Environmental Impact Statement
Preparation Notice

Kawailoa Wind Farm Project
O`ahu, Hawai`i

Submitted to

State of Hawai`i Department of Business, Economic Development and Tourism (DBEDT)

September 2010

Prepared for

First Wind, LLC

By

CH2MHILL

Project Summary

Project:	**Kawailoa Wind Farm**
Applicant	Kawailoa Wind, LLC 810 Richards Street, Suite 650 Honolulu, HI 96813 Contact: Wren Wescoatt Phone: (808) 265-9719
Accepting Authority	Department of Business, Economic Development and Tourism (DBEDT) State of Hawai`i P.O. Box 2359 Honolulu, HI 96804 Contact: Ms. Malama Minn Phone: (808) 587-9000
Location	Wind power facilities: Former Kawailoa Plantation, North Shore, Island of O`ahu; Communication facilities: Mount Ka`ala, Waianae, Island of O`ahu
Tax Map Key	Wind power facilities: 6-1-05:1, 6-1-06:1, 6-1-07:1, 6-2-09:1, 6-2-10:1, 6-2-11:1, 6-2-11:1; Communication facilities: 67003024:0000
Parcel Area	Wind power facilities: 10,550.04 acres; Communication facilities: 0.27 acres
Project Site Area	550-650 acres, depending on final design
State Land Use District	Wind power facilities :Agriculture; Communication facilities: Conservation
County Zoning	Wind power facilities: AG-1 and P-1 ; Communication facilities: P-1
Proposed Action	Construction of a renewable energy (wind power) facility with a generating capacity of up to 70 MW at the former Kawailoa Plantation to be permitted with the assistance of the DBEDT under the Renewable Energy Facility Siting Process (REFSP) ; Construction of communication facilities on Mount Ka`ala that will require the use of State lands within the Conservation District. Communication facilities are needed for the operation of the Kawailoa wind power facility.

Associated Actions Requiring Environmental Assessment	Wind power facilities: Renewable Energy Facility under HRS 201N; access improvements to a state highway; possible SMA permit; Communication facilities: Use of Conservation District Lands, use of State-owned land
Required Permits & Approvals	Wind power facilities: State and Federal ITP/HCP, Conditional Use Permit-Minor, Access to state highway, SMA permit, NPDES Construction Permit, PUC Approval, FAA Clearance, Construction and Building permits; Communication facilities: Conservation District Use Permit, Use of State Lands, NPDES Construction Permit, Construction and Building permits
Parties Consulted	The applicant consulted the State Department of Land and Natural Resources Office of Conservation and Coastal Lands, Office of Environmental Quality Control, Division of Forestry and Wildlife, Land Division, Department of Business, Economic Development, and Tourism, and the U.S. Fish and Wildlife Service during the preparation of this EISPN.
Anticipated Determination	Completion of an Environmental Impact Statement
Consultant	CH2M HILL, Inc. 1132 Bishop Street, Suite 1100 Honolulu, HI 96813 Contact: Paul Luersen Phone: (808) 943-1133

Summary

First Wind LLC (Applicant) has prepared this Environmental Impact Statement Preparation Notice (EISPN) pursuant to the State of Hawai`i (State) environmental review process, as defined by Chapters 201N and 343 of the Hawai`i Revised Statutes (HRS) and Title 11, Chapter 200 of the Hawai`i Administrative Rules (HAR). The purpose of this EISPN is to initiate the EIS scoping process under Chapter 343 and provide an opportunity for comment by reviewing agencies and the public to ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations.

The Applicant proposes to construct the Kawailoa Wind Farm Project to provide up to 70 megawatts (MW) capacity of clean, renewable energy to the Island of O`ahu. The Wind Farm will be permitted with the assistance of the Hawai`i Department of Business, Economic Development and Tourism (DBEDT) under the Renewable Energy Facility Siting Process (REFSP). DBEDT has been identified as the Accepting Authority for the purposes of complying with the Chapter 343 environmental review, as provided under HRS 201N. In

addition, the Wind Farm will, if necessary, obtain an Incidental Take License from the Hawaii Division of Forestry and Wildlife (DOFAW), and an Incidental Take Permit from the U. S. Fish and Wildlife Service (USFWS), pursuant to state and federal endangered species laws, and mitigate for listed wildlife that may be adversely affected by the project. The Wind Farm will also require the use of State lands and work within the State Conservation District for construction of new communication facilities at existing communication sites on Mount Ka`ala.

Description of the Proposed Action

The Kawailoa Wind Farm Project consists of a proposed wind power facilities site and a communication facilities site. The Wind Farm is planned to be located on former Kawailoa Plantation lands above Haleiwa on the North Shore of O`ahu, and the communications facilities are planned to be located at existing communication facility sites near the summit of Mount Ka`ala on the Waianae mountain range.

The wind farm site is located on land that is designated by the State of Hawai`i as an agricultural district and is zoned by the City & County of Honolulu as an AG-1 Restricted Agricultural District and P-1 Preservation District. The proposed wind power facilities would include the following components: wind turbine generators, two collector substations, one battery energy storage system, underground and overhead electrical connector lines, an operations and maintenance (O&M) building, a communications tower, permanent meteorological towers, construction staging and equipment laydown areas, and internal access roads.

The proposed communication facilities site would consist of two microwave communication towers that provide a required dedicated communication link between the proposed wind power facilities site and Hawaiian Electric Company (Hawaiian Electric) substations in Waialua and Wahiawa. The land on which the proposed communication facilities sites would be located is designated by the State of Hawai`i as Conservation District and zoned by the City & County of Honolulu as P-1 Preservation District.

Action Alternatives

Measurement and analysis of the wind resource on the site has been underway since August 2009, and is ongoing. As the wind resource analysis progresses, various turbine models will be evaluated for their suitability for the site, including their generating capacity, compatibility with Hawaiian Electric's system, efficiency, reliability, and market availability. The number, layout and arrangement of turbines on the site will ultimately depend on the distribution of the wind resource on the site and the model of turbine selected. Alternative site and turbine layouts will be evaluated as part of the environmental impact statement (EIS).

Depending on the turbine model that is selected, the project may consist of up to 43 turbines. The towers range in height from approximately 95 meters to 99.5 meters (312 feet to 327 feet), with rotor diameters ranging between approximately 100 meters and 101 meters (328 feet to 332 feet). Because of ongoing meteorological data collection and analysis, and an ongoing interconnection study with Hawaiian Electric, the final turbine model would likely not be selected until the project permitting process is well underway.

To allow for flexibility in the turbine selection process while still adequately assessing the project-related impacts, all project-related permitting and planning documents will consider the maximum number and maximum dimensions of the different turbine models for each alternative wind farm layout considered. The assessment of potential impacts will account for the greatest degree of impact associated with each of these features, and collectively would represent the maximum extent of impacts. Thus, irrespective of which of the turbine models and wind farm layouts is ultimately selected, the actual impacts would fall within the envelope of impacts presented.

No Action Alternative

Under the "No Action" alternative, the Kawailoa Wind Farm would not be constructed. The "No Action" alternative does not provide a new source of renewable energy for the island of O`ahu, nor does it contribute to compliance with the State's Renewable Portfolio Standard (RPS). Therefore, the "No Action" alternative does not fulfill the project's purpose and is not considered a feasible solution. However, it will be evaluated in the EIS to provide the baseline for evaluating potential impacts of the Proposed Action, and pursuant to HAR § 11-200-17(f)(1).

Conclusions

The project is designed to provide a source of clean, renewable energy to O`ahu's residents. It would provide economic benefits in the form of a native energy source that does not depend on imported fuel and a stable energy price that hedges against the volatility of fossil fuel prices. It would also provide environmental benefits in the form of reduced emissions of green house gases and other pollutants produced by typical fossil-fuel generation

It is anticipated that the proposed action may result in a significant impact to the human and/or natural environment. Therefore, in accordance with HRS Chapters 201N and 343, and HAR § 11-200, the Applicant intends to prepare an EIS to evaluate the impacts associated with the proposed project.

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Acronyms and Abbreviations

°F	degrees Fahrenheit
µg/m^3	micrograms per cubic meter
AC	alternating current
ALISH	Agricultural Lands of Importance to the State of Hawai`i
ASL	above sea level
AST	aboveground storage tank
AWEA	American Wind Energy Association
BESS	Battery Energy Storage System
BWS	Honolulu Board of Water Supply
CAA	Clean Air Act
CDPs	Census Designated Places
CWA	Clean Water Act
DAR	Division of Aquatic Resources
DBEDT	Hawai` i Department of Business, Economic Development, and Tourism
DC	direct current
DLNR	Department of Land and Natural Resources
DoD	Department of Defense
DOE	U.S. Department of Energy
DOFAW	Division of Forestry and Wildlife
EIS	environmental impact statement
EISPN	Environmental Impact Statement Preparation Notice
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
FAA	Federal Aviation Administration
FAC	facultative
FACU	facultative upland
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
First Wind	First Wind, LLC
HAAQS	Hawai`i ambient air quality standards
HAR	Hawai`i Administrative Rules
Hawaiian Electric	Hawaiian Electric Company
Hawaiian Tel	Hawaiian Telcom
HCEI	Hawai`i Clean Energy Initiative
HCP	Habitat Conservation Plan
HDOH	State of Hawai`i Department of Health

HELCO	Hawai`i Electric Light Company
HRS	Hawai`i Revised Statutes
IRS	Interconnect Requirement Study
Kawailoa Wind	Kawailoa Wind, LLC
kV	kilovolt
kWh	kilowatt hours
LSB	Land Study Bureau
Leq	equivalent sound pressure level
LUC	Land Use Commission
LUO	Land Use Ordinance
MECO	Maui Electric Company
MOU	Memorandum of Understanding
msl	mean sea level
MW	megawatts
NAAQS	National Ambient Air Quality Standards
NaS	sodium-sulfur
NO_2	nitrogen dioxide
NRCS	Natural Resource Conservation Service
NWI	National Wetlands Inventory
O&M	operations and maintenance
PM	particulate matter
POI	point of interconnection
PPA	power purchase agreement
PUC	Public Utilities Commission
RPS	Renewable Portfolio Standard
SHPD	Hawai`i State Historic Preservation Division
SLDA	Site Lease Development Agreement
SO_2	sulfur dioxide
SWCA	SWCA Environmental Consultants
TMK	Tax Map Key
UPL	obligative upland
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
WRCC	Western Regional Climate Center
WTG	wind turbine generator

1.0 Purpose and Need

1.1 Introduction

1.1.1 Applicant Background

Kawailoa Wind, LLC (Kawailoa Wind) was formed by First Wind, LLC (First Wind), a Boston-based wind energy company for the express purpose of developing wind generation facilities at the former Kawailoa Plantation on the North Shore of O`ahu (Kawailoa). First Wind is a leading independent wind energy company exclusively focused on the financing, construction, ownership and operation of utility-scale wind projects in the United States (US). First Wind currently has seven projects in operation across the US for a total of approximately 504 megawatts (MW) of generation, as well as a considerable pipeline of prospective projects under development.

In Hawaii, First Wind operates Kaheawa Wind Power I on Maui (Hawai`i's largest wind farm), has begun construction of Kahuku Wind Power on O`ahu, and is involved in the development of additional wind power projects elsewhere in the state.

1.1.2 Project Overview

Kawailoa Wind is proposing a new wind energy generation facility at the former Kawailoa Plantation Site located on the North Shore of O`ahu. The proposed wind energy generation facility will have a capacity of up to 70 MW and is planned to commence operation in late 2012.

The operation of the wind farm requires the construction of communication facilities at two existing communication facility sites near the summit of Mount Ka`ala. The communication facilities at both locations would be sited on State-owned land in the Conservation District. The facilities are needed to integrate the electricity generated by the wind farm with the Hawaiian Electric Company Ltd. (Hawaiian Electric) transmission and distribution system.

The Kawailoa wind energy facility would supply wind-generated electricity to Hawaiian Electric under the terms of a Public Utilities Commission (PUC) -approved power purchase agreement (PPA). Kawailoa will consist of up to 43 wind turbine generators (WTGs), an operations and maintenance (O&M) building, underground and overhead electrical connector lines carrying electrical power from the individual wind generators to two electrical substations, a Battery Energy Storage System (BESS), underground and overhead connection lines between, communication facilities, wind monitoring equipment, and service roadways to connect the new facilities to the existing main access roads.

The exact type, number, and location of turbines will be determined once (1) additional meteorological data has been collected, which will allow Kawailoa Wind to better characterize the wind resource, (2) after further discussions have been held with Hawaiian Electric regarding the design features needed to best integrate the new facilities into the electrical grid, and (3) following completion of the environmental impact statement (EIS) process. Because of this, there is no "preferred alternative" at this time. However, the

information that is currently available allows the desired range of output for the proposed facility to be determined, and the elimination of several alternatives from consideration, as described in further detail in Section 2.

The exact locations of wind turbines on the project site will be determined based on final information on wind patterns, topography, geotechnical investigations, and other factors that are still being assessed.

Under the range of alternatives being considered, wind turbines would be constructed in two or three strings or rows that run across the project site from roughly the northwest to the southeast, to maximize collection of the wind resource. The configurations of the WTGs currently being considered are shown on Figure 1-1.

1.2 Project Purpose and Need

1.2.1 Project Need

As one of the world's most remote island chains, with no fossil fuel resources of its own, Hawai`i is the most dependent on imported energy of all the U.S. states. Recent fluctuations in fossil fuel prices, potential future volatility in fuel costs, and uncertainty regarding production rates or status of Hawai`i refineries have put the state's energy producers at additional risk. These factors combine to create potential risk for Hawai`i residents and municipalities in terms of the stability of the energy supply within Hawai`i.

In an attempt to alleviate its dependence on imported fuels, the State has established Renewable Portfolio Standards (RPS) [Hawai`i Revised Statutes (HRS) § 269-92], which require Hawaiian Electric and its affiliates, Hawai`i Electric Light Company (HELCO) and Maui Electric Company (MECO), to generate renewable energy equivalent to 10 percent of their net electricity sales by the end of 2010, 15 percent by the year 2015, and 20 percent by 2020. On January 28, 2008, the State also signed a Memorandum of Understanding (MOU) with the U.S. Department of Energy (DOE) that established the Hawai`i Clean Energy Initiative, under which at least 70 percent of Hawai`i's energy needs would be supplied by renewable resources by the year 2030.

The regulations and initiatives established by the State in an effort to increase its portfolio of renewable energy reflect the State's commitment to move away from petroleum-based energy generation and projects. Collectively, the issues briefly described above establish an overwhelming need for the development and implementation of renewable energy projects throughout the State.

1.2.2 Project Purpose

In response to the requirements of the State's RPS and the State's increasing vulnerability with regard to energy production because of fossil fuel dependence, First Wind has been actively engaged in developing wind power projects throughout Hawai`i. The purpose of the proposed project is to provide O`ahu with a source of clean, renewable energy that can replace a portion of the electricity that is currently generated by burning fossil fuels. Completion of the project would significantly reduce green-house gas emissions and other forms of pollution and would potentially reduce particulate-related negative health effects associated with burning fossil fuels. As currently proposed, the project may provide up to a

maximum of 70 MW of electricity generating capacity to Hawaiian Electric's system, providing enough electricity to power approximately 15,000 O`ahu homes. The project would convert a portion of the electrical energy generated on O`ahu to a local renewable fuel source, helping the State move toward its energy independence and sustainability goals. The project will also provide electricity to O`ahu's residents that is de-linked from the potential volatility in fossil fuel supply and cost. Each of these benefits is discussed in more detail in the following subsections.

The properties that comprise the former Kawailoa Plantation were identified by its landowner, Kamehameha Schools, as an appropriate site for a wind farm in its 2008 North Shore Master Plan. Kamehameha Schools solicited proposals from wind farm developers in May 2008. It is expected that the project would result in economic benefits to the surrounding communities through job production, as well as providing a long-term tax revenue stream for the State and County. The project may potentially have a positive long-term effect on tourism, as many Hawai`i visitors are likely to appreciate the State's commitment to the principles of sustainability and a cleaner environment.

1.3 Overall Objectives of the Proposed Action

Based on the identified needs of its system described above, Kawailoa Wind has identified the following objectives for the proposed action.

1. *Bring on-line at the earliest possible date a wind power facility of up to 70 MW generating capacity on the island of O`ahu to increase the portion of O`ahu's energy derived from renewable sources and reduce dependencies on fossil fuels.*
2. *Ensure that the size and operating characteristics of the new wind farm are compatible with Hawaiian Electric's overall system requirements to facilitate their integration into the company's grid.*
3. *Locate the wind farm in an area with compatible surrounding land uses.*
4. *Maintain environmental quality and contribute to stabilizing future energy prices.*

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2.0 Proposed Action and Alternatives

2.1 Introduction

This chapter describes the physical and operational characteristics of the facilities that will be constructed if the proposed project receives all needed approvals. It also describes the alternative means of achieving the objectives for the proposed action identified in Section 1.3 above.

The description is divided into five major parts.

- Section 2.2 describes the background of Kawailoa Wind Farm project.
- Section 2.3 describes the facilities that would comprise the Kawailoa facility and connect it with the Hawaiian Electric transmission system.
- Section 2.4 discusses the anticipated schedule for the construction of the project.
- Section 2.5 provides preliminary cost estimates for each of the major components.
- Finally, Section 2.6 discusses the alternatives to the proposed action.

This chapter describes the physical and operational characteristics of the facilities included under the proposed action. It also describes a range of reasonable alternatives to satisfy the purpose and need of the project as identified in Section 1 above.

2.2 Background

The proposed project site for the wind power facilities would be located on land currently owned by Kamehameha Schools in the Kawailoa region of the north shore of O`ahu. Historically part of the plantation operated by Waialua Sugar Company, this area was one of the primary subjects of the 2008 North Shore Master Plan, which provides the framework for management of Kamehameha Schools' land holdings on the North Shore. The site is located on land that is designated by the State of Hawai`i as an agricultural district (Figure 2-1), and is zoned by the City & County of Honolulu as an AG-1 Restricted Agricultural District and P-1 Preservation District (Figure 2-2). Kamehameha Schools identified the agricultural production potential of the land within which wind power facilities site is located as low because of the lack of water resources and irrigation infrastructure.

Kamehameha Schools identified the area as an appropriate site for a wind farm in its 2008 North Shore Master Plan and solicited proposals from wind farm developers in May 2008. Kawailoa Wind believes that the proposed site of the wind power facilities is one of the last few remaining large parcels on O`ahu that is suitable for wind project development, in terms of wind resource and constructability. The site's size, existing access roads, and relatively flat topography allow for necessary turbine spacing and conventional construction methods. The site's existing cane haul roads can accommodate the necessary

construction vehicles, requiring fewer improvements and less site disturbance. Furthermore, the two existing Hawaiian Electric 46- kilovolt (kV) lines within the project site provide access to O`ahu's electrical grid without major upgrades to Hawaiian Electric facilities.

The proposed project site for the communication facilities would be located at two existing communication facility sites near the summit of Mount Ka`ala, at the north end of the Waianae mountain range. Land at the location of the communications facilities is designated by the State of Hawai`i as conservation district (Figure 2-3), and zoned by the City & County of Honolulu as P-1 Preservation District (Figure 2-4).

2.3 Technical Description of the Proposed Action

2.3.1 Overview

Kawailoa Wind LLC proposes to construct, (1) a wind generating facility with a maximum capacity of 70 MW at former Kawailoa Plantation lands and (2) associated communications facilities on Mount Ka`ala, on the island of O`ahu. The proposed project site for the wind power facilities is located on the North Shore of O`ahu and would include the following components: wind turbine generators, two collector substations, one battery energy storage system, underground and overhead electrical connector lines, an O&M building, a communication tower, permanent meteorological towers, a construction staging and equipment laydown area, and internal access roads.

The proposed communication facilities are located at existing communication facility sites on Mount Ka`ala, and would consist of two microwave communication towers that provide a required dedicated communication link between the proposed wind power facilities site and Hawaiian Electric substations in Waialua and Wahiawa. The land on which the proposed communication facilities site would be located is designated by the State of Hawai`i as Conservation District, and zoned by the City & County of Honolulu as P-1 Preservation District.

If the required land use approvals and environmental permits are granted, Fist Wind LLC will:

- Obtain a lease from the Kamehameha Schools for approximately 4,200 acres of land within the former Kawailoa Plantation.
- Modify the existing cane haul roads to create internal service roads, as needed to connect to Kawailoa Road (which will serve as the primary access road).
- Install up to 43 wind turbines, including excavation and construction of foundations and erection of the support towers and transformers.
- Install underground electrical collection cables and overhead electrical lines connecting all of the turbines to the electrical substation.
- Install electrical substation and interconnection equipment to link the facility with the existing Hawaiian Electric power transmission system.
- Construct a new O&M building for equipment and parts storage.

- Construct a BESS within the footprint of the substation to provide dispatchable energy under various operating conditions. This stored energy will be used to increase the penetration of the as-available wind resource on the O`ahu grid.
- Construct up to five permanent meteorological towers and a communications tower to support data gathering and control functions.
- Obtain a sub-lease agreement from Hawaiian Telcom (Hawaiian Tel) for two communications facilities on Mount Ka`ala.
- Construct communications towers at two existing Hawaiian Tel communications facility locations on Mount Ka`ala

2.3.2 Project Location

The proposed Kawailoa Wind Farm Project is located almost entirely on the former Kawailoa Plantation lands, approximately 5 miles northeast of Haleiwa town, within the Kawailoa and Opaeula regions of O`ahu. The project site boundary encompasses approximately 4,200 acres of the 7,000-acre Kamehameha Schools Kawailoa property. The site's size, existing access roads, and relatively flat topography allow for proper turbine spacing and conventional construction methods. The site's existing cane haul roads can accommodate the necessary construction vehicles, requiring fewer improvements and minimal site disturbance. The primary access route to the proposed wind farm site would be via Kawailoa Road.

Energy generated would be delivered to Hawaiian Electric from an onsite collector substation using two independent 46 kV points of interconnection (POI) on Hawaiian Electric's existing Waialua-Kuilima and Waialua-Kahuku 46 kV lines. The project will also include a 21 MW Battery Energy Storage System (BESS) for smoothing the energy output and meeting Hawaiian Electric's ramp rate requirements.

Two communications facilities (tower and microwave dish) would also be constructed at existing communications sites located at Mount Ka`ala.

Figure 2-5 indicates the general project location for both the wind farm and communications facilities.

2.3.3 Land Ownership

The wind farm site is located entirely on land owned by Kamehameha Schools. The tax map keys for property located within the proposed wind farm project area are listed below in Table 2-1 and are shown on Figure 2-6.

TABLE 2-1
Parcel Information for the Kawailoa Wind Farm Project

Project Component	Tax Map Key (TMK)	Landowner(s)
Wind Farm Site	6-1-05:1	Kamehameha Schools
	6-1-06:1	Kamehameha Schools
	6-1-07:1	Kamehameha Schools
	6-2-09:1	Kamehameha Schools
	6-2-11:1	Kamehameha Schools

The communication facilities sites are located entirely on land owned by the State of Hawai`i, and currently leased by Hawaiian Telcom.

The tax map keys for property located within the proposed Mount Ka`ala communications facilities project area are listed below in Table 2-2 and are shown on Figure 2-7.

TABLE 2-2
Parcel Information for the Mount Ka`ala Communications Facilities

Project Component	Tax Map Key (TMK)	Landowner(s)
Communications Facilities	67003024:0000	State of Hawai`i

2.3.4 Meteorological Monitoring Towers

Four temporary 60-meter guy wire-supported meteorological towers were installed on the Kawailoa site in order to gather wind speed and direction information. The monitoring towers were erected between August and November 2009, and are presently collecting data.

In addition, for calibration during normal operations First Wind anticipates erecting up to five permanent meteorological towers near the new WTGs.

2.3.5 Wind Turbine Generators

Several different turbine models are currently being evaluated for constructability, reliability, performance and availability. The final wind turbine generator type will be decided upon once these factors and additional meteorological data have been evaluated. WTGs have four principal elements: (1) a three-bladed rotor that converts the wind's energy into rotational shaft energy, (2) a nacelle that houses a gearbox and a generator, (3) a tower that holds the rotor and drive train above the ground, and (4) electronic equipment at the base of the turbine such as controls, electrical cables, and a transformer.

Figure 2-8 contains a schematic drawing of the type of a typical WTG. Although different types of turbines may eventually be considered for use, the features are expected to be similar to those shown below. The exact dimensions and other specifications of the selected turbine model will be included in the Final EIS.

2.3.5.1 Rotor

The three-bladed rotor on each WTG may have a diameter of up to approximately 332 feet. When the blade tip is at the top of its arc it can extend nearly 492 feet above the ground. Typically WTG blades rotate between 10 and 21 revolutions per minute depending on wind speed.

2.3.5.2 Nacelle

The nacelle atop each tower contains the gear box, low- and high-speed shafts, generator, controller, and brake. The nacelles are mounted on the towers in a manner that enables 360-degree horizontal rotation. Each WTG is equipped with sensors that monitor wind

speed and direction. When the wind speed increases to within operating range, the sensors cue the WTG to orient itself to face the wind, to switch its rotor from a dormant (that is, feathered) to an active position, and to commence generating power.

2.3.5.3 Tower

The conical tubular steel towers supporting each unit would be approximately 327 feet high; they would taper from approximately 15 feet across at the base to approximately 10 feet at the top. Each tower would contain an internal safety ladder that allows access to the nacelle and a 450-pound capacity load-lifting system that would allow work equipment and parts to be hoisted from the ground to the nacelle. The poured concrete foundation for each tower is approximately 46 feet square. The exact foundation depth will depend upon the results of geotechnical tests conducted at each of the final tower locations, but will probably on the order of 10 feet below finished grade.

2.3.5.4 Electronic Equipment

An electronics cabinet inside the base of the tower houses the electric switchgear and related controls. A small (approximately 8-foot cube) pad-mounted transformer located immediately adjacent to the base of each tower increases the voltage of the electricity produced by the generator to 23 kV.

2.3.6 Communication Dishes and Towers

Kawailoa Wind is proposing to construct three new microwave communication towers. One tower will be located at the Kawailoa wind farm site and two towers will be located at existing communication facility sites located at Mount Ka`ala on state conservation land currently leased by Hawaiian Telcom. The towers are necessary to provide a dedicated communication link between the wind power facilities in Kawailoa and Hawaiian Electric substations in Waialua and Wahiawa. One will be located near the existing Hawaiian Tel communications building and one will be located at the existing Hawaiian Tel repeater antenna on a nearby ridge.

The current plan is to install a 30-foot lattice steel tower at the Hawaiian Tel building, which will support a single parabolic microwave radio antenna and be connected via waveguide cable, to radio equipment inside the Hawaiian Tel building. At the repeater site, a 20-foot lattice tower with a single parabolic antenna will be constructed. At both sites, structures will be designed that meet the system communication requirements, and that can be constructed with minimal impact to the surrounding environment.

2.3.7 WTG Pads & Foundations

A work area will be cleared and graded around the base of each WTG to provide room for delivery and laydown of turbine components, crane access, and foundation and turbine construction. This will be done using bulldozers, excavators, compactors, graders, front-end loaders, trenching equipment, and a drill rig (for possible probe and grout activities). A rock crusher and screener may be used if excavation of significant amount of rock is required. Water trucks will be used to provide moisture for compaction as well as dust control activities. Ready-mix concrete trucks may deliver concrete for the turbine foundations; alternatively, a temporary concrete batch plant may be set up at the wind farm site during construction.

Based on experience gained at other projects, the size and shape of each work area will vary depending on terrain and construction requirements. However, an area roughly 135 feet in radius will generally be required to construct each WTG. Additional area will be disturbed outside this finished pad surface to provide a safe layback of cut/fill. A gravel perimeter will be provided around each foundation at the completion of construction to facilitate access and maintenance. Geotextile material will be used beneath the gravel as dictated by the geotechnical engineer where required for road stability. Disturbed areas outside the gravel perimeter will be scarified and seeded to stabilize the soil. In addition, it is anticipated that a grassed area around each turbine will be maintained in a mowed condition for the life of the project in order to facilitate detection of downed wildlife.

2.3.8 Equipment Transport and Installation

The WTG components would be stored at an interim site on O`ahu. The equipment will be transported to the site via existing State and County roadways using appropriate road safety precautions. Once at the site, the turbines will be erected utilizing cranes.

2.3.9 Operation and Maintenance Building

The O&M building would be a prefabricated metal building. It would be approximately 7,000 square feet and up to 25 feet in height. The O&M building would house the wind farm system controller, which monitors the performance of the overall system and the operational status and performance of individual turbines and wind monitoring equipment. The facility will also provide for an indoor work area and a storage area for spare parts. In addition to providing space to store spare equipment, it would house the office for the site manager and maintenance workers.

2.3.10 Access to the Project Site

The primary access to the proposed facility would be from Kawailoa Road.

2.3.11 Internal Road Network

The onsite access roads would use the existing network of cane haul roads, which were designed and constructed to accommodate large cane haul trucks. Kawailoa Wind will upgrade these roads and construct new roads as needed to connect the new WTGs to the existing access roads. The extent of that network will depend upon the number and location of WTGs that are eventually constructed.

The road network would provide access to the project area, each turbine location, operations and maintenance building, BESS facility, and substations. The cleared and graded width for the proposed new access roads would be approximately 36 feet (11 meters). Of this 36-foot width, only 16 to 20 feet will be graveled (8 to 10 feet earthen shoulders on each side of the gravel roadway will be used for large crane travel that will essentially straddle the gravel portion as it tracks from WTG to WTG) with a 16- to 20-foot-wide gravel area and a 10-foot-wide (3-meter-wide) shoulder on either side. The width of the roads is designed to accommodate large trucks and cranes. Individual spur roads would branch off from the main connector roads to each WTG site.

2.3.12 Battery Energy Storage System (BESS)

Because of the technical requirements of interconnecting to the Hawaiian Electric system, this project includes a BESS that stabilizes energy output during extreme wind fluctuations. The BESS provides short-term storage, essentially charging during periods of sustained wind and discharging into the grid when the wind falls off suddenly, thereby mitigating sudden variations in the wind resource and providing a more levelized output. In addition, the BESS may provide voltage control, frequency control, and other services required to support Hawaiian Electric's electrical system.

Kawailoa Wind is proposing to install a commercial-scale BESS immediately adjacent to the 50 MW substation. It would be up to 15,000 square feet and up to 25 feet in height. The BESS will be sized according to the PPA and Interconnection Reliability Study (IRS), which could be approximately 10 MW with 20 MWh of energy storage capability.

The proposed BESS enclosure will be a four-wall structure, with an angled pitched roof totaling approximately 12,000 square feet in area. It will be located adjacent to the proposed 50 MW substation. The BESS enclosure will house the power cell components and electrical equipment including control and switching panels, direct current/alternating current (DC/AC) inverters, and up to eight external pad-mounted transformers to connect to the substation. The BESS enclosure will also accommodate the relaying, metering, and control equipment for the substations, as well as the control equipment for the BESS. Outdoor parking will be provided for three to five vehicles.

2.3.13 Electrical System Components

2.3.13.1 Electrical Lines

Electrical power generated by the WTGs would be transformed and collected through a network of underground and overhead collection circuits. The pad-mounted transformers located at the base of each WTG would increase the voltage of electricity generated by each WTG to 23 kV. Kawailoa Wind would install an underground and overhead collection system to bring electrical output from the pad-mounted transformers at each WTG to the electrical substations.

Two Hawaiian Electric electrical transmission lines presently cross the site, the Waialua-Kuilima and Waialua-Kahuku 46 kV transmission lines.

2.3.13.2 Electrical Substations

Two electrical substations would be constructed to transform the voltage from the onsite collection system and facilitate the interconnection to the existing Hawaiian Electric 46 kV transmission lines. The substations would have a fenced perimeter with the tallest structure being approximately 50 feet in height. Energy generated by the wind turbines would be delivered via the overhead collection system to the substations. The WTGs would connect to a 50 MW substation near the Waialua-Kuilima line. A new 46 kV line would connect the other WTGs to a 20 MW substation near the intersection of Kamehameha Highway and Cane Haul Road, near the Waialua-Kahuku line.

2.3.13.3 Transformers and WTG Interconnections

As previously noted, a transformer at the base of each tower will boost the lower-voltage electrical power produced by the nacelle-mounted generator to 23 kV. The 23kV power will be carried by underground and overhead lines from the pad-mounted transformers to the onsite electrical substations.

2.3.14 Water Supply/Wastewater Disposal

The project facilities have very low onsite water requirements. As a result, it is not anticipated that a direct connection to the municipal water supply will be required. Small amounts of bottled potable water and an eye wash station will be provided in the operations building. A septic tank will collect wastewater from restrooms in the maintenance building. A connection to the municipal water system may also be considered.

2.3.15 Proposed Land Use Agreement

First Wind has in place with Kamehameha Schools a Letter of Intent for use of the proposed wind power facilities site at the former Kawailoa Plantation and is currently negotiating lease terms. First Wind is also applying for a license agreement with Hawaiian Telcom and will coordinate with the State of Hawai`i Board of Land and Natural Resources Land Division for use of lands at the proposed communication facilities site.

2.3.16 Proposed Power Purchase Agreement

First Wind has been selected by Hawaiian Electric to negotiate a PPA to provide 70 MW of wind generated electricity.

2.4 Schedule

It is anticipated that construction of the facility will begin in late 2011 and will commence operation in 2012/2013.

2.5 Anticipated Costs

Cost estimates are not yet available for the project as engineering planning and design have not been completed. Cost estimates for the project will be provided in the EIS document.

2.6 Alternatives

2.6.1 Framework for Consideration of Alternatives

HAR, §11-200-17 (a section in the Office of Environmental Quality Control's Environmental Impact Statement Rules) addresses the content requirements of draft and final EISs. Subsection §11-200-17(f) states:

> (f) *The Draft EIS shall describe in a separate and distinct section alternatives which could attain the objectives of the action, regardless of cost, in sufficient detail to explain why they were rejected. The section shall include a rigorous exploration of the environmental impacts of all such alternative actions. Particular attention shall be given to alternatives that might enhance environmental quality or avoid, reduce, or minimize some or all of the adverse environmental effects, costs, or risks. Examples of alternatives include:*

(1) The alternative of no action;

(2) Alternatives requiring actions of a significantly different nature which could provide similar benefits with different environmental impacts;

(3) Alternatives related to different designs or details of the proposed action which would present different environmental impacts;

(4) The alternative of postponing action pending further study; and

(5) Alternative locations for the proposed project.

In each case the analysis shall be sufficiently detailed to allow a comparative evaluation of the environmental benefits, costs, and risks of the proposed action and each reasonable alternative.

The objectives listed in Section 1.3 of this report were used in identifying the alternatives described below for inclusion in this evaluation. Section 2.6.2 describes the alternatives that will be evaluated in detail in the Draft EIS. Section 2.6.3 lists the alternatives that Kawailoa Wind considered but rejected during early planning phases and describes the reasons why they were excluded from further consideration in this impact analysis.

2.6.2 Alternatives to be Evaluated in EIS

The Kawailoa wind energy facility would supply wind-generated electricity to Hawaiian Electric under the terms of a PUC-approved PPA. Kawailoa will consist of up to 43 WTGs, an O&M building, underground and overhead electrical connector lines carrying electrical power from the individual wind generators to two electrical substations, a BESS, underground and overhead connection lines between, the communication facilities, wind monitoring equipment, and service roadways to connect the new facilities to the existing main access roads.

The exact type, number, and location of turbines will be determined once (1) additional meteorological data has been collected, which will allow Kawailoa Wind to better characterize the wind resource, (2) after further discussions have been held with Hawaiian Electric regarding the design features needed to best integrate the new facilities into the electrical grid, and (3) following completion of the EIS process. Because of this, there is no preferred alternative at this time.

2.6.3 No-Action Alternative

Under the "No Action" alternative, the Kawailoa Wind Farm would not be constructed. The No Action alternative does not provide a new source of renewable energy for the island of O`ahu, nor does it contribute to compliance with the State's RPS. Therefore, the No Action alternative does not fulfill the project's purpose and is not considered a feasible solution. However, it will be evaluated in the EIS to provide the baseline for evaluating potential impacts of the Proposed Action, and pursuant to HAR § 11-200-17(f)(1).

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3.0 Existing Environment and Potential Impacts

This section summarizes the existing environment in the study area and the kinds of potential adverse and beneficial effects that could result from the proposed action as presented in Section 2.

This section is not intended to be an in-depth analysis. Instead, it briefly describes the issues that have been identified to date and outlines the kinds of analysis that Kawailoa Wind expects to include in the EIS. By highlighting the kinds of analysis Kawailoa Wind believes is needed, it provides reviewers an opportunity to consider whether all issues that are important to them are likely to be addressed and to identify additional areas of concern that they believe should be included in the EIS.

3.1 Climate

3.1.1 Definition of Resource

Climate refers to the average weather conditions in a region over a long period of time. The climate of a location is affected by its latitude and terrain, as well as by the nearby ocean and its currents. Specific climate types can be described based on characteristics such as temperature and rainfall.

3.1.2 Existing Conditions

Hawai`i's climate is characterized by two seasons: summer (May through September) and winter (October through April). In general, the islands have relatively mild temperatures and moderate humidity throughout the year (except at high elevations), with persistent northeasterly trade winds and infrequent severe storms. However, summer is typically warmer and drier, with minimal storm events. The trade winds are prevalent 80 to 95 percent of the time during the summer months, when high-pressure systems tend to be located north and east of Hawai`i. During the winter months, the high-pressure systems are located farther to the south, decreasing the prevalence of the trade winds to about 50 to 80 percent of the time [Western Regional Climate Center (WRCC), 2010].

Despite the strong marine influence resulting from Hawai`i's insularity, some mountainous areas exhibit semi-continental conditions (especially on the islands of Hawai`i and O`ahu). Combined with the rugged and irregular topography, the result is diverse climatic conditions across the various regions of the state, including significant geographic differences in rainfall amounts, which range from 20 inches to 300 inches (WRCC, 2010).

3.1.2.1 Wind Farm

The proposed wind farm project area is located in a windward lowland region of O`ahu. Windward lowlands are generally below 2,000 feet on the north to northeast sides of the islands. The area is moderately rainy, with frequent trade wind showers, and partly cloudy to cloudy days. Temperatures are more uniform and mild than in other regions (WRCC,

2010). Rainfall occurs primarily between the months of October and April. Based on data recorded between 1961 and 1990, the average annual rainfall in this vicinity is 38.94 inches, with monthly totals ranging between 1.17 inches (August) and 7.15 inches (March) (WRCC, 2010). In general, the lowlands have a narrow range of diurnal temperatures, with daytime temperatures from 70 degrees Fahrenheit (°F) to 89°F and nighttime temperatures from 60°F to 79°F. At elevations below 4,000 feet, the difference in the mean daily maximum and mean daily minimum temperatures from winter to summer is only about 4°F to 8°F (WRCC, 2010). The prevailing wind direction in the project area is from the east.

3.1.2.2 Mount Ka`ala Communication Facility Sites

The proposed communications towers will be located at the wind farm site and at two existing communications facilities sites at Mount Ka`ala. The sites at Mount Ka`ala are located in regions classified as rainy mountain slopes along the windward sides of the island. In these areas, rainfall and cloudiness are very high, with considerable rain during both winter and summer. Temperatures are equable, and humidities are higher than in any of the other six Hawai`i climatic regions (WRCC, 2010).

3.1.3 Potential Impacts

The proposed project is not expected to affect climatic conditions or weather patterns, however the EIS will include a more thorough evaluation of potential impacts to climatic conditions or weather patterns as a result of the proposed action.

The proposed project is expected to have a beneficial impact on the climate by decreasing fossil fuel consumption and decreasing greenhouse gas emissions. Burning fossil fuels is known to emit several greenhouse gases (GHGs) (mainly carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O]), which contribute to climate change,. Renewable electricity generated by the wind farm would reduce oil consumption, thereby reducing emissions of these GHGs. Although construction and operation of the facility will result in some emissions of CO_2 (such as through employee trips and transporting materials), reductions that would result from replacing fossil fuel-generated power with the wind-generated power produced by the proposed project would more than offset these emissions.

3.2 Geology, Topography and Soils

3.2.1 Definition of Resource

Geologic resources consist of the earth's surface and subsurface materials. Topography refers to an area's surface features including its shape, height, and depth. Soils are unconsolidated surface materials that form from underlying bedrock or other parent material. Soil drainage, texture, strength, shrink/swell potential, and rates of erosion affect the suitability of the ground to support manmade structures and facilities. In combination with other factors (for example, climate and terrain), these characteristics are also important considerations in terms of soil productivity and suitability for cultivation.

3.2.2 Existing Conditions

3.2.2.1 Geology

Wind Farm

The island of O`ahu was formed by two shield volcanoes that are now considered extinct: Waianae Volcano forming the west side of the island, and Ko`olau Volcano forming the east side. Lava flows from the two volcanoes merged to form the central plain of O`ahu. The eroded remains of these volcanoes form the Waianae and Ko`olau mountain ranges. Features of both mountain ranges include amphitheater-headed valleys and steep cliffs. Eroded materials from the volcanoes form extensive alluvial and colluvial deposits in the lowlands (Hawaiian Electric, 1993). The proposed wind farm site is located within coastal lowlands, extending mauka towards the base of the Ko`olau Mountain range. Shallow soils are developed in deep alluvium derived from terrigenous sediments, and consist of silty clays. Near the coast, terrigenous sediments may be intermingled with marine sediments in the shallow subsurface.

Mount Ka`ala Communication Facility Sites

The proposed communications facility sites are located along steep mountainous ridges near the summit of Mount Ka`ala. Shallow soils along the ridges are developed as recent alluvium derived from terrigenous sediments, and consist of silts and clays overlying saprolite and basalt.

3.2.2.2 Topography

Wind Farm

The wind facility site covers a wide area and encompasses a range of topographical conditions from moderately sloping agricultural lands at the low to mid elevations to uplands at the base of the Ko`olau mountains. The land is moderately dissected by intermittent streams. Elevations range from 200 feet above sea level (ASL) at the western edge of the Kawailoa wind farm property to 1,280 feet ASL, which equates to an approximately 7 percent grade. However, the valley heads and cliffs of the Ko`olau Range can have slopes as steep as 50 to 60 percent.

Communications Towers

The communications towers will be constructed at existing Hawaiian Telcom communication facility sites located near the summit of Mount Ka`ala. The sites exist along steeply sloping mountain ridges within the upper reaches of the Waianae Mountain Range. Topography at each site consists of a narrow ridge, with steep (in some areas nearly vertical) mountain slopes immediately adjacent to each side of the ridge.

3.2.2.3 Soils

Natural Resource Conservation Service

The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) classifies soils within the United States and prepares maps indicating the soil types present in all states including Hawai`i. A map unit delineation on a NRCS soil map represents an area dominated by one or more major kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soils. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic

classes. Consequently, every map unit is a mix of the dominant soils and minor soils that may belong to other classes.

Soils that have profiles that are almost alike comprise a soil series. Except for differences in texture of the surface layer, all the soils of a series are similar in composition, thickness, and arrangement. Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use.

Wind Farm

Multiple soil types are present within the footprint of the wind farm project (Table 3-1). The primary soil types present range from clays to silty clays, and to rocky soils along the stream gulches. The predominant soil types at the site are in the Lahaina, Leilehua, and Wahiawa Series, all of which are typically well-drained soils derived from weathered basalt that form in upland areas. Along the base of the Ko`olau range, alluvial fans are present, and along the sides of stream gulches, colluvial deposits are present; these areas are generally more steeply sloping and can be rocky. The characteristics of the predominant soils at the wind farm site are presented in Table 3-2.

TABLE 3-1
Soils within the Kawailoa Wind Farm Area

Map Unit Symbol	Map Unit Name
EmA	Ewa silty clay loam, moderately shallow, 0 to 2 percent slopes
EwC	Ewa stony silty clay, 6 to 12 percent slopes
HeA	Haleiwa silty clay, 0 to 2 percent slopes
HLMG	Helemano silty clay, 30 to 90 percent slopes
KlaB	Kawaihapai stony clay loam, 2 to 6 percent slopes
KlbC	Kawaihapai very stony clay loam, 0 to 15 percent slopes
KlB	Kawaihapai clay loam, 2 to 6 percent slopes
LaB	Lahaina silty clay, 3 to 7 percent slopes
LaC	Lahaina silty clay, 7 to 15 percent slopes
LaC3	Lahaina silty clay, 7 to 15 percent slopes, severely eroded
LeB	Leilehua silty clay, 2 to 6 percent slopes
LeC	Leilehua silty clay, 6 to 12 percent
MoB	Manana silty clay loam, 2 to 6 percent slopes
PaC	Paaloa silty clay, 3 to 12 percent slopes
PbC	Paaloa clay, 2 to 12 percent
rRK	Rock land
rRT	Rough mountainous land
W	Water > 40 acres
WaA	Wahiawa silty clay, 0 to 3 percent slopes

TABLE 3-1
Soils within the Kawailoa Wind Farm Area

Map Unit Symbol	Map Unit Name
WaB	Wahiawa silty clay, 3 to 8 percent slopes
WaC	Wahiawa silty clay, 8 to 15 percent slopes
WaD2	Wahiawa silty clay, 15 to 25 percent slopes, eroded
WkA	Waialua silty clay, 0 to 3 percent slopes
WkB	Waialua silty clay, 3 to 8 percent slopes
WlB	Waialua stony silty clay, 3 to 8 percent slopes

TABLE 3-2
Characteristics of Predominant Soil Types within the Wind Farm Area

Soil Type	Slope %	Permeability	Runoff	Erosion Hazard	Land Uses
Lahaina silty clay	0-15	Moderately Rapid	Slow to Medium	Slight to Moderate	Agricultural, pasture, woodland, & wildlife habitat
Leilehua silty clay	2-12	Moderately Rapid	Slow to Medium	Slight to Moderate	Agricultural, pasture, woodland, & wildlife habitat
Wahiawa silty clay	3-15	Moderately Rapid	Slow to Medium	Slight to Moderate	Agricultural, pasture

Source: General Soil Survey of Hawai`i, Foote et al. 1972 (U.S. Soil Conservation Service).

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

ALISH is a system that identifies and classifies agriculturally suitable land primarily (though not exclusively) on the basis of soil characteristics. Much of the project area, including the proposed wind power facilities, would be located on land classified by ALISH as prime land. The preferred location for WTGs, roads, meteorological monitoring towers, and the Operations and Maintenance building are on prime agricultural land. The 20-MW substation is on land classified as other important agricultural land. The 50-MW substation and the BESS are not located on important agricultural lands.

Prime agricultural land is land 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 economically when treated and managed, including water management, according to modern farming methods (Hawaii Department of Agriculture, November 1977).

Land Study Bureau Detailed Land Classification

The University of Hawai`i Land Study Bureau rates the agricultural productivity of soils throughout the State, based on characteristics including texture, slope, salinity, erodibility, and rainfall. The productivity ratings are used to designated 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 classification also includes Category "U," which is for soils that were not rated.

The soils at the turbine locations currently under consideration are classified as Categories B, C, and D by the Detailed Land Classification System.

Mount Ka`ala Communications Facility Sites

The predominant soil types at the Mount Ka`ala communications facility are in the Helemano and Kemoo Series (Table 3-3). These soils exist as alluvial fans and colluvial slopes on the sides of steeply sloping gulches. The characteristics of these soils are presented in Table 3-4.

TABLE 3-3
Soils within the Mount Ka`ala Communications Facilities Sites

Map Unit Symbol	Map Unit Name
HLMG	Helemano silty clay, 30 to 90 percent slopes
KpF	Kemoo silty clay, 35 to 70 percent slopes

TABLE 3-4
Characteristics of Predominant Soil Types within the Mount Ka`ala Communications Sites

Soil Type	Slope %	Permeability	Runoff	Erosion Hazard	Land Uses
Helemano silty clay	30-90	Moderately Rapid	Medium to Very Rapid	Severe to Very Severe	Pasture, woodland, & wildlife habitat
Kemoo silty clay	35-70	Moderately Rapid	Rapid	Severe	Pasture, wildlife habitat

Source: General Soil Survey of Hawai`i, Foote et al. 1972 (U.S. Soil Conservation Service).

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

The communication facilities are not located on land classified by ALISH.

Land Study Bureau Detailed Land Classification

The soils at the proposed Mount Ka`ala communications facility sites are classified as Category E.

3.2.3 Potential Impacts

At the wind farm, grading would be required for the turbine pads, internal access roads, substation, and O&M building associated with the proposed facilities. At the communications facilities, excavations for foundations may be required. Design work for the project facilities has not been completed. While earthwork would be designed to avoid impacts to the major topographic features, it may still result in noticeable localized topographic changes. The EIS will address the scope of earthwork and resulting topographic changes in further detail. There are no known unique or unusual geologic resources or conditions known to be present at the wind farm site. The communications

facilities sites are located on steeply sloping terrain, and will require airlifting of equipment in order to complete the project, and implementation of controls to mitigate the potential for erosion because of steep mountain slopes. The EIS will discuss the potential effects of the proposed action on the soils that are present.

3.3 Hazardous Materials

3.3.1 Definition of Resