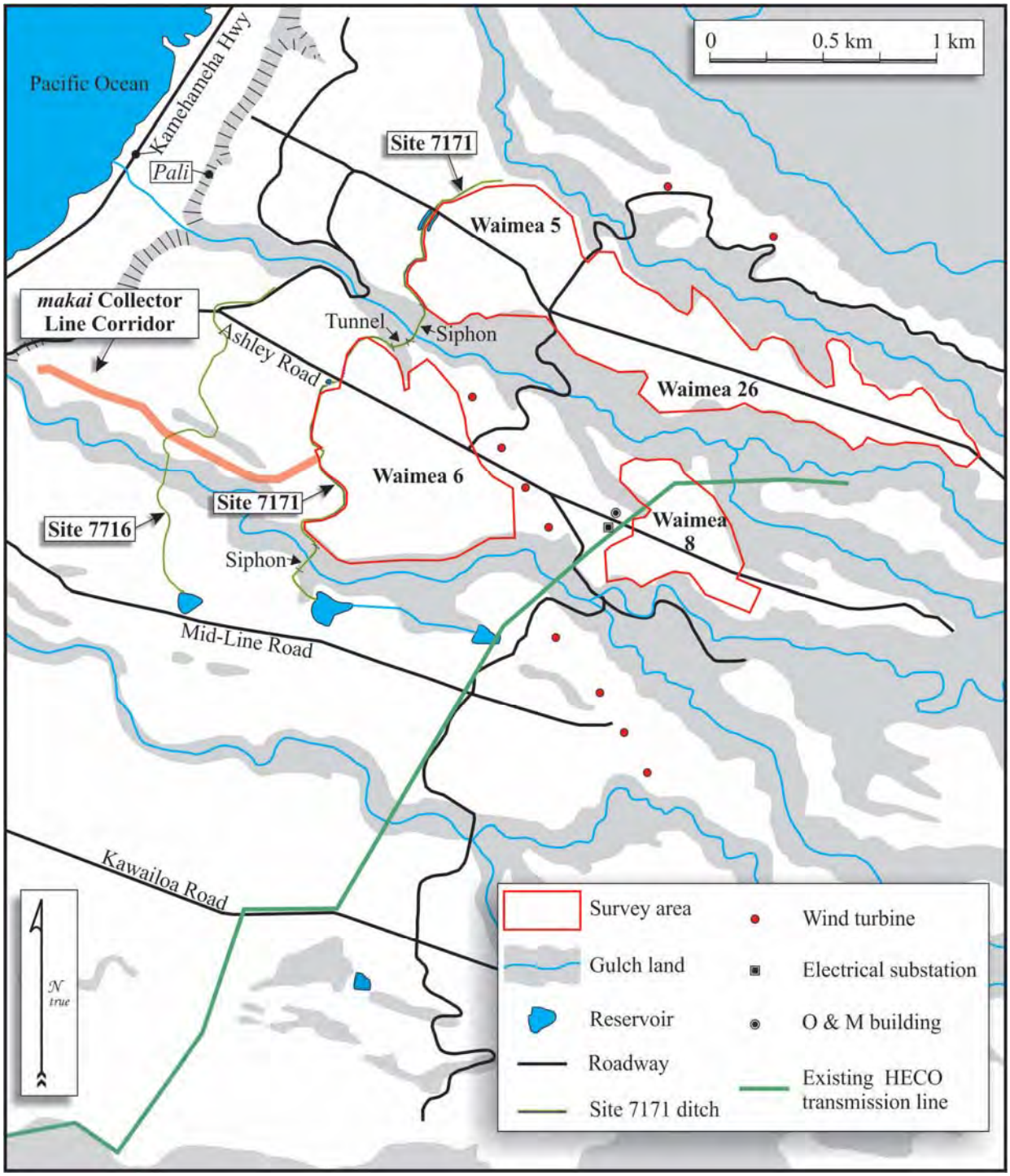

Figure 34. Site location map.

Table 9. Sites with the potential to be impacted by the proposed development.

Site #	*Description*	*Function*	*Association*
50-80-04-7171	Ditch complex	Agricultural irrigation	Plantation
50-80-04-7716	Ditch complex	Agricultural irrigation	Plantation

Figure 35. Plastic drip line and weed matting in an un-vegetated portion of the Waimea 6 survey area, view to the northeast.

SIHP Site 50-80-04-7171

Site 7171, originally recorded by Rechtman et al. (2011), was the designation assigned to a plantation-era irrigation ditch that extends northeast and southwest from Ashley Road following the 410-foot contour (Figure 36). Rechtman et al. (2011) describe Site 7171 as follows:

> South of the road [Ashley Road] the basalt and cement walls of the ditch can be seen sticking out above re-deposited red soil [Figure 37], while north of the road the entire canal has been covered by soil [Figure 38]. Judging from the exposed canal rims, the two-meter wide ditch is constructed from carefully cut basalt blocks joined together and capped with cement. The ditch widens to three meters where it abuts a buried culvert beneath Ashley Road [see Figure 36]. An elongated water retention pond occurs southwest of the intersection between the ditch and the road. Linking this pond with Site 7171 is a sluice gate complex. This complex, which is 50 meters southwest of Ashley Road and outside the [wind farm] project area, contains two sluice gates, with the wooden gate slots and a slot for a plank still visible in one. On the cement capping of the sluice gate is incised, partly in picture writing, "Victor (arrow and heart symbol) Patience DEC. 3 1987-88." Cross-hatched incisions frame the top end of the writing. A dirt road follows the *mauka* edge of Site 7171 across the [Ashley Road] survey corridor. This irrigation ditch is part of the Kamananui ditch system that was created by the Waialua Agricultural Co. during the early to mid-1900s. To the south [of Ashley Road] the ditch once connected with the Mid-Line Road ditch system [Site 7170; see Table 7 above], and to the north the ditch continued nearly to the Eastern Tableland Array, carrying water the northernmost portion of the Wailua Sugar Co.'s lands. (Rechtman et al. 2011:141)

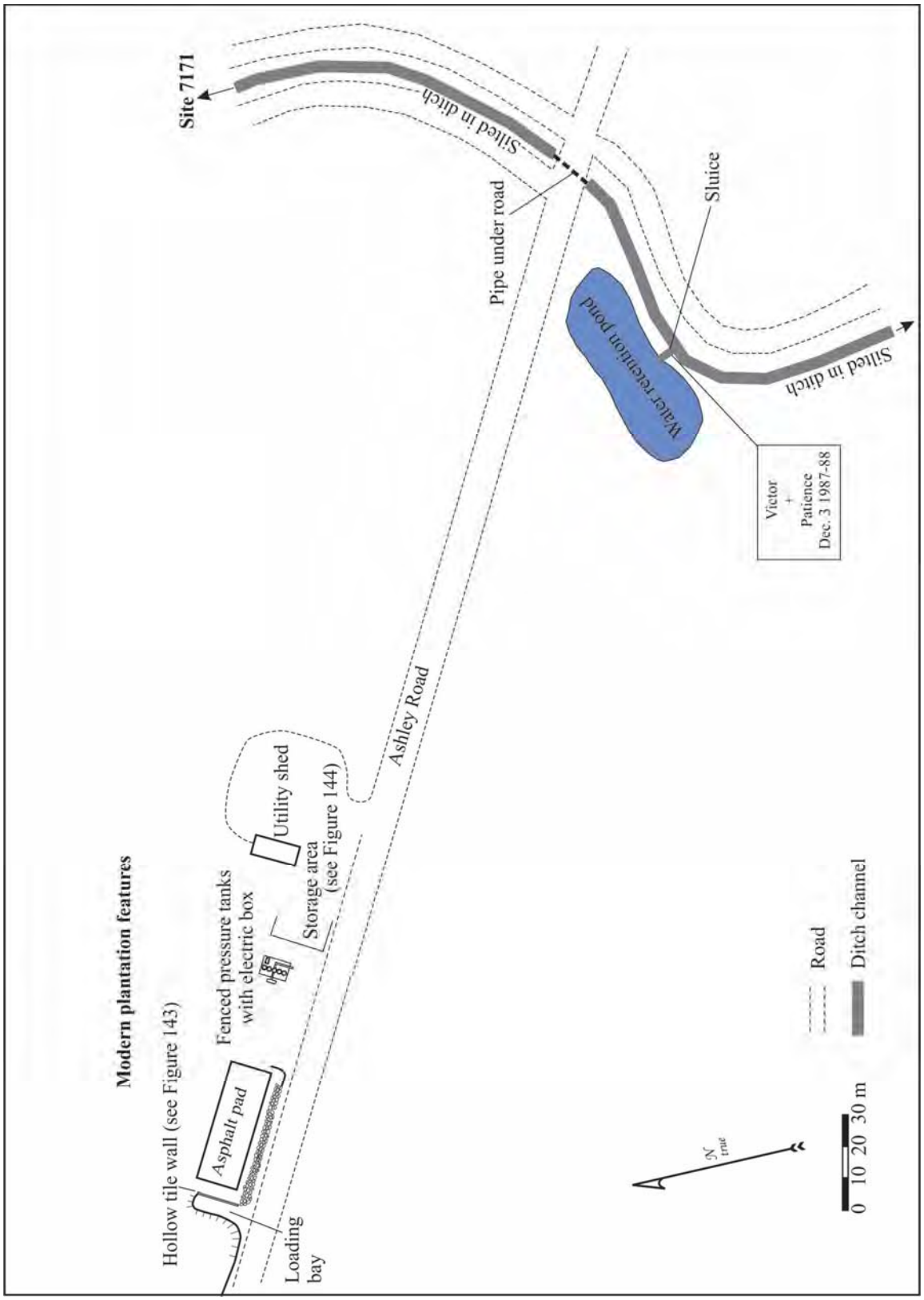

Figure 36. Plan view of Site 7171 prepared by Rechtman et al. (2011:143).

Figure 37. Site 7171, view to the south (from Rechtman et al. 2011:142).

Figure 38. Site 7171, view to the north (from Rechtman et al. 2011:142).

A plan view of Site 7171 prepared for the purposes of the current study shows the full extent of the ditch system as it follows the road along the *makai* boundaries of the Waimea 5 and 6 survey areas and crosses the gulch between them (Figure 39). The ditch complex, as shown in the 1928 U.S.G.S. Haleiwa quadrangle (see Figure 5), is the uppermost ditch in the Waimea section of the plantation. It extends well beyond the limits of the Rechtman et al. (2011) Ashely Road survey corridor, and is more aptly called the upper Waimea Ditch Complex, a name that will be applied to Site 7171 throughout the remainder of this report.

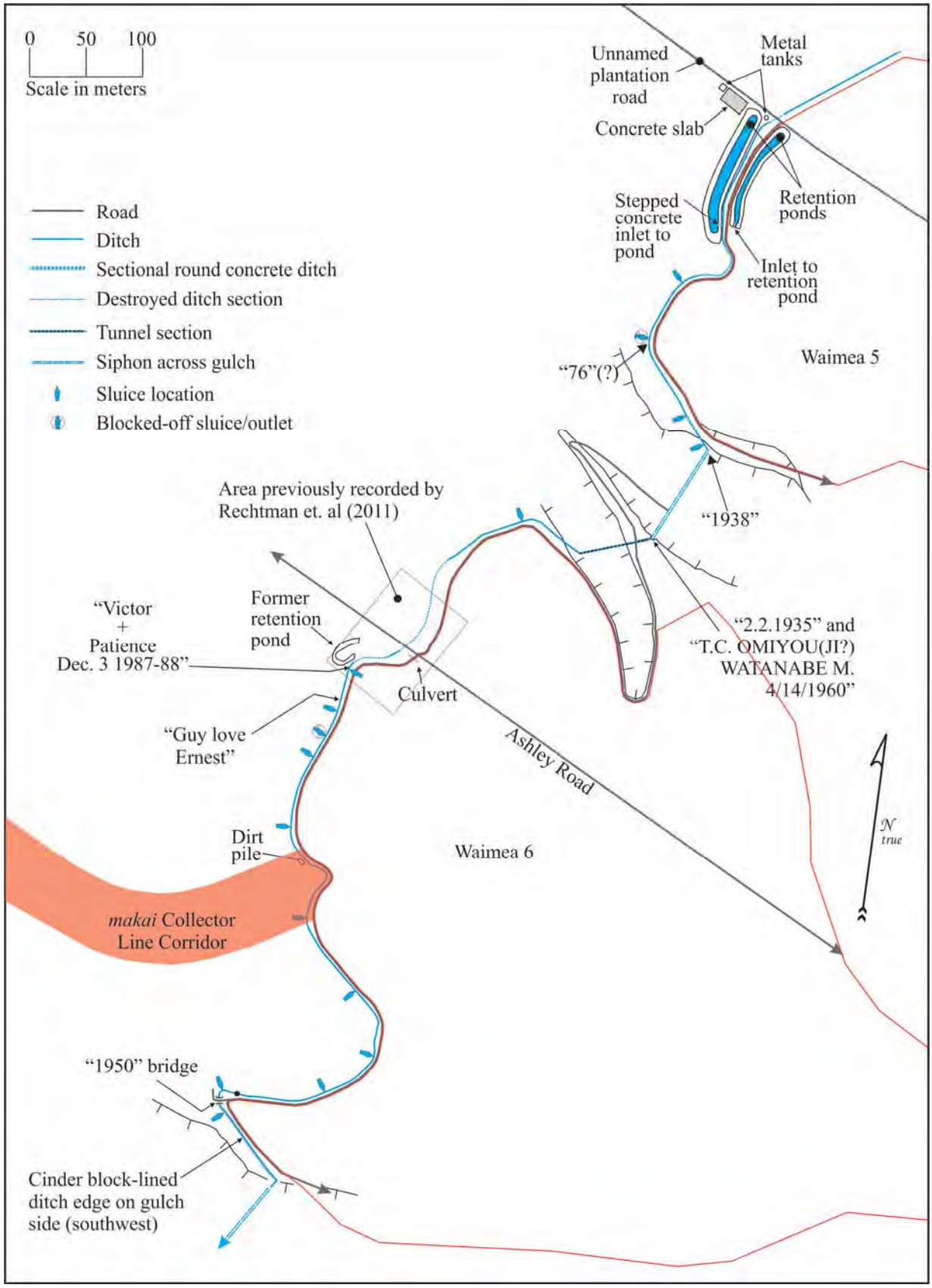

Figure 39. Plan view of Site 7171.

South of Ashley Road (Figure 40), Site 7171 is located entirely along the *makai* edge of the dirt road that defines the western boundary of the Waimea 6 survey area, and it crosses the Overhead Collector Line Corridor survey area (see Figure 39). This section of the ditch, which extends roughly 1,055 meters southwest following a meandering course to a gulch along the southern edge of the Waimea 6 survey area, is no longer maintained and is overgrown with Guinea grass (Figure 41). A large diameter water line has been placed within the former canal channel and covered over with soil. The water line extends beneath Ashley Road through the same pipe that once carried water beneath the road. The northern levee of the retention pond recorded by Rechtman et al. (2011) within the Ashley Road Corridor has been destroyed and the pond no longer holds water (Figure 42). The Victor (arrow and heart symbol) Patience DEC. 3 1987-88." inscription is still evident in the concrete of the former sluice gate complex, and another inscription that reads "GUY LOVE ERNEST" was noted in the concrete south of the former retention pond along the upper edge of the ditch (see Figure 39). A number of former sluices are present in the *makai* edge of this section of Site 7171, some have wooden gates (Figure 43), some are open with no gate, and some were permanently sealed with concrete (Figure 44) prior to the abandonment of the ditch system. As Site 7171 nears the gulch along the southern edge of the Waimea survey area it turns ninety degrees to the southeast and continues 115 meters along the northern edge of the gulch to a siphon (Figure 45) that connects with the lower Mid-Line Road Ditch Complex (Site 7170) in the Kawailoa section of the plantation (see Figure 5). A concrete bridge (Figure 46) with the inscription "3/4/50", indicating the date it was constructed, crosses the Site 7171 ditch complex where it makes the ninety degree turn (see Figure 39).

Figure 40. Site 7171, view to the south from the southern edge of Ashley Road.

The section of Site 7171 located north of Ashley Road (see Figure 39), although shorter in length, is very similar to the section located south of the road. The northern section extends for roughly 347 meters to the northeast following a meandering course to a gulch along the northern edge of the Waimea 6 survey area. This section is also situated entirely along the *makai* edge of the dirt road that defines the western boundary of the Waimea 6 survey area and will not be impacted by the proposed Kawailoa Solar Power Project. Much of the northern section was already mostly buried in soil at the time of the Rechtman et al. (2011) study (see Figure 38), and now portions of the ditch (especially at its southern end nearer to Ashley Road) are completely buried, covered in thick Guinea grass (Figure 47), and no longer visible. A large diameter water line is buried in the southern portion of this section of the ditch, but it has not been covered with soil at the northern end (Figure 48).

Figure 41. Site 7171, ditch section south of Ashley Road, in the vicinity of the proposed *makai* Solar Substation and the *makai* Collector Line Corridor, view to the southwest.

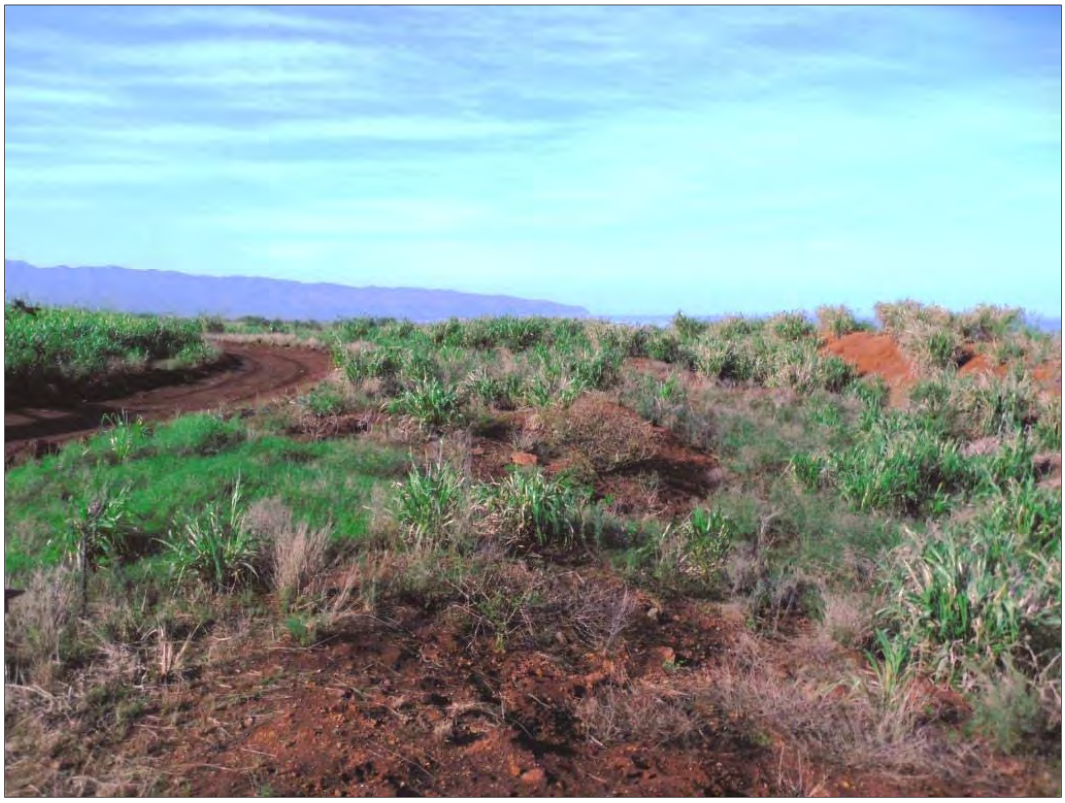

Figure 42. Site 7171, former retention pond south of Ashley Road, view to the southwest.

Figure 43. Site 7171, wooden sluice gate, view to the west.

Figure 44. Site 7171, former sluice sealed with concrete, view to the west.

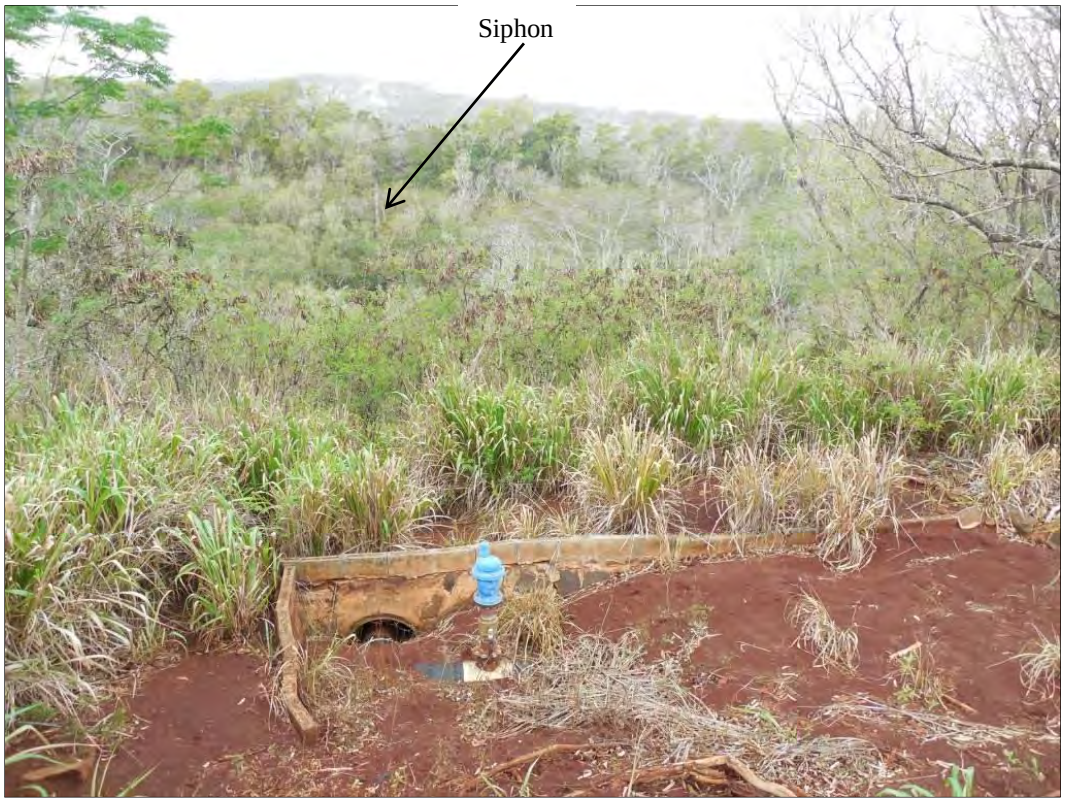

Figure 45. Site 7171, siphon across the gulch south of the Waimea 6 survey area, view to the south.

Figure 46. Site 7171, ditch following the gulch along the southern edge of the Waimea 6 survey area, view to the northwest (note the concrete bridge in the background).

Figure 47. Road that the Site 7171 ditch follows north of Ashley Road, view to the north. This is the same area photographed by Rechtman et al. (2011) in Figure 38.

Figure 48. Site 7171, water line within the ditch, view to the southwest.

As the ditch approaches the gulch between the Waimea 5 and Waimea 6 survey areas (see Figure 39), it turns ninety degrees to the southeast following the southern edge of the gulch for 85 meters to a point where it feeds into a pipe (Figure 49) that continues underground to the north, extending beneath a shallow drainage finger for 100 meters, to another short section of basalt and concrete ditch directly adjacent to the larger gulch edge (Figure 50). The outlet of the pipe into the southern end of this short section of ditch is inscribed with the date "2.2.1935." (Figure 51). At its north end, the short section of ditch feeds into a siphon that crosses the gulch to a ditch that follows the dirt road along the *makai* edge of the Waimea 5 survey area (see Figure 39). The concrete cap along the northern edge of the ditch at the siphon has been inscribed with the date "4/14/1960" (on a patched area) and the names "T. C. Omiyou[ji]" (?) and "Watanabe M." (Figure 52).

Figure 49. Site 7171, pipe extending beneath a shallow gulch finger north of the Waimea 6 survey area, view to the north.

On the north side of the gulch, the Site 7171 siphon feeds into a basalt and concrete ditch section near the southwestern corner of the Waimea 5 survey area (see Figure 39) that has a "1938" date stamped in concrete above the pipe opening (Figure 53). From the gulch edge, the Site 7171 ditch extends northwest and then north for 1,125 meters to the unnamed plantation road that that extends through the center of the Waimea 5 survey area. The ditch follows a meandering course along the *makai* edge of the of the dirt road that defines the western boundary of the Waimea 5 survey area and will not be impacted by the proposed Kawailoa Solar Power Project development. This section of ditch, like the sections on the opposite side of the gulch, is no longer maintained, contains a buried water line, and is obscured by soil and Guinea grass (Figure 54). Several sluice location are present in the *makai* edge of the ditch, indicating where water would have been drawn off to water fields down slope of Site 7171 (see Figure 39). The number "76" is inscribed in a concrete slab gate at one of the former sluices (Figure 55).

As the Site 7171 ditch nears the southern edge of the unnamed plantation road that extends through the center of the Waimea 5 survey area, two former retention ponds are present along either edge of the dirt road that defines the western boundary of that survey area (see Figure 39). Based on a review of aerial photographs, these former ponds were created and connected to the upper Waimea Ditch System sometime between 1977 (see Figure 8) and 1993 (see Figure 9). The *mauka* pond, which is the only portion of Site 7171 situated within the proposed Kawailoa Solar Power project area, has the potential to be impacted by the development of the Waimea 5 solar array. Neither of the retention ponds are still functioning, but a 2008 aerial image (Figure 56) shows that the *makai* pond was holding water at that time, and that both ponds were located at the northern termination of the Site 7171 ditch (in 2008).

Figure 50. Site 7171, short section of basalt and concrete ditch adjacent to the southern edge of the large gulch separating the Waimea 5 and Waimea 6 survey areas, view to the east.

Figure 51. Site 7171, pipe outlet with the inscription “2.2.1935.”, view to the south.

Figure 52. Site 7171, siphon across the gulch between the Waimea 5 and Waimea 6 survey areas, view to the northeast.

Figure 53. Site 7171, siphon opening with near the southwestern corner of the Waimea 5 survey area, view to the south.

Figure 54. Site 7171, typical ditch section *makai* of the Waimea 5 survey area, view to the northwest.

Figure 55. Site 7171, former sluice with the number “76” etched into the concrete slab gate, view to the southwest.

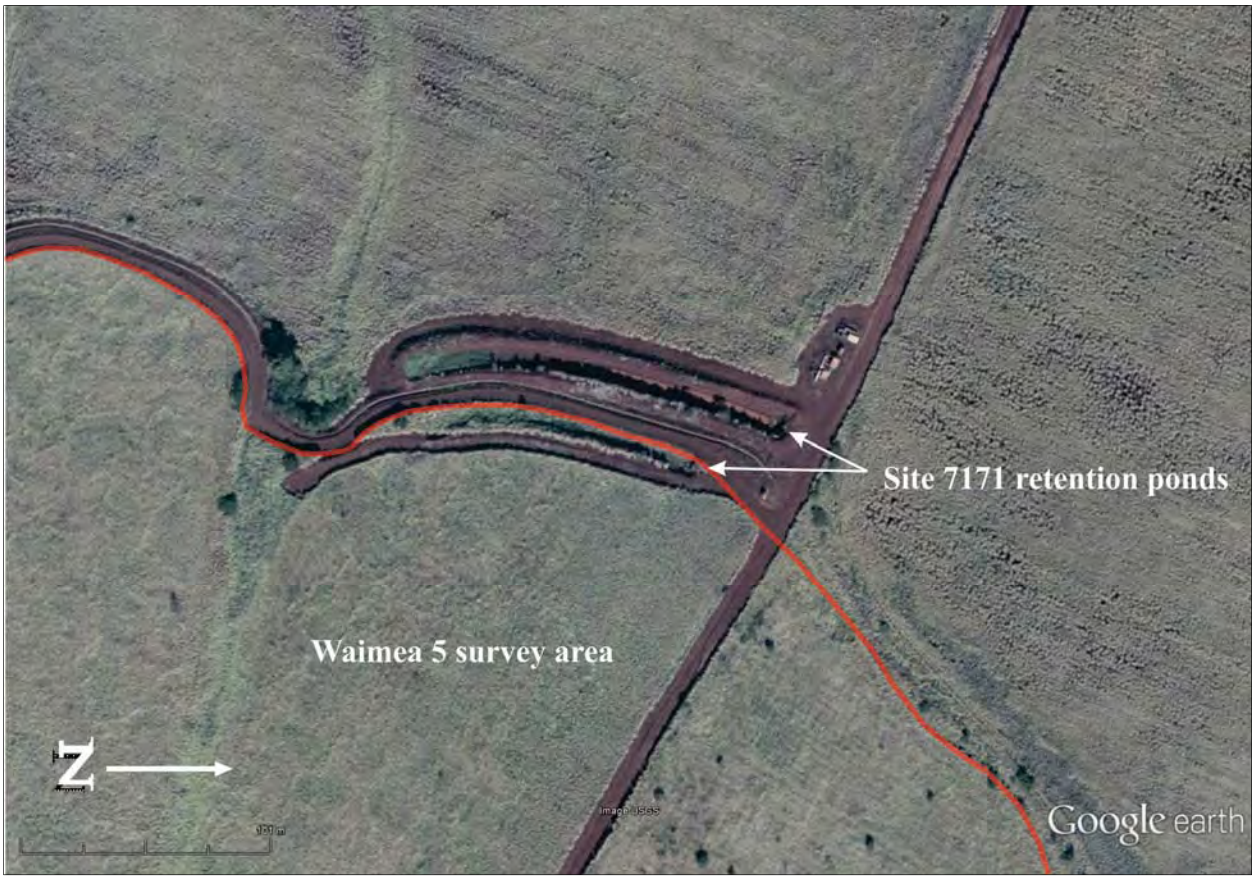

Figure 56. 2008 Google Earth image showing the Site 7171 retention ponds.

Both retention ponds at Site 7171 are long and narrow (although the *makai* pond is larger), and are both currently overgrown with Guinea grass. The *mauka* pond, within the Waimea 5 survey area (Figures 57 and 58), measures approximately 130 meters by 12 meters by three to five meters deep, while the *makai* pond (Figure 59) measures approximately 165 meters by 15 meters by six meters deep. Side channels in the Site 7171 ditch connect to the southern ends of each of the retention ponds (see Figure 39). The connection to the *mauka* pond is a silted-in metal pipe that extends beneath the dirt road (Figure 60); the connection to the *makai* pond is a stepped concrete channel that is roughly 80 centimeters deep by 50 centimeters wide (Figure 61). Water fed into these ponds by the Site 7171 ditch would have been drawn out through pipes and used to water fields (PVC pipes can be seen sticking up out of the bottom of the *makai* pond; Figure 62). The buildings evident in the 2008 aerial photograph *makai* of the ponds along the unnamed plantation road may have housed pumps used to distribute water. A concrete slab and water tank are currently present at that location. Another metal water tank (Figure 63) is located at the northern end of the *makai* pond. The Site 7171 ditch continues beyond the retention ponds to the south edge of the unnamed plantation road, where it once entered a pipe that extended beneath the roadway (currently a large diameter water line T-intersection with a shut off valve and pressure gauge are located in the ditch adjacent to the southern edge of the road; Figure 64).

To the north of the unnamed plantation road, the Site 7171 ditch (and the dirt road that it follows) have been abandoned for a longer period of time than the rest of the upper Waimea Ditch Complex (see Figure 56), and consequently both the ditch and road are buried beneath a nearly impenetrable blanket of Guinea grass. The thick vegetation prevented detailed inspection of this section of the ditch, but its remnants were observed at a few locations to the north of the road to ensure that it stayed *makai* of the proposed Waimea 5 solar array, which it does. As can be seen in Figure 5, the Site 7171 ditch once continued to the northeast along the *makai* edge of the dirt road that defines the western boundary of the Waimea 5 survey area nearly to the next gulch where it terminated. This northernmost section of Site 7171 will not be impacted by the proposed development of the Kawailoa Solar Power Project.

Figure 57. Site 7171, former *mauka* retention pond, view to the east.

Figure 58. Site 7171, former *mauka* retention pond, view to the south.

Figure 59. Site 7171, former *makai* retention pond, view to the south.

Figure 60. Site 7171, pipe extending east to the southern end of the *mauka* retention pond, view to the east.

Figure 61. Site 7171, stepped concrete channel between the ditch and the southern end of the *makai* retention pond, view to the east.

Figure 62. Site 7171, PVC pipes protruding from the bottom of the *makai* retention pond, view to the south.

Figure 63. Site 7171, water tank at the north end of the *makai* retention pond, view to the northwest.

Figure 64. Site 7171, termination of the ditch at the southern edge of the unnamed plantation road, view to the south.

SIHP Site 50-80-04-7716

Site 7716 is a concrete irrigation ditch complex that extends across a portion of the current survey area (see Figure 34). This ditch roughly following the 320-foot contour, and was part of a larger system of irrigation ditches created by the Waialua Agricultural Co. during the early to mid-1900s. The ditch spans the entire width (100 feet) of the current "*makai* Connector Line" survey corridor, and it continues both to the north and south with an overall length of approximately 1.9 miles (3 kilometers). This ditch complex, as shown in the 1928 U.S.G.S. Haleiwa quadrangle (see Figure 5), is the lower ditch in the Waimea section of the plantation, and will be referred to as the lower Waimea Ditch Complex.

This ditch was constructed using quarter pipe concrete sections each measuring 90 centimeters long by 4 centimeters thick. The section are joined both laterally (along the length of the feature) as well as centrally to the opposing quarter pipe sections with cold concrete joints (Figure 65). The upper portion of the ditch measures 1 meter wide, and it is 57 centimeters deep. This portion of the ditch appears to have flowed to the north, but given its state of disrepair and neglect, this section of Site 7716 has not been in use for years. A representative section of ditch was cleared and photographed (Figures 66 and 67).

A sluice feature was also observed in this segment of the ditch, with the ditch section terminating (Figure 68) then picking up again after the sluice feature. The sluice box, which measures 2 meters long by 1.4 meters wide, was poured in place with 15 centimeter meter thick concrete walls. There were two sets of double wooden gates (Figure 69); one set controlled the flow within the ditch, and the other set allowed for flow *makai* into an adjacent field. Both sluice gate spaces are currently blocked with boulders (Figure 70), and the ditch on the northern side of the sluice is almost completely obscured, having been completely filled in with dirt.

A comparative examination of Figure 27 and Figure 5 indicates that this section of the lower Waimea Ditch Complex was built after 1901 and before 1928. Given the style of the ditch (concrete quarter pipe sections) and sluice feature (poured in places with double wooden gates), this temporal assignment fits with the ditch construction chronology presented by Rechtman et al. (2011) for the overall Waialua Agricultural Company plantation lands in their Waimea, Kawailoa and adjacent Opae'ula fields.

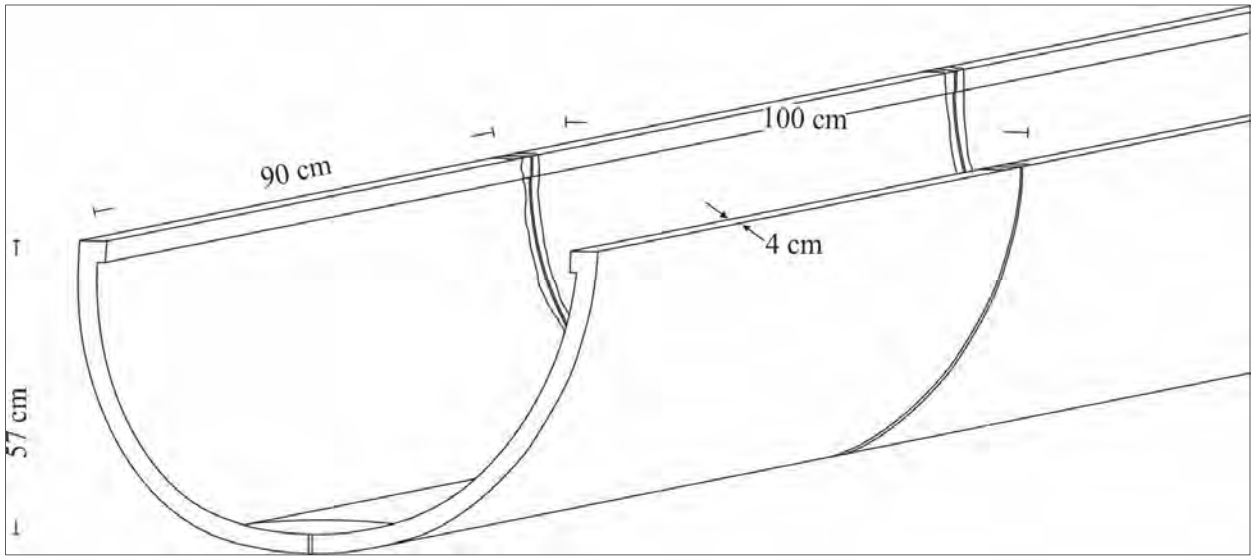

Figure 65.Schematic drawing of Site 7716 concrete irrigation ditch showing segmented construction.

Figure 66. Site 7712 cleared portion of concrete irrigation ditch.

Figure 67. Site 7712 showing sectional concrete ditch elements.

Figure 68. Site 7712 junction of ditch and sluice box, view to the south.

Figure 69. Site 7712 example of double wooden sluice gates controlling water flow into adjacent fields, view to the southwest.

Figure 70. Site 7712 filled in sluice gate area along ditch flow, view to the north.

5. SIGNIFICANCE EVALUATION AND TREATMENT RECOMMENDATIONS

The sites documented during the current study are assessed for their significance based on criteria established and promoted by the DLNR-SHPD and contained in the Hawai‘i Administrative Rules 13§13-284-6. This significance evaluation should be considered as preliminary until DLNR-SHPD provides concurrence. For a resource to be considered significant it must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

A Be associated with events that have made an important contribution to the broad patterns of our history;

B Be associated with the lives of persons important in our past;

C Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

D Have yielded, or is likely to yield, information important for research on prehistory or history;

E Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional 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.

The significance and recommended treatments for Sites 7171, the upper Waimea Ditch Complex, and Site 7716, the lower Waimea Ditch Complex, are discussed below and presented in Table 10. A portion of Site 7171, adjacent to Ashley Road, was previously evaluated by Rechtman et al. (2011) as significant under Criterion D, and no further work was recommended. A similar assessment and determination was also made for a portion of Site 7716 (then considered a part of Site 7170) during the Rechtman et al. (2011) study. As DLNR-SHPD provided concurrence for these significance evaluations and treatments; similar evaluations and treatments are proposed here.

Table 10. Site significance and treatment recommendations.

Site #	*Description*	*Association*	*Significance*	*Treatment*
7171	Ditch complex	Plantation	D	No further work
7716	Ditch complex	Plantation	D	No further work

Site 7171, although non-functional, does retain sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O‘ahu. This site was recorded and investigated during an earlier study (Rechtman et al. 2011) and further documented during the current study. It is suggested that a reasonable and adequate amount of information has been collected from and about this site as a result of the past the current studies to warrant a continued no further work recommendation; and thus, a no historic properties affected determination for this site with respect to the proposed Kawailoa Solar Power Project.

Site 7716, also non-functional and in many places intentionally buried, and like Site 7171 does retain sufficient integrity to be considered significant under Criterion D for the historical information it has yielded relative to the development of the plantation industry on the north shore of O‘ahu. Two small portions of this site may be impacted by the construction of an access and maintenance road servicing the *makai* collector line, however it is suggested that a reasonable and adequate amount of information has been collected from and about this site as a result of the current study to warrant a no further work recommendation; and thus, a no historic properties affected determination for this site with respect to the proposed Kawailoa Solar Power Project.

It is further recommended, with respect to the overall development, that a program of archaeological monitoring be maintained during the construction activities associated with the Kawailoa Solar Power Project. Such a program will help to ensure that any inadvertently discovered resources would receive immediate attention and protection, while their ultimate disposition is being determined by DLNR-SHPD. A monitoring plan in compliance with HAR 13§13-279 should be prepared and submitted to DLNR-SHPD for review and approval.

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Attachment 9. Visual Simulations of Proposed Project

Location Key for Simulated Views of the Proposed Project

Existing View from Puu o Mahuka Heiau (KOP-1)

Simulated (Revealed) View from Puu o Mahuka Heiau (KOP-1)

Existing View from Mokuleia Beach Park (KOP-2)

Simulated View from Mokuleia Beach Park (KOP-2)

Existing View from Pupukea Road (KOP-3)

Simulated (Revealed) View from Pupukea Road (KOP-3)

Existing View from Kamehameha Highway (KOP-4)

Simulated (Revealed) View from Kamehameha Highway (KOP-4)

Existing aerial view looking *makai* (KOP-5)

Simulated aerial view looking *makai* (KOP-5)

Attachment 10. Reflectivity Study

AVIATION SYSTEMS INC.
Aviation Consultants

Wren Wescoatt
First Wind Energy, LLC
810 Richards Street, Suite 650
Honolulu, HI 96813

Re: Kawailoa PV Reflectivity Study

Dear Mr. Wescoatt:

Thank you for the opportunity to conduct a Reflectivity (or Glare) Study on your Kawailoa Solar Farm Project. As we understand it is a 50 MW photovoltaic single axis 10-degree tilt project located on approximately 304 acres easterly from Kawailoa Beach and Highway 83 along Ashley Road (see following map showing the Project and surrounding area).

As can be seen in the map (Figure 1) the Project is approximately 7.8 NM to the Dillingham Airfield Airport Reference Point ("ARP") on a bearing of 255° but only 7.1 NM to the end of Runway 26 (the nearest runway end). The Federal Aviation Administration ("FAA") ID for Dillingham is "HDH" and it is a Visual Flight Rules facility open to the public by way of an agreement between the US Army and the State of Hawaii. It has 54 based aircraft an approximately 42,000 annual operations of which a large portion is military helicopter and glider training. There is no Air Traffic Control Tower at DIL.

The Project is also 7.8 nautical miles (NM) from the Wheeler Army Airfield's Airport Reference Point ("ARP") and 7.7 NM from the end of Runway 24 (the nearest point of the runway). The relative bearing is approximately 180 ° from the nearest point of the Project to both points. The FAA ID for Wheeler is "HHI" and is also a Visual Flight Rules facility but is available only for private military usage without prior permission. Flight operations information is not available but is believed to involve substantial military and defense training activity. There is an Air Traffic Control Tower ("ATCT") at HHI and it is one of the Observation Points used in the analysis.

Because of the proximity of flight activity at Dillingham and Wheeler the Solar Glare Hazard Analysis Tool ("SGHAT") developed by the Sandia National Laboratories was used. The SGHAT is recommended by the Federal Aviation Administration ("FAA") for glare hazard analysis near airports. It checks various user-specified viewing points (e.g., Air Traffic Controllers' eyes, pilots' eyes along an approach to a runway) for reflections from the photovoltaic panels as the sun moves throughout the sky. The SGHAT has been validated against several on-airport installations of solar panels that

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Tel: 310.530.3188 • Fax: 310.530.3850 • Email: asi@aviationsystems.com • www.aviationsystems.com

initially resulted in glare matching the model prediction. The following brief description of the SGHAT is provided in the tool's User's Manual:

> *With growing numbers of solar energy installations throughout the United States, glare from photovoltaic ("PV") arrays and concentrating solar systems has received increased attention as a real hazard for pilots, air traffic control personnel, motorists, and others. Sandia has developed a web-based interactive tool that provides a quantified assessment of (1) when and where glare will occur throughout the year for a prescribed solar installation, and (2) potential effects on the human eye at locations where glare occurs.*

The SGHAT was applied to the Wheeler ATCT and to typical approach flight paths used by pilots for Runways 06 and 24. Similarly, it was applied to Dillingham Airfield and its approaches to Runways 08 and 26 although, as stated above, there is no ATCT at Dillingham. It was also applied to several locations in the project environs in Haleiwa and Waialua to determine if there is any adverse potential for motorists or at households. In all, fourteen observation points were selected for analysis. The Observation Points are described below along with their geographic locations in latitude/longitude in decimal degrees. The parentheses indicate the ID of each Observation Point used for the map depiction (Figure 2) as well as the SGHAT computer result.

Observation Point	Latitude (decimal degrees)	Longitude (decimal degrees)	SGHAT Result
Wheeler Airfield ATCT	21.48172	-158.03719	No glare
Dillingham Airfield ARP	21.57947	-158.19728	No glare
Puu O Mahuka Helau State Monument (PuuM)	21.64092	-158.05919	No glare
Paakaa Uka Pupukea Rd. (Pupu)	21.64132	-158.02512	No glare
Ashley Rd. and Kamehameha Hwy Intersection (Ashi)	21.62253	-158.08020	No glare
62-490 Kamehameha Hwy (Hale)	21.59825	-158.10300	No glare
Along Kamehameha Hwy 3.4 NM east of Weed Circle (Dole)	21.55048	-158.04996	No glare

68 Farrington Hwy (Moku)	21.58126	-158.18956	No glare
Along Hawaii 82 0.3NM west of Haleiwa Rd (Waia)	21.57504	-158.12193	No glare
61-555 Pohaku Loa Way (Surf)	21.62400	-158.08721	No glare
Wheeler SW Approach	There are 9 points along the path from the threshold to 2 miles out (see appendix)		No glare
Wheeler NE Approach	Same number of points (see appendix)		No glare
Dillingham RWY 08 Approach (from the west)	There are 9 points along the path from the threshold to 2 miles out (see appendix)		No glare
Dillingham RWY 26 Approach (from the east)	Same number of points (see appendix)		No glare

In conclusion, the SGHAT calculates that **none** of the Observation Points will have potential glare. Theoretically, there may be some fleeting early morning instances of potential glare at some points on the Kamehameha Highway or in nearby areas of Haleiwa and Waialua it would be so insignificant that the SGHAT regards it below the calculable reporting threshold. The same conclusion applies to any potential effect on pilots flying the approaches into Wheeler Army Airfield or Dillingham Airfield.

The Project area is also located to the west of the Tactical Flight Training Area ("TFTA") used by the US military for low-level helicopter and ground training activities. The TFTA is designated on FAA Aeronautical charts as A-311 and for flight below 500 feet above ground level ("AGL"). Since these training activities in the TFTA occur at varying times of night and day, and at varying locations and terrain elevations throughout the TFTA, it is not possible to assess precise glare impacts to aviators involved in daytime training. However, based on the Project location relative to the TFTA, it is generally unlikely that the Project would have any significant glare impacts on specific activities or the sustainability of the TFTA's training mission. In fact, any glare at all, would be of extremely short duration and probably barely perceptible to helicopter pilots in the TFTA.

Please refer to the appended material for the SGHAT computer report which contains more detailed information regarding the analysis and findings at the Observation Points above.

Sincerely,

Gary M. Allen, PhD, Esq.

Aviation Systems, Inc.

DeLORME

XMap® 7

TN

MN (9.9°E)

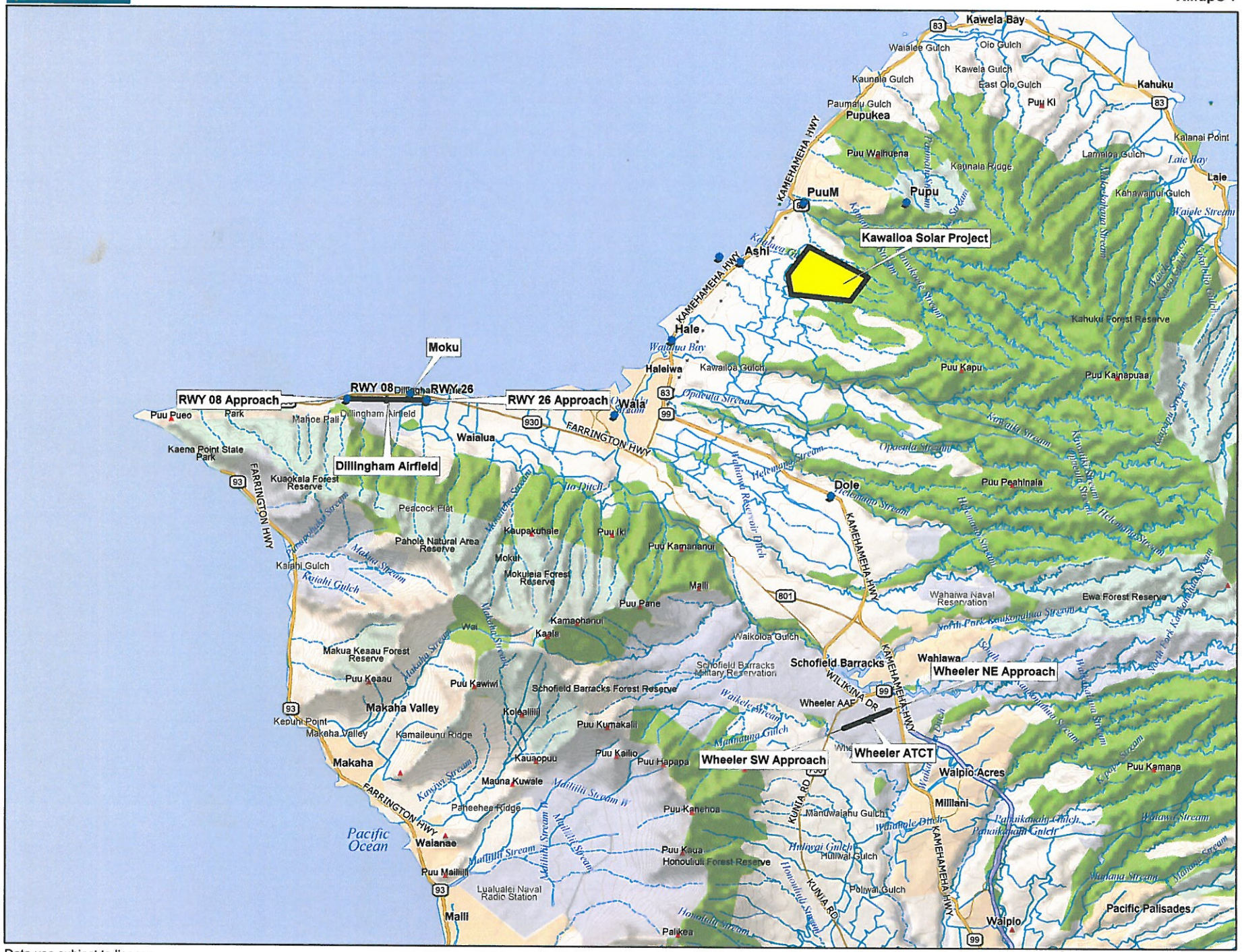
Scale 1 : 225,000

1" = 3.09 NM

Data Zoom 10-0

DeLORME

XMap® 7



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TN

MN (9.9°E)

Scale 1 : 175,000

1" = 2.40 NM

Data Zoom 10-4

APPENDIX I

-Glare Analysis-

Sandia National Laboratories (http://www.sandia.gov/index.html)

UTC-10:00

PV Array | Observation | Flight Path | Animation

Submit for analysis

PV Array

Array name

PV array 1

Description

Axis tracking

Single

Tilt of tracking axis

10 deg

Orientation of tracking axis

180 deg

Offset angle of module

0 deg

☑ Limit the rotation angle?

Maximum tracking angle

45 deg

Rated power

50000 kW

Slope error

10 mrad

☑ Reflectivity varies with incidence angle (view data) (/phlux/sghat/reflectivity-data/)

Module surface material

Smooth glass without ARC

Vertices click to expand/collapse

id	Latitude	Longitude	Ground Elevation	Height of panels above ground	Total elevation
	deg	deg	ft	ft	ft
1	21.61797	-158.03777	728.69	6	734.69
2	21.62738	-158.05743	420.54	6	426.54
3	21.61868	-158.06438	424.17	6	430.17
4	21.61262	-158.06326	415.51	6	421.51
5	21.6107	-158.04361	754.61	6	760.61

Flight Path(s)

Solo Observation Point(s)

name	latitude	longitude	ground elevation	Eye-level height above ground
	deg	deg	ft	ft
	21.64092	-158.05919		

1.PuuM			317.45	5	✖
2.Pupu	21.64132	-158.02512	975.59	5	✖
3.Ashl	21.62253	-158.0802	18.21	5	✖
4.Hale	21.59825	-158.103	9.87	5	✖
5.Dole	21.55048	-158.04996	886.71	5	✖
6.Moku	21.58126	-158.18956	3.28	5	✖
7.Waia	21.57504	-158.12193	16.44	5	✖
8.Surf	21.624	-158.08721	0	3	✖

Sandia National Laboratories (http://www.sandia.gov/index.html)

Results for PV array 1

Summary OP: 1.PuuM OP: 2.Pupu OP: 3.Ashl OP: 4.Hale OP: 5.Dole OP: 6.Moku OP: 7.Waia OP: 8.Surf

Observation	status
OP: 1.PuuM	No glare
OP: 2.Pupu	No glare
OP: 3.Ashl	No glare
OP: 4.Hale	No glare
OP: 5.Dole	No glare
OP: 6.Moku	No glare
OP: 7.Waia	No glare
OP: 8.Surf	No glare

Energy

Max produced annually, assuming sunny skies every day. Assumptions about local weather conditions, system efficiencies and other factors that affect energy estimates differ from those used by solar energy system designers.

1.666E+08 kWh

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:09 p.m.

No glare found

Print

Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
1.PuuM	21.6409213367	-158.059189618	317.45	5.0

No glare found.

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:10 p.m.

No glare found

Print

Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
2.Pupu	21.6413207391	-158.025122881	975.59	5.0

No glare found.

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:11 p.m.

No glare found

Print

Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
3.Ashl	21.6225311974	-158.080204725	18.21	5.0

No glare found.

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:32 p.m.

No glare found

Print

Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
4.Hale	21.5982547682	-158.103003502	9.87	5.0

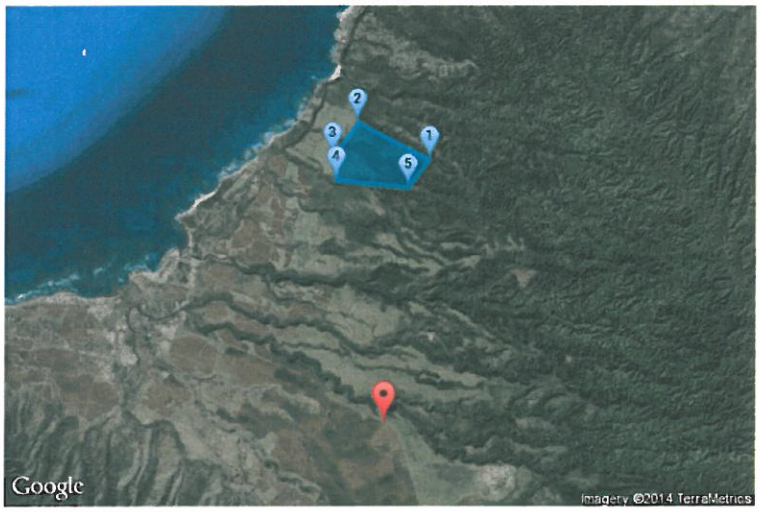
No glare found.

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:12 p.m.

No glare found

Print



Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
5.Dole	21.5504840069	-158.049960136	886.71	5.0

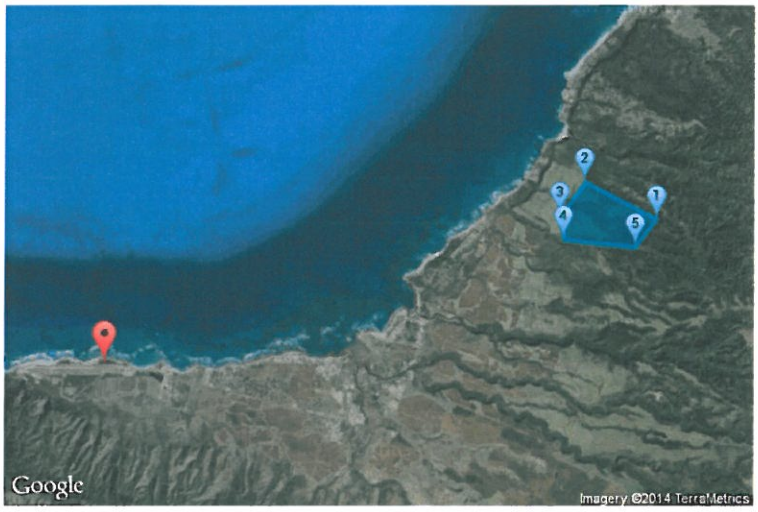
No glare found.

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:12 p.m.

No glare found

Print



Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
6.Moku	21.5812634395	-158.189563751	3.28	5.0

No glare found.

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:12 p.m.

No glare found

Print

Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
7.Waia	21.5750378384	-158.121929169	16.44	5.0

No glare found.

Solar Glare Hazard Analysis Report

Generated Sept. 26, 2014, 1:13 p.m.

No glare found

Print

Inputs

Analysis name	Kawailoa Solar
PV array axis tracking	single
Tilt of tracking axis (deg)	10.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True

Maximum tracking angle (deg)	45.0
Rated power (kW)	50000.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

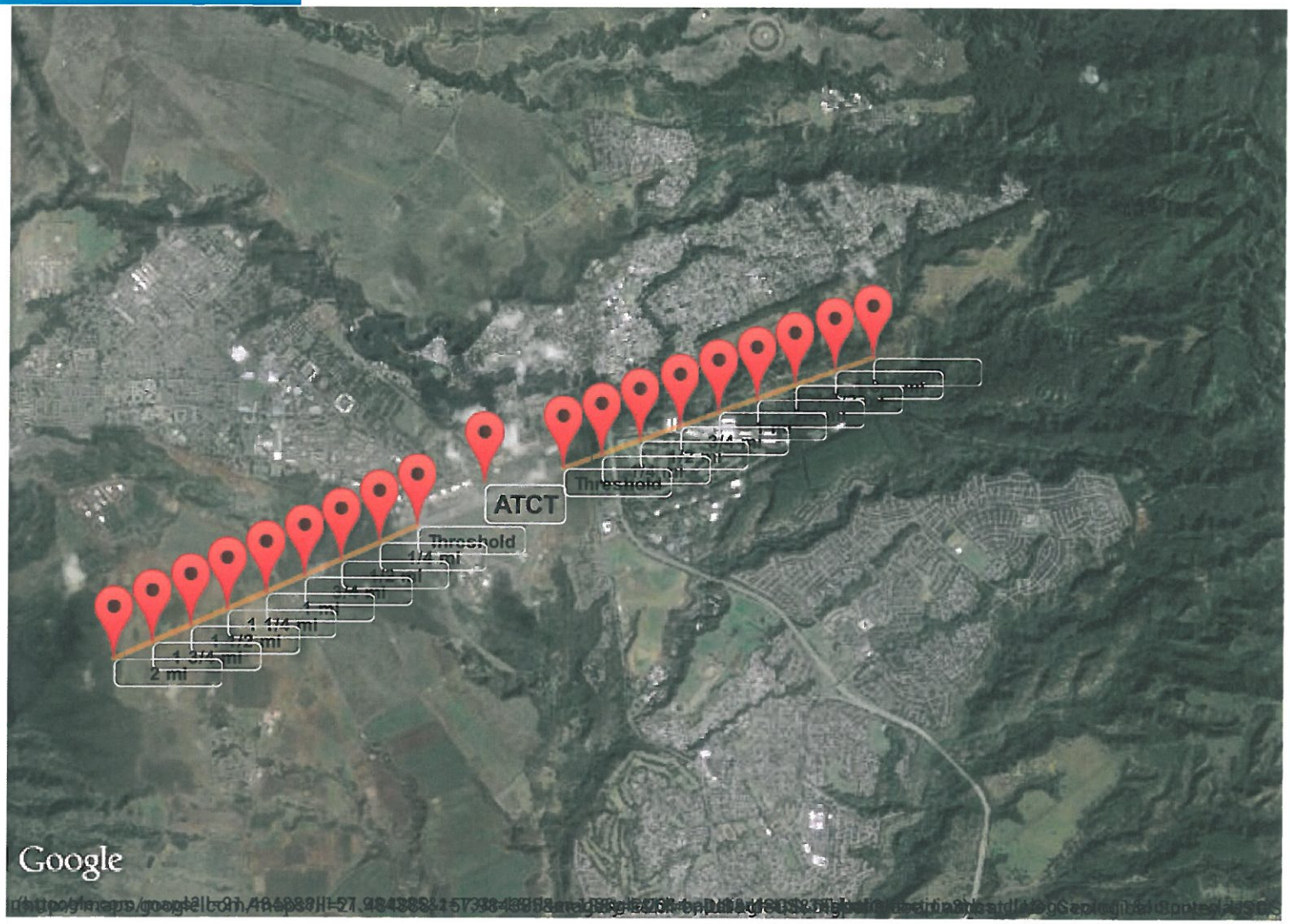
id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	21.6179650921	-158.037772179	728.69	6.0	734.69
2	21.627380412	-158.057427406	420.54	6.0	426.54
3	21.6186832314	-158.064379692	424.17	6.0	430.17
4	21.6126188325	-158.063263893	415.51	6.0	421.51
5	21.6107037063	-158.043608665	754.61	6.0	760.61

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
8.Surf	21.6239973585	-158.087210655	0.0	3.0

No glare found.

Sandia National Laboratories (http://www.sandia.gov/index.html)



UTC-10:00

PV Array | Observation | Flight Path | Animation

Submit for analysis

PV Array

Array name

PV array 1

Description

Axis tracking

Single

Tilt of tracking axis

10 deg

Orientation of tracking axis

180 deg

Offset angle of module

0 deg

☑ Limit the rotation angle?

Maximum tracking angle

45 deg

Rated power

50000 kW

Slope error

10 mrad

☑ Reflectivity varies with incidence angle (view data) (/phlux/sghat/reflectivity-data/)

Module surface material

Smooth glass without ARC

Vertices click to expand/collapse

id	Latitude	Longitude	Ground Elevation	Height of panels above ground	Total elevation
	deg	deg	ft	ft	ft
1	21.61797	-158.03777	728.69	6	734.69
2	21.62738	-158.05743	420.54	6	426.54
3	21.61868	-158.06438	424.17	6	430.17
4	21.61262	-158.06326	415.51	6	421.51
5	21.6107	-158.04361	754.61	6	760.61

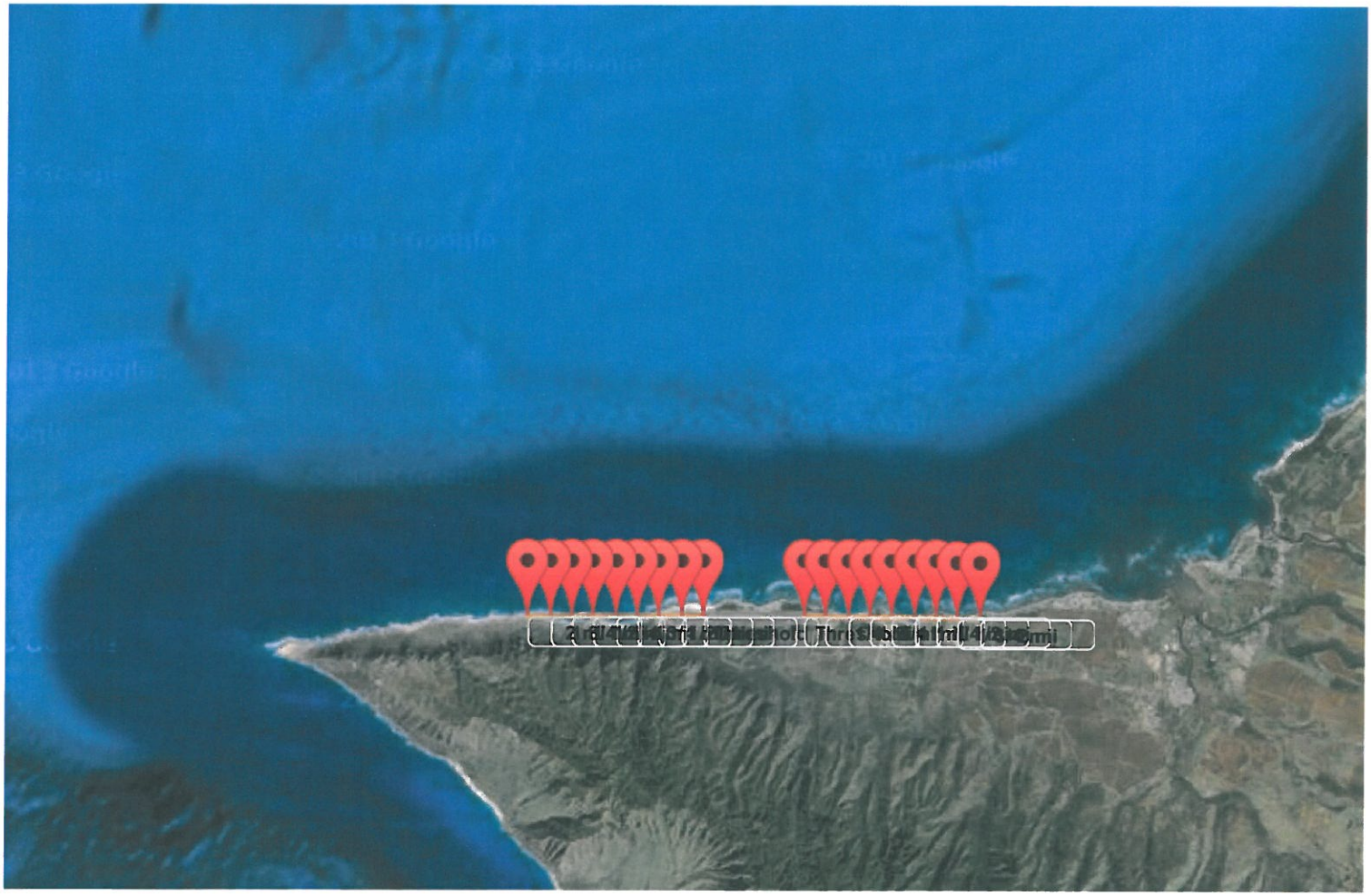
Flight Path(s)

Solo Observation Point(s)

name	latitude	longitude	ground elevation	Eye-level height above ground	
	deg	deg	ft	ft	
ATCT	21.48298	-158.03744	836.72	100	✖

Sandia National Laboratories (http://www.sandia.gov/index.html)

10/21/14 Site Availability: SGHAT is currently undergoing maintenance. Reduced performance is expected.



UTC-10:00

PV Array | Observation | Flight Path | Animation

Submit for analysis

PV Array

Array name

PV array 1

Description

Axis tracking

Single

Tilt of tracking axis

10 deg

Orientation of tracking axis

180 deg

Offset angle of module

0 deg

☑ Limit the rotation angle?

Maximum tracking angle

45 deg

Rated power

50000 kW

Slope error

10 mrad

☑ Reflectivity varies with incidence angle (view data) (/phlux/sghat/reflectivity-data/)

Module surface material

Smooth glass without ARC

Vertices click to expand/collapse

id	Latitude	Longitude	Ground Elevation	Height of panels above ground	Total elevation
	deg	deg	ft	ft	ft
1	21.61797	-158.03777	728.69	6	734.69
2	21.62738	-158.05743	420.54	6	426.54
3	21.61868	-158.06438	424.17	6	430.17
4	21.61262	-158.06326	415.51	6	421.51
5	21.6107	-158.04361	754.61	6	760.61

Flight Path(s)

Flight path name

1

Description

Direction

270.8 deg

Glide slope

3 deg

Threshold crossing height

50 ft

☐ Consider pilot visibility from cockpit

Path observation points click to expand/collapse

Flight path name

2

✖

Description

Direction

90 deg

Glide slope

3 deg

Threshold crossing height

50 ft

☐ Consider pilot visibility from cockpit

Path observation points click to expand/collapse

Solo Observation Point(s)

name	latitude	longitude	ground elevation	Eye-level height above ground
	deg	deg	ft	ft

Sandia National Laboratories (http://www.sandia.gov/index.html)

10/21/14 Site Availability: SGHAT is currently undergoing maintenance. Reduced performance is expected.

Results for PV array 1

Summary FP: 1 FP: 2

Observation	status
Flight path: 1	No glare
Flight path: 2	No glare

Energy

Max produced annually, assuming sunny skies every day. Assumptions about local weather conditions, system efficiencies and other factors that affect energy estimates differ from those used by solar energy system designers.

1.666E+08 kWh

Attachment 11. North Shore Neighborhood Board (No. 27) Meeting Minutes

NORTH SHORE NEIGHBORHOOD BOARD NO. 27

c/o NEIGHBORHOOD COMMISSION • 530 SOUTH KING STREET ROOM 406 • HONOLULU, HAWAII, 96813
PHONE (808) 768-3710 • FAX (808) 768-3711 • INTERNET: http://www1.honolulu.gov

DRAFT REGULAR MEETING MINUTES
TUESDAY, JANUARY 28, 2014
HALEIWA ELEMENTARY SCHOOL CAFETERIA

CALL TO ORDER: Chair Kathleen Pahinui called the meeting to order at 7:00 p.m. **Quorum was established with 13 members present**. Note – This 15-member Board requires eight (8) members to establish quorum and to take official Board action.

Board Members Present – Leif Andersen, Moana Bjur, Lloyd Burlew, John Hirota, Roberts Leinau, Michael Lyons, Blake McElheny (arrived at 7:08 p.m.), Antya Miller, Jacob Ng, Kathleen Pahinui, Isabel Palalay, Carol Philips, Thomas Shirai, and Patrick Vega.

Board Members Absent – Warren Scoville

Vacancies – None.

Guests – Arlene Kawahakui; Jack Reid; Thomas Young (Board of Water Supply); Jared Dow; Kelly Evans; Bob and Flo Robinson; Fau Laloala; Bill Quinlan; City Council Chair Ernie Martin; Reed Matsuura (City Council Chair Ernie Martin's Office staff); Jo-Ann Adams (Waikiki Neighborhood Board No. 9); Jason Adams; Stew Ring (Mokuleia Community Association); Ron Westcoat, Crystal Kua and Carolyn Unser (First Wind); Mitchell Nakagawa (HBL); Andrea Woods (Sunset Beach Community Association); Adam Young; Jeff Scott; Fire Fighter 1 Kaimi Pelekai; Representative Lauren Matsumoto; Maxi Moto; Gil Riviere; Karen Gallagher; Mark Yonamine (Mayor Kirk Caldwell's Representative); Lieutenant Mark Boyce; George William; Senator Clayton Hee; Captain Dan Johnson; Chris Gardener; Ren Westcoat; Kalani Fronda (Kamehameha Schools); and Kazuaki McArthur (Neighborhood Commission Office staff).

PLEDGE OF AGLLEGIANCE: Shirai led those present in the Pledge of Allegiance and the singing of Hawaii Ponoi.

CITY MONTHLY REPORTS:

Mayor's Report – Mark Yonamine reported the following;

- Shuttle: The Department of Parks and Recreation (DPR) will consider utilizing shuttles to transport people from Kaiaka Park during the next Van's Triple Crown of Surfing event.

- Vehicle Safety Check: The Federal government sets the minimum standard for vehicle safety. The State has the right to implement stricter standards at their discretion.

- Bus Stop Shelter Replacement: The decision to install a bus stop shelter is determined by the number of persons boarding the bus at that bus stop. If the average daily usage is 30 boardings or more, a replacement shelter will be considered. Installation is also based on available funding.

- Surf Boards: Per section 13-2.4 of the Revised Ordinances of Honolulu (ROH), surfboards are not allowed on City buses. The City is unable to prohibit surfers from walking with their boards along public access right of ways.

- Barbed Wire: Barbed wire is allowed on ag-zoned parcels.

- Town Hall Meetings: Community members at the Mayor's town hall meetings were encouraged to submit their questions in writing to allow the mayor to answer more questions on a variety of subjects. The Mayor and cabinet members also stayed a few minutes following the meeting to answer any other questions from the public.

Blake McElheny arrived at 7:08 p.m.; **14 members present**.

Questions, comments, and concerns followed;

1. Questions: A community member noted that they had emailed questions to the mayor had yet to receive a response.

2. Haleiwa Bus Shelter: Ng noted that the Haleiwa Post Office bus shelter was donated by the Lions Club. It was further noted that many seniors use that bus stop and must now wait in the sun.

3. Surf Board Racks: Andersen suggested the City install racks for surf boards on the City bus. Andersen noted that doing so would take cars off the road and help alleviate traffic.

4. Advertising on Buses: Leinau discouraged the implementation of advertising on buses and noted that there are other ways for the City to raise funds.

5. Covering: Phillips asked if it would be possible for private organizations to partner with the City to provide funding to install a covering for shade at Banzai Skate Park.

6. Barbed Wire/Bus Shelter: George William noted that the barbed wire from the ag-zoned parcel in Haleiwa has been removed. It was also noted that the bus shelter at the Haleiwa Post Office needs to be replaced. Miller noted that the bus shelter had been installed earlier in the day.

7. Shuttle Service: A community member reported that Hawaii's greatest export is surfing and noted that other cities on the mainland utilize shuttles for surf spots.

8. Haleiwa Canoe Halau: McElheny asked and Yonamine noted that the City has hired a consultant to look into the situation surrounding the canoe halau at Haleiwa Beach Park. McElheny noted that the existing halau located on the makai portion of the park is eroded and noted that if the halau is to be relocated, a location further mauka would be preferred.

9. Kaiaka Beach Park Comfort Station: Vega reported that there are now no comfort stations at Kaiaka Beach Park because the existing comfort station has been burned. Yonamine noted that the Department of Design and Construction (DDC) previously assessed the condition of the comfort station and determined that $100,000 was needed to replace the roof. However, due to the recent arson, the entire comfort station will now need to be replaced.

Honolulu Fire Department (HFD) – Fire Fighter 1 Kaimi Pelekai reported the following for both the Waialua and Sunset Beach fire stations;

- December 2013 Statistics: Statistics included 2 structure fires, 4 wild land fires, 2 rubbish fires, 75 medical emergencies, 18 search and rescues, and 22 miscellaneous calls for service.

- Safety Tip: Ensure that all electrical work is done by a qualified electrician. Ensure that only one (1) heat producing appliance is plugged into a receptacle outlet at a time. Plug major appliances directly into wall receptacle outlets; not into power strips or extension cords. Do not run electrical cords across doorways or under carpets. Extension cords are intended for temporary use. Have a qualified electrician add more receptacle outlets to avoid using extension cords. Use light bulbs that match the recommended wattage on the lamp fixture. A sticker on the lamp or fixture should indicate the maximum wattage light bulb to use.

Questions, comments, and concerns followed;

High Surf Warning: Leinau commended HFD for being proactive and patrolling the beaches during the recent high surf and advising the public to stay out of the water.

Honolulu Police Department (HPD) – Lieutenant Mark Boyce reported the following;

- December 2013 Statistics: Statistics included 14 motor vehicle thefts, 32 burglaries, 79 thefts, 59 unauthorized entries into motor vehicles, and 3423 total calls for service.

Questions, comments and concerns followed;

Safety Tip: Shirai requested HPD provide a monthly safety tip.

Board of Water Supply (BWS) – Pahinui reported that BWS representative Thomas Young was called out to rectify a water main break and circulated a written report to the Board.

City Council Chair Ernie Martin – Ernie Martin greeted the community and noted that he would take questions from the public and leave to prepare for the full council meeting the next day. Martin noted that Reed Matsuura would give the full report following questions.

Questions, comments, and concerns followed;

1. Illegal Vacations Rentals: A community member asked if City Council would be doing anything about regulations on illegal vacation rentals. Martin noted that the council will look into past bills and gather components from each and try to come to an agreement on a law that would be enforceable.

2. Lunch Wagons: Miller noted that brick and mortar restaurants are held to a strict standard and asked what can be done to better regulate lunch wagons. Martin noted that the Department of Planning and Permitting (DPP) needs to do more frequent checks on the lunch wagons. Martin noted a bill is being considered to designate space at underutilized parks for lunch trucks.

3. Grass: Ng raised concern that private citizens have been cutting grass at parks and on right of ways because DPR has been negligent in their duties. Ng asked if there is a lack of communication from the public and the regional maintenance directors. Martin noted that the City needs to address essential services. Martin reported that the Mayor dedicated $150 million toward a 5-year road maintenance program and opined that a portion of that money could have gone to supporting other essential services instead of to a singular item. Martin noted that when the City donates more money to support a certain service, it takes away money from another. Martin noted that District 2 has more money dedicated to it than any other district.

4. Upcoming Projects: McElheny asked if there were any projects in the current budget that the community should track. Martin noted that the projects that are set forth in the district come as a result of public input. Martin encouraged the public to continue to voice their concerns to the administration.

5. Facility Maintenance: Lyons noted that many parks are closed or are in need of repair. Lyons suggested the City take care of existing facilities before building new things.

6. Koolauloa Sustainable Communities Plan: Leinau noted that many people are against the Koolauloa Sustainable Communities Plan and expressed that the plan is too aggressive.

7. Haleiwa/Kaiaka: Vega noted that the Sunset Beach area has recently received many projects to improve that area; and raised concern that Haleiwa and Kaiaka have not received their fair share of improvements. Vega expressed that a comfort station is sorely needed at Kaiaka.

8. Partnerships: Phillips noted that many community members currently take care of the parks. Phillips also noted that there are also other organizations that are also willing to partner with the City to maintain the parks. Martin noted that the City's parks are the jewel of Oahu and should be better maintained. Martin noted that more money will be diverted to park maintenance in the upcoming budget.

9. Pake Ditch: Ng suggested DPP cite landowners in Pake Ditch for not maintaining the area.

Reed Matsuura reported the following;

- Kaiaka Beach Park Comfort Station: Martin noted that money was put into the budget to fund the comfort station at Kaiaka Beach Park. However, the administration did not release the money.

- Repaving: There are plans in place to repave Kaukonahua Road and streets within Haleiwa and Waialua in 2015.

- Street Rehabilitation: There are monies in place to perform street rehabilitation in Pupukea, Sunset Beach, Kahaola, and Holawa by the end of 2015.

- Mobile Billboards: DPR does not allow mobile billboards at City parks unless they obtain a permit to operate commercial activity with the particular park at which they will be operating.

- Sand Pushing: DPR has not implemented annual sand pushing on the North Shore. In the past five (5) years, there were a few occasions where the City pushed sand to address safety concerns and protect the beach right of ways and the bike path and Ke Ala Pupukea bike path running through Sunset Beach Park. This was done only after consulting with the coastal geologist from the State Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, and only if there was sufficient quantity of sand available in the area.

Treasurer's Report – Leinau read the Treasurer's report and noted the expenditure of $18.87 in December 2013; leaving a remaining balance of $601.01. The report was filed.

There being no objections, the agenda was moved out of order to item VIII-A Senator Clayton Hee.

Senator Clayton Hee – Senator Hee circulated two (2) bills that will be discussed during the current legislative session. Senate Bill (SB) 3035 proposes the issuance of general obligation bonds and the appropriation of funds for the planning and construction of a Laniakea wayside park. If approved, Kamehameha Highway will be moved further mauka to make room for the wayside park. The park would be placed under the jurisdiction of DLNR. The proposal aims to alleviate traffic, address pedestrian safety, and provide a new wayside park. The measure would create a park, alleviate traffic, and move the highway mauka of its existing location. Kamehameha Schools has also been contacted about the project. SB 3036 proposes to appropriate funds to the University of Hawaii (UH) Sea Grant Program to conduct a study and create a beach management plan for the areas between Haleiwa and Kahuku. Hee noted that the Governor supports both bills.

Questions, comments, and concerns followed;

1. Start: Bill Quinlan suggested relocating the highway mauka at Laniakea and installing a parking lot makai of the realigned highway. Quinlan suggested starting as soon as possible. Hee noted that this is a community driven project and suggested the community provide testimony.

2. Niihau Fishing: Shirai noted that he has already submitted testimony and will be attending the hearing on fishing at Niihau.

3. Historical/Cultural Sites: Ng noted that there are many historical and cultural sites around Laniakea and cautioned against rushing to build things in the area. Lyons noted that Kamehameha Schools are aware of many culturally significant areas at Laniakea. Hee noted that he has been in contact with Kamehameha Schools and has already identified a number of culturally significant sites in the area.

4. Resolution: Leinau noted that the wayside park resolves many problems and makes a lot of sense.

5. Safety: McElheny commended Hee for addressing the safety aspect in the SB3035.

6. Hotel Room Tax: McElheny noted that Representative Joe Souki has talked about a measure to reallocate a larger portion of funding from the hotel room tax to Oahu since Oahu has more hotels. Hee expressed that he does not believe the measure will pass.

7. Fairness: Vega expressed that more money should be allocated to the North Shore due to the amount of visitors that travel trough the area. It was also expressed that Haleiwa and Mokuleia receive their fair share of funding for improvements.

8. Support: Phillips noted she would be rallying support for the bills and noted that parking is needed in Laniakea. Phillips noted that surfing is Hawaii's biggest export and the lack of parking is hindering that. It was expressed that the project needs to break ground as soon as possible.

9. Unfunded Liability: Miller noted that Hawaii has the third highest pension liability in the nation and urged that it be taken care of. Hee noted that the State looks to address the issue over a 30 year period.

10. Park Facilities: Miller asked and Hee noted that a wayside park will typically include a comfort station. However, the exact facilities will depend heavily on community input.

11. Waialua Media Room: Pahinui asked and Hee clarified that the Waialua media room would be opened in March 2014.

U.S. ARMY 8TH MILITARY BRIGADE REPRESENTAIVE: Captain Dan Johnson noted that he currently does not have any information on the homeless at Army Beach.

Questions, comments, and concerns followed;

1. Homeless: A community member noted that he contacted and was promised multiple times that the Army would address the homeless individuals camping on Army Beach. The community member noted that the Army has yet to address the issue and HPD has instead taken action to remove the homeless individuals from the area. Stew Ring stated that the Army should be taking care of the homeless on their property. Ring also noted that due to the increased enforcement on the part of DLNR at Kaena Point, many of the homeless have since migrated further down the coast.

2. Military Branches: Shirai raised concern of the Air Force training over residential areas instead of out at sea. Shirai requested that representatives form other military branches also appear before the Board if their activities affect the residents of the area. Bjur concurred.

3. Kaena point: Bjur reported that there was a cleanup at Kaena Point on Martin Luther King Day and reminded all that Kaena Point is not a playground for 4-wheeling and dirt bikes.

4. Study: Johnson reported that a study will be conducted between Friday, January 17, 2014 to Monday March 3, 2014 for an Environmental Impact Study (EIS) for the installation of a biofuel power plant that will be built and maintained by the Hawaiian Electric Company (HECO). Community comments are needed as part of the EIS. Meetings to gather public input will be held on Wednesday, February 5, 2014, at Mililani Mauka Elementary School and Thursday, February 6, 2014, at Wahiawa District Park, from 6:00 to 9:00 p.m.

RESIDENTS'/COMMUNITY CONCERNS:

1. North Shore Swim Series/Triathlon: Chris Gardener reported that 2014 will mark the 26th year for the North Shore Swim Series and the 17th year for the North Shore Triathlon. The swim series and triathlon provides many outreach and community services for the community and the Board and community were invited to continue supporting both events.

2. Bike Race: Jason Adams announced that there is proposed bike race set for Sunday, March 9, 2014. The proposed route will begin at North Shore Marketplace and end at Pineapple Hill. The start time will be 7:00 a.m. No road closures are anticipated and the anticipated number of cyclists is less than 75.

3. Fishing Charter: Jared Dow reported that he will be starting a fishing charter. Activities will included catch and release fishing.

4. Homeless: Will Schoettle reported that he is seeking out anyone willing to rent out a living space under $1,200 for a friend who is currently homeless. The individual has a steady job and does not use drugs.

5. First Wind: Carolyn Unser introduced Crystal Kua and noted that there are several community grants available through First Wind for 501(c)(3) non-profit organizations. Applications are due Tuesday, July 15, 2014. Kua reported that First Wind has heard the community concerns surrounding past projects. Kua and Ron Westcoat noted that First Wind will be doing a future presentation on a 50 megawatt solar farm project in Kawailoa. The project will be built on 350 acres of Kamehameha Schools property. A number of agriculture activities will also be performed in conjunction with the project. There are currently two (2) bills being considered by the State legislature that would allow such activities.

6. Hawaiian Bats: McElheny noted that two (2) Hawaiian bats were found dead on the Kawailoa property and asked what the total population of Hawaiian bats on the property. Unser noted that there is currently no information indicating the total Hawaiian bat population. Unser further noted that First Wind will be working with the United States Geological Survey (USGS) to determine the total population of Hawaiian bats in the area.

7. Turtle Bay: Doug Cole gave a quick update on the Turtle Bay expansion. Phases 1 and 2 of the project will preserve five (5) miles of coast line and provide for public access.

8. Liliuokalani Protestant Church: Kalani Fronda thanked Liliuokalani Protestant Church for opening up their parking lot to help alleviate illegal parking occurring due to the Haleiwa revitalization project by Kamehameha Schools.

9. Pake Ditch: Fronda reported that Kamehameha Schools in the procurement process to secure $45,000 to clean out overgrowth in Pake Ditch. Kamehameha Schools previously funded a $45,000 cleanup of Pake Ditch six (6) months ago.

10. Haleiwa Metric Century: Mitchell Nakagawa announced the upcoming Haleiwa Metric Century Ride will be held on Sunday, April 27, 2014. Setup will be at 5:00 a.m., with the race running between 7:30 a.m. to 2:00 p.m. The race will start and end at Kaiaka Bay Beach Park. 900 participants are anticipated this year. Nakagawa reported that Waialua Elementary School will be selling plate lunches as a fundraiser. Upcoming bike education is also planned for Haleiwa Elementary in February. Volunteers for bike education are encouraged to call 735-5756 or email mitchell@hbl.org. Mg raised concern that it will be congested in Haleiwa Town and raised safety concerns. Nakagawa noted that five (5) HPD bike officers will be staggered throughout the race to ensure safety of cyclists.

BOARD BUSINESS:

Improving the Permitting Process: Jo-Ann Adams of the Waikiki Neighborhood Board introduced herself and reported that the Waikiki Neighborhood Board has created a permitted interaction group (PIG) to investigate solutions to improve the permitting process. Adams noted that there needs to be more visibility in the permitting process and requested any suggestions from the board.

Questions, comments, and concerns followed;

1. Data: Leinau suggested collecting data to use a basis for comparison. Leinau noted that the North Shore has had many issues with vacation rentals.

2. Reference Sheet: Miller suggested creating a quick reference sheet for applicants listing all the steps to the permitting process. Miller noted that obtaining a permit can be quite confusing if you are not familiar with the process.

3. Communication: Bjur noted that there is a lack of communication between the City and State when approving a permit. It was noted that sometimes things are passed on one side that is not permitted on the other.

4. Slow: A community member noted that the though the total amount of permits have reduced over the last few years, the approval time takes just as long as when there were more permits to process.

5. Hong Kong: Quinlan raised concern that the guidelines that Honolulu has in place is starting to make Honolulu look like Hong Kong.

Appointment of Members to the North Shore Neighborhood Board Committees – Pahinui reported that the Board Committee Chairs were asked to submit names of members to serve on their committees. The Agriculture Committee will take up next month. Pahinui noted that after the committees and their membership has been approved, the community will be given an opportunity to serve on the committees. However, community members must be nominated by a Board member to be considered for committee membership. Voting took place as follows:

- Homeless Committee: **Phillips moved, and Leinau seconded to approve the Homeless Committee with Kathleen Pahinui, Reed Matsuura, Heidi Apau, Will Schoettle, Bill Quinlan, Jay King, and Cindy**

Vaillancourt as committee members. The motion was ADOPTED, 13-0-1 (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, McElheny, Miller, Ng, Pahinui, Palalay, Philips, Shirai, and Vega **Abstain**: Lyons).

- Parks Committee: **Shirai moved, and Palalay Seconded to approve the Parks Committee with Isabelo Palalay, Mike McNeice, Juliana Foster, Bill Quinlan, Patrick Vega, Tonya Reid, Jack Reid, Bob Justice, and Kelly Jean Evans as committee members. The motion was ADOPTED, 13-0-1** (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, McElheny, Miller, Ng, Pahinui, Palalay, Philips, Shirai, and Vega **Abstain**: Lyons).

- Transportation Committee: **Miller moved, Shirai seconded to approve the Transportation Committee with Carol Phillips, Bob Leinau, Blake McElheny, Leif Andersen, Bill Quinlan, Gil Riviere, and Bill Martin as committee members.**

Discussion followed;

Conflict: Miller noted that one (1) of the proposed members of the committee is currently involved in a lawsuit with the Department of Transportation (HDOT).

The motion was ADOPTED, 13-0-1 (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, McElheny, Miller, Ng, Pahinui, Palalay, Philips, Shirai, and Vega **Abstain**: Lyons).

- Waterways Committee: **Shirai moved, and Lyons seconded to approve the Waterways Committee with Jake Ng, Mike Lyons, Jill Comprenda, Dr. Russell Yost, and Dr. Aly Ed-Kadi as committee members. The motion was UNANMIOSULY ADOPTED 14-0-0** (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, Lyons, McElheny, Miller, Ng, Pahinui, Palalay, Philips, Shirai, and Vega).

Pahinui opened the floor for others interested in serving on the various committees to voice their interest and be appointed by the Board.

- Homeless Committee: No other interested individuals expressed interest.

- Parks Committee: **Bjur nominated Leinau and Phillips nominated McElheny to serve on the Parks Committee. Leinau and McElheny were APPOINTED to the Parks Committee, 13-0-1** (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, McElheny, Miller, Ng, Pahinui, Palalay, Philips, Shirai, and Vega **Abstain**: Lyons).

- Transportation Committee: **Phillips nominated Bjur and Leinau nominated Miller to serve on the Transportation Committee. Bjur and Miller were APPOINTED to the Transportation Committee, 13-0-1** (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, McElheny, Miller, Ng, Pahinui, Palalay, Philips, Shirai, and Vega **Abstain**: Lyons).

- Waterways Committee: **Miller nominated Leinau and Leinau nominated Miller to serve on the Waterways Committee. Leinau and Miller were APPOINTED to the Waterways Committee. 12-2-0** (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, McElheny, Miller, Pahinui, Palalay, Philips, Shirai, and Vega **Nay**: Lyons and Ng).

APPROVAL OF MINUTES:

November 26, 2013 Regular Meeting Minutes – **Leinau moved, and Shirai seconded to approve the November 26, 2013 regular meeting minutes as amended. The motion was UNANMOUSLY ADOPTED 14-0-0** (**Aye**: Andersen, Bjur, Burlew, Hirota, Leinau, Lyons, McElheny, Miller, Ng, Pahinui, Palalay, Philips, Shirai, and Vega). Corrections included;

- Page 2 – Under Laniakea Barriers should read…parking at the **Banzai** Skate Park.

- Page 6 – Under Pioneer Properties should read…Richard **McCormack**…

Discussion followed;

Committee Meeting Attendance: Leinau asked and Pahinui noted she will check with the Neighborhood Commission Office (NCO) regarding the ability of non-committee Board members attending other committees on the Board.

COMMITTEES: No reports.

STATE ELECTED OFFICIALS:

Representative Lauren Matsumoto – Representative Matsumoto circulated a report and introduced her staff. Matsuomoto noted she has authored an APA Licensing bill, an Agricultural Housing bill and a school farm bill. Community members were encouraged to read the mailer and find instructions on how to properly submit testimony online. Matsumoto noted that community members can visit www.repmatsumoto.org and request updates on be sent to them on current bills.

Questions, comments, and concerns followed;

1. Rock Climbing: Leinau voiced support for a bill that would allow for rock climbing while reducing the State's liability.

2. Farming Regulations: Leinau asked and Matsumoto opined that the State should allow flexibility for each county to set regulations on farming since each county differs from the next.

3. College of Tropic Agriculture: Shirai expressed that the University of Hawaii (UH) College of Tropical Agriculture belongs at the UH-West Oahu.

4. Crawford Convalescent Home: McElheny asked and Matsumoto noted that she has yet to hear anything about the future of Crawford Convalescent Home.

ANNOUNCEMENTS:

1. Next Meeting: The next North Shore Neighborhood Board meeting is scheduled for Tuesday, February 25, 2014, at 7:00 p.m.

2. Special Meeting: McElheny reported that that the Board will be holding a special meeting on pesticides on Tuesday, February 18, 2014, from 6:00 to 9:00 p.m., at Waimea Valley.

3. Waimea Valley Family Day: Bjur announced that Waimea Valley hosts a monthly family day every third Sunday of the month.

4. Haleiwa Harbor Master: Miller reported that there is currently no Haleiwa Harbor Master and requested an update.

ADJOURNMENT: The meeting adjourned at 9:04 p.m.

Submitted by: Kazuaki McArthur, Neighborhood Assistant

Reviewed by: Daniela Arriaga, Neighborhood Commission Office staff; Kathleen Pahinui, Chair.

NORTH SHORE NEIGHBORHOOD BOARD NO. 27

c/o NEIGHBORHOOD COMMISSION • 530 SOUTH KING STREET ROOM 406 • HONOLULU, HAWAII, 96813
PHONE (808) 768-3710 • FAX (808) 768-3711 • INTERNET: http://www1.honolulu.gov

DRAFT REGULAR MEETING MINUTES
TUESDAY, SEPTEMBER 23, 2014
WAIALUA ELEMENTARY SCHOOL CAFETERIA

CALL TO ORDER: Chair Pro Tem Kathleen Pahinui called the meeting to order at 7:01 p.m. **Quorum was established with 14 members present**. Note— This 15-member Board requires eight (8) members to establish quorum and to take official Board action.

Board Members Present: Leif Andersen, Moana Bjur (arrived at 7:40 p.m.), Sharlyn Foo, John Hirota, Roberts "Bob" Leinau, Michael Lyons, Blake D. McElheny, Antya Miller, Jacob Ng, Kathleen Pahinui, Isabelo Palalay, Carol Philips, Warren Scoville, Thomas Shirai, and Patrick Vega.

Board Members Absent: None.

Vacancies: None.

Guests – Fire Fighter I Christopher Pates (Honolulu Fire Department), Lieutenant Mark Boyce (Honolulu Police Department), Representative Lauren Matsumoto, Reed Matsuura (Council Chair Ernie Martin's Office), Design and Construction Deputy Director Mark Yonamine (Mayor Kirk Caldwell Representative), Representative Richard Fale, Carly Schoenhoft (8th Military Police Brigade), Joy Kalke, Steph Da Silva; Crystal Kua and Carolyn Unser (First Wind), Jeff Sulzbach (Boy Scouts), Carrie Martell, Michele Kehler, Jim Kehler, Kent Fonoimoana, Stew Ring (Mokuleia Community Association); Alan Takemoto and Caleb Dohrman (Monsanto), Jack Reid, Karen Gallagher, Rex Dubiel Shanahan (Sunset Beach Elementary School), Ed Shanahan, Diane Anders, Matthew Barbee, Gitte Du Plessis, Diane Hanzel, Robert Justice (Porks Community), Asher Robinson (Direct Electric), Debora Driscoll; Boh and Flo Robinson, Jason Friedmann, Kanani Oury, TJ Cuaresma, Bill Quinan, Amy Chiang, Ana Giuberti-Ippel, Makani C., Jessica Casson, Maxi Moto, Lee Bryant (Mays Wonder Gardens), Janna Bills, Eileen Hirota, Boyd Ready, Miks Dixon, Patrick Reed, Mane Futo, Jodie Marek, Pancho Sullivan, Deni O' Shea, Susan McCarthy, Jim Tgbuszecski (North Shore Community Land Trust), Cab Spates, and Stephen Saito (Neighborhood Commission Office staff).

CITY MONTHLY REPORTS:

Honolulu Fire Department (HFD) – Fire Fighter I Christopher Pates reported the following:

- August 2014 Fire Statistics: There was 1 structure fire, 0 wild land fire, 1 rubbish fire, 1 Vehicle fire, 49 medical emergencies, 0 search and rescue, and 22 miscellaneous calls for service.
- Fire Prevention Week: Fire Prevention Week (FPW) has its roots from the Great Chicago Fire of Sunday, October 8, 1871, through Tuesday, October 10, 1871. The Fire Marshals Association of North America (FMANA) has decided to observe the anniversary of the Great Chicago Fire be observed nationally to inform the public about the importance of fire prevention. Since 1992, FPW has been observed during the week of October 9.
- Theme: The National Fire Protection Association (NFPA) has selected "Working Smoke Alarms Save Lives: Test Yours Every Month!" as FPW 2014 theme which will occur from Sunday, October 5, 2014, to Saturday, October 11, 2014. Each year, nearly 3,000 people die in the United States as a result of home fires. FPW 2014 theme is about keeping individuals, families, and the community safe from fire.
- Fire Fighter's Safety Guide (FFSG): Children attending elementary schools statewide will be receiving a FFSG from student's teachers. HFD encouraged parents to review the FFSG with the family, to create or revisit the family fire escape plan, practice the plan, test the smoke alarms, and consider other safety tips in the guide.

Honolulu Police Department (HPD) – Chair Pahinui reported the following:

- August 2014 Crime Statistics: There was 1 auto theft recovery, 1 burglary, 1 motor vehicle theft, 24 thefts, and 7 unauthorized entry into a motor vehicle (UEMV).

Questions, comments, and concerns followed:

1. Abduction: Lieutenant Boyce noted that HPD did not receive any report about child abduction this month.
2. Construction: Leinau noted construction that would interfere with a committee meeting. Lieutenant Boyce noted that the question be referred to the Mayor's representative.
3. Illegal Parking: Lieutenant Boyce answered for McElheny to call 911 if there are concerns about illegal parking activity for HPD to assess. Lyons suggested HPD to provide constant patrols in reported areas.
4. Traffic Control: Vega noted his appreciation for HPD's enforcement of traffic control.
5. Speeding: Shirai noted concerns of speeding on Waialua Beach Road.
6. Drug Trafficking: Community member Wayne U. noted concern of drug trafficking occurring at Kaiaka Beach Park.

Moana Bjur arrived at 7:10 p.m. **15 members were present.**

Mayor Kirk Caldwell's Representative – Department of Design and Construction (DDC) Deputy Director Mark Yonamine reported the following:

- Election: Monday, October 6, 2014 is the deadline to register to vote in the November General Elections. Register by visiting honoluluelections.org.
- Groundskeeper: Department of Parks and Recreation (DPR) noted that the number of groundskeepers' vacancies in North Shore varies depending upon transfers, promotions, and retirement. Most districts are in similar vacancy situations.
- Tennis Courts: DPR noted that the park and tennis courts are opened by the groundskeeper stationed at Waialua District Park. The roving crew opens the facilities only on the groundskeeper's day off. The supervisor had been informed about facilities not being opened consistently and will correct the situation.
- Gender Equality: DPR noted that surf championship's applications are reviewed and the criteria is shared with all applicants.
- Ratio: DPR did not conduct studies on the ratio of park employees to visitors on the North Shore compared to Waikiki.
- Staffing: DPR noted that Park staffing is based on availability of funds. Districts are annually reviewed and evaluate staff requirements and submit for budget increases. There have been years when new parks have been developed but were not accompanied by an increase in funds for park staff.
- Play Apparatus: DPR noted that the status for the play apparatus for Haleiwa Beach Park and Aweoweo Beach Park went out for bid for replacement. Waialua District Park apparatus is being evaluated for repair until funding is available for replacement.
- Comfort Stations: DPR noted that to prevent delay of additional permits and funding, a consultant had been hired to renovate and repair existing comfort stations is currently in progress.

Questions, comments, and concerns followed:

1. Repairs: Shirai noted that the work on the telephone pole at Kaena Place is incomplete and that there is need for repair of the area surrounding the electrical apparatus green box found at Mokuleia Beach Park.
2. DPR Budget: Deputy Director Yonamine answered for Leinau that the Office of the Managing Director (MDO) and the Mayor (MAY) approves the budget for DPR.
3. Council Hearing: Lyons noted that there will be a City Council hearing regarding the enforcement of septic tanks over cesspools on Saturday, October 4, 2014.
4. Gender Equality: Philips elaborated that the concern that was reported to the Mayor's representative about gender equality was supposed to be about equal opportunity for men and women to compete in surf championships, not about accommodations.
5. Bus Stop: Vega requested a status update on the request about the bus stop on Kamehameha Highway Opposite of Haleiwa Beach Park and of the request on restriping of roads.
6. Illegal Vacation Rentals: Foo asked for Mayor Caldwell's position on illegal vacation rentals and what actions would be done.
7. Curbing: Miller requested repaving of the curbing fronting Kamehameha Highway and Amara Road.
8. Recycling: Resident Roxanne Shanahan requested when the recycling will start up in the community.
9. Lunch Wagons: Resident TJ Cuaresma asked why lunch wagons are able to park overnight near the Kamehameha Highway, Haleiwa McDonalds and noted there is a City Ordinance that mandates to have the lunch wagons be cleaned at a certified kitchen every night.
10. Shark's Cove: Community member Liam M. noted concern of theft, drug, and homelessness activity at Shark's Cove.

Board of Water Supply (BWS) – Chair Pahinui noted that a BWS representative would not be present and provided

a report to Board members.

City Council Chair Ernie Martin – City Council Chair Ernie Martin's representative Reed Matsuura reported the following:

- Clean City Parks: Reed noted the challenges DPR faces in keeping the City parks clean. In fiscal year (FY) 2014, nearly $12 million was appropriated to cover costs of repair and maintenance.
- Walk Wise Hawaii: Walk Wise Hawaii was recognized for promotion of pedestrian Safety. The program is focused on pedestrian safety and driver awareness.
- Workshops: Department of Community Services (DCS) will be holding workshops for non-profit organizations to assist in applying for grants offered by the City.
- Park and Ride: DTS did not respond to the request to increase the paved "Park and Ride" area at the Waialua Community Association.
- Aweoweo Beach Park: The playground equipment at Aweoweo Beach Park had been repaired, but is in need of being replaced.
- Haleiwa Ali'i Beach Park: The expansion of the Haleiwa Ali'i Beach Park parking area will be considered when the parking needs to be repaved.
- Trash: Waialua Corporation Yard will be monitoring trash pick up next to Ki'iki'i Bridge on Waialua Beach Road.
- Bus Shelter: Bus shelters at Pupukea Fire Station and Haleiwa Regional Park are still being worked on and hopefully will be completed before the end of 2014.
- Fire Station: The Hauula Fire Station is HFD's first priority and will not fund other stations. Matsuura noted that the Waialua Fire Station does not have the facilities to accommodate the women fire fighters that are employed at Waialua Fire Station.
- Parking Violations: HPD called a tour company about parking violations at Haleiwa Ali'i Beach Park and will be monitoring the area.

Questions, comments, and concerns followed:

1. Violators: Chair Pahinui noted that reported parking violator's pictures can be emailed to Chair Pahinui to be sent to Captain Lawson from HPD to review.
2. Water Tanker: Shirai suggested that one tanker can be equipped near Kaiaka Bay Beach Park City and another nearby City facility.
3. Public Hearing: McElheny suggested to communicate to Department of Planning and Permitting (DPP) about the fence erected at Laniakea Beach. Matsuura noted that only Mayor Caldwell can order DPP's director to hold a public hearing on the matter. Council Chair Martin's office can only make a suggestion to DPP.
4. Committee: Ng noted appreciation for Matsuura and Council Chair Martin's office for the help in setting up the Watershed committee meeting held at the Honolulu City and County Council Meeting Room. Ng summarized what occurred at the committee meeting.
5. Fence: Philips noted that the fence near Laniakea Beach Park blocks City parking and suggested that Council Chair Ernie Martin move the Kamehameha Highway back.
6. Safety Concern: Community member Robert Justice noted that on Kaukonahua Road is privately owned land and the fence blocks lateral access. There is a safety concern with the incurred narrow spaces.

RESIDENTS'/COMMUNITY CONCERNS:

- Homecoming: Community member Avis Nanbu announced that the Waialua High and Intermediate School homecoming parade will be on Thursday, September 25, 2014 starting at 4:30 p.m. The homecoming football game will be on Friday, September 26, 2014 starting at 6:00 p.m.
- Hawaiian Music: Community member TJ Cuaresma announced that there will be a Leilehua Concert Series featuring various Hawaiian music groups such as Na Hoa, Ho'okena, Kainalu'eha, and Weldon Kekau'oha, at The Grill at Leilehua Golf Course. For more information, visit www.himwr.com.
- Air Conditioners: Community member M. Taylor noted that at Waialua High School, air conditioners for rooms at the school had been donated by student parents and community members and request from the community more air conditioners to be donated for the school.
- Air Traffic: Community member Elizabeth Barry noted increased air traffic concern at Sunset Beach Park. A petition was circulated.
- Recycling: A community member announced that at Sunset Beach Elementary School, there will be a recycling drive on Saturday, October 25, 2014. The North Shore Agriculture Circle will meet on Tuesday, September 30, 2014, at Waimea Valley at 5:30 p.m.
- Menehune Surf Contest: A community member announced that the Menehune Surf Contest will be held on

Thursday, October 16, 2014. There will also be a volunteer day sponsored by Friends of Ali'i Beach, on Thursday, October 10 2014 to Friday, October 11, 2014. For more information, contact Jack Reid at 542-1354.

- Bike Path: A community member noted that a petition for a lateral bike path route from Wahiawa to Haleiwa had been circulated.

BOARD BUSINESS:

Determination of Board Recess Months: Determination of Board Recess Months was deferred to the next regular meeting.

First Wind Kawailoa Solar Project: First Wind Kawailoa Solar Project presentation was deferred to the next regular meeting.

Treasurer's Report: Treasurer's Report was deferred to the next regular meeting.

Camp Pupukea Update – PBR Hawaii representative Tom Schnell reported the following:

- Background: Camp Pupukea is used by the Aloha Council Boy Scouts of America located on Pupukea Road. PBR Hawaii plans to make improvements to Camp Pupukea over a 20 year period. Schnell gave a summarized history of Camp Pupukea.
- Master plan: The Camp Pupukea master plan improvements include wastewater, fire safety, electrical, road, and camp capacity. There was never a public wastewater management system in the area. Porta-potties are used. Environmental Assessment had been initiated with Department of Land and Natural Resources (DLNR).

Question, comments, concerns followed:

1. Alternative Route: McElheny suggested and Philips agreed in providing an alternative access of Pupukea Road to provide better access for emergency vehicles and relieve traffic congestion in the master plan. Schnell noted that part of the plan provides better access for emergency vehicles and an alternative main road had been proposed. There will still be access to the Pupukea Beach Park.
2. Upgrade: Schnell answered for Vega that the improvements of the facilities in Camp Pupukea are critical due to the fact that functioning restrooms and showers are necessary for the functioning of the camp.
3. Military Roads: Schnell answered for Ng that the military road will not be used to access Camp Pupukea.
4. Septic Tanks: Schnell answered for Shirai that the septic tanks will be sub surfaced and archaeological surveys showed no variables of concern.
5. Operational Date: Schnell answered for Vega that there is no plans to close Camp Pupukea. PBR Hawaii will only be making improvements to the camp while Camp Pupukea remains open.

Agriculture Committee Resolution Supporting North Shore Agricultural Practices and Policies: Miller introduced the Agriculture committee members and the various perspective that compiled the Agriculture committee resolution. The purpose of the Agriculture committee resolution is to create a policy statement regarding the North Shore agriculture and for the policy to be packaged for the 2015 Hawaii legislation. Hawaii has a statute for the Right to Farm. If agriculture is not protect in the North Shore, the land will instead be for potential housing. Committee member Dave Burlew then circulated the proposed two (2) paged Agriculture Committee Resolution to support all forms of agriculture on the North Shore.

Question, comments and concerns followed:

1. Kamehameha: Shirai suggested to amend the first paragraph of "during" with "prior to King Kamehameha's time."
2. Pesticide: Philips noted the concern received by community members about pesticide and how pesticide could affect the functions of bees and suggested to remove support of use of pesticide and to support conventional farming. Burlew noted that the Agriculture committee resolution is to be used as a talking point to move the discussion further.

Andersen moved and Miller seconded to approve the Agriculture committee resolution as amended. Chair Pahinui requested for the call for the question to not be asked to allow the community to express concerns.

3. Language: Lyons suggested that the language used in the resolution be elaborated on. The community needs to have a full understanding of the language used in the resolution.

4. Conflict: A community member asked for clarification for those who are "attracted to the rural setting and lifestyle of the North Shore" and who does the subject of agriculture create conflict for "resident and existing farming operations." Miller noted that the Right to Farm statute is for the protection of farmers.
5. Resolution: Leinau noted that the resolution addresses too many items and should be simplified. A community member noted that the aim of the Agriculture Committee Resolution is for discussion and that issues that are being brought up will be presented to the respective authorized body. Miller answered for a community member that the Agriculture committee resolution is currently a draft and is not in its final form. Chair Pahinui reminded the audience that the North Shore Neighborhood Board meeting has been made available for community input for the discussion of the Agriculture committee resolution.
6. Farming Belief: Various community members noted their opposition for the resolution and stated personal beliefs in farming practices.
7. Genetically Modified Organism (GMO): Community member Monica Parker noted the history of GMO in Hawaii legislation and noted her opposition. Burlew noted that concerns of GMO can be brought up to the Department of Agriculture (HDOA).
8. First Resolution: A community member noted that the Board had adopted a similar resolution in the past and noted opposition of the aims of the new resolution.
9. Agreement: Ng noted his experience in the plantation and suggested that both sides of the argument of the resolution come to some sort of agreement.
10. Commercials: A community member noted that there are commercials on television that promotes agriculture development and noted that the chemicals that are used by agriculture developers remain in the air. The community member suggested that the agriculture developers use air monitors to monitor chemicals in the air.
11. HDOA: Community member Daniela A. asked for the removal of two paragraphs of the resolution regarding HDOA and crop protection methods.
12. Farmers: Miller asked for farmers in the audience to stand and commented that pesticide usage should be limited.
13. Meeting: Chair Pahinui answered for Shirai that testimonies for the Agriculture committee resolution will continue and all other agenda items will be addressed if time permits.
14. Amendments: McElheny circulated his amendments suggested for the Agriculture committee resolution.
15. Support: Community members noted their support for the resolution and the reason why.
16. Alternatives: A community member noted alternatives to pesticides.
17. Community Input: A community member asked and Foo agreed why the Agriculture committee resolution was drafted before community input.
18. Field Test: Community member Ashley Lukens noted that Hawaii has the highest amount of field test on Genetically Engineered (GE) agriculture in the nation and suggested that there be modest disclosure of agriculture practices for the community to understand how to move this discussion forward.

Andersen and Miller rescinded the motion to approve the Agriculture committee resolution as amended.

19. Next Committee: Miller noted that the next Agriculture committee meeting will be on Wednesday, October 1, 2014 at the Waialua Community Association Atherton Room from 7:00 p.m. to 8:30 p.m.
20. Broad Issues: Miller answered for a community member that the first resolution did not address broad issues that affect the community at this time.

ANNOUNCEMENTS: Next Regular Meeting: The next North Shore Neighborhood Board No. 27 regular meeting will be on Tuesday, October 28, 2014.

ADJOURNMENT: The meeting adjourned at 9:30 p.m. at agenda item "Agriculture Committee Resolution Supporting North Shore Agricultural Practices and Policies."

Submitted by: Stephen Saito, Neighborhood Assistant

Reviewed by: Rise Doi, Neighborhood Assistant II; Kathleen Pahinui, Chair

Attachment 12. Real Property Assessment for Dedicated Agricultural Use

Previous Parcel | Next Parcel | Return to Main Search Page | Honolulu Home | Real Property Home

Owner and Parcel Information Print Owner Info

Parcel Number	610050010000	**Data current as of**	November 3, 2014
Owner Name	B P BISHOP TRUST ESTATE Fee Owner DOLE FOOD CO INC Lessee	**Project Name**	
Location Address	KAWAILOA DR	**Plat Map**	Plat Map PDF
Property Class	Multiple Property Classes on Parcel VACANT AGRICULTURAL AGRICULTURAL INDUSTRIAL	**Parcel Map**	GIS Parcel Map
Land Area (approximate sq ft)	63,257,396	**Legal Information**	
Land Area (acres)	1452.19		

Assessment Information Show Historical Assessments Print Assessment Info

Fiscal Year	Property Class	Assessed Land Value	Dedicated Use Value	Land Exemption	Net Taxable Land Value	Assessed Building Value	Building Exemption	Net Taxable Building Value	Total Property Assessed Value	Total Property Exemption	Total Net Taxable Value
2014	VACANT AGRICULTURAL	$ 4,834,200	$ 2,417,100	$ 0	$ 2,417,100	$ 0	$ 0	$ 0	$ 2,417,100	$ 0	$ 2,417,100
2014	AGRICULTURAL	$ 16,012,100	$ 9,754,200	$ 0	$ 9,754,200	$ 988,400	$ 0	$ 988,400	$ 10,742,600	$ 0	$ 10,742,600
2014	INDUSTRIAL	$ 4,300	$ 0	$ 0	$ 4,300	$ 8,135,100	$ 8,135,100	$ 0	$ 8,139,400	$ 8,135,100	$ 4,300

Appeal Information Print Appeal Info

Year	Appeal Type Value	Scheduled Hearing Date *subject to change*	Status	Tax Payer Opinion of Value	Tax Payer Opinion of Exemptions	Tax Payer Opinion of Tax Classification
2013	BOARD OF REVIEW	05/15/2013	Closed	$ 1,500,000	$ 0	
2012	BOARD OF REVIEW	04/26/2012	Closed	$ 1,500,000	$ 0	
2012	BOARD OF REVIEW	NA	Invalid	$ 7,500,000	$ 0	
2011	BOARD OF REVIEW	06/28/2012	Closed	$ 9,046,900	$ 0	
2010	BOARD OF REVIEW	06/28/2012	Closed	$ 2,540,200	$ 0	
2009	BOARD OF REVIEW	06/28/2012	Closed	$ 2,540,200	$ 0	
2008	BOARD OF REVIEW	04/26/2012	Closed	$ 0	$ 0	
2007	BOARD OF REVIEW	10/11/2007	Closed	$ 0	$ 0	
2006	BOARD OF REVIEW	04/26/2012	Closed	$ 0	$ 0	
2005	BOARD OF REVIEW	04/26/2012	Closed	$ 0	$ 0	
2005	BOARD OF REVIEW	06/28/2012	Closed	$ 0	$ 0	
2004	BOARD OF REVIEW	08/12/2004	Closed	$ 0	$ 0	
2002	BOARD OF REVIEW	08/22/2002	Closed	$ 0	$ 0	

Land Information Land Print

Property Class	Square Footage	Acreage	Agricultural Use Indicator
INDUSTRIAL	154	0.35	
AGRICULTURAL	334,105	7.67	
VACANT AGRICULTURAL	10,528,800	241.708	Yes
AGRICULTURAL	13,636,981	313.062	Yes
AGRICULTURAL	18,940,759	434.82	
VACANT AGRICULTURAL	19,816,598	454.9265	

Agricultural Assessment Information

Acres in Production	Agricultural Type	Agricultural Value

434.82	Soil: Use:	$652,230
7.67	Soil: Use:	$100
454.9265	Soil:1 Use:JV5 20AC-V	$9,098,530
241.708	Soil:1 Use:JV5 20AC-V	$2,417,080
313.062	Soil:1 Use:J5 20ACZ5	$3,819
This parcel has land in agricultural usage and therefore agricultural usage assessments have been made.		

Commercial Improvement Information

Property Class	Building Card	Building Number	Improvement Name	Identical Units	Units	Structure Type	Year Built	Effective Year Built	Gross Building Description	Sketch
AGRICULTURAL	1	0001	MAINTENANCE STORAGE WH	0	1	WAREHOUSE MET/AVG	2001	2001		NA

Commercial Building Sections

Card	Section	Level From	Level To	Area	Perimeter	Usage	Wall Height	Exterior Wall	Frame Type
1	1	01	01	7,500	400	WAREHOUSE	19	STEEL	STEEL

Property Class	Building Card	Building Number	Improvement Name	Identical Units	Units	Structure Type	Year Built	Effective Year Built	Gross Building Description	Sketch
AGRICULTURAL	2	0001	DRYER BLDG	0	1	WAREHOUSE MET/AVG	2005	2005		NA

Commercial Building Sections

Card	Section	Level From	Level To	Area	Perimeter	Usage	Wall Height	Exterior Wall	Frame Type
2	1	01	01	2,346	250	WAREHOUSE	16	STEEL	STEEL

Property Class	Building Card	Building Number	Improvement Name	Identical Units	Units	Structure Type	Year Built	Effective Year Built	Gross Building Description	Sketch
AGRICULTURAL	3	0001	EQUIPMENT STORAGE BLDG	0	1	WAREHOUSE MET/AVG	2005	2005		NA

Commercial Building Sections

Card	Section	Level From	Level To	Area	Perimeter	Usage	Wall Height	Exterior Wall	Frame Type
3	1	01	01	2,800	220	WAREHOUSE	16	STEEL	STEEL

Other Building and Yard Improvements

Description	Quantity	Year Built	Area
GROSS BUILDING VALUE	1	2012	8,135,100

Permit Information Department of Planning and Permitting (DPP)

Date	Permit Number	Reason	Permit Amount
03/30/2012	688955	OTHER WORK	$ 15,000,000
03/22/2012	688482	OTHER WORK	$ 100,000
12/27/2001	529902	NEW BUILDING	$ 230,000
07/24/2000	511099	ADDITION	$ 35,000
07/24/2000	511098	ADDITION	$ 20,000
11/23/1999	502227	NEW BUILDING	$ 100,000
11/22/1999	502216	NEW BUILDING	$ 75,000

Sales Information Print Sales Info

Sale Date	Sale Amount	Instrument #	Instrument Type	Instrument Description	Date of Recording	Land Court Document Number	Cert #	Book/Page
08/07/2012		A46050429	FEE CONVEYANCE	Grant of easement	08/10/2012			
03/15/2012		A-44640766	FEE CONVEYANCE	Grant of easement	03/22/2012			
08/30/2004			FEE CONVEYANCE	Land Court Order (all types)	08/30/2004	157840	42477	
07/27/1999		9900166054			10/15/1999			
10/22/1993								
09/15/1988								
12/21/1987	$ 2,075,173	8700196763	LEASE		12/31/1987	1521549	28650	21491/663

12/21/1987			LEASE		12/31/1987	1521550	28650	21491/670

Current Tax Bill Information		2014 Tax Payments		Show Historical Taxes		Treasury Division		Print Bill
Tax Period	**Description**	**Original Due Date**	**Taxes Assessment**	**Tax Credits**	**Net Tax**	**Penalty**	**Interest**	**Other**	**Amount Due**
2014-2	Property Tax	02/20/2015	$ 40,915.74	$ 0.00	$ 40,915.74	$ 0.00	$ 0.00	$ 0.00	$ 40,915.74
									$ 40,915.74
Tax bill is computed to 11/30/2014 Or pay online at http://www.hnlpay.com/ Other Payment Options Click Here									

Previous Parcel | Next Parcel | Return to Main Search Page | Honolulu Home | Real Property Home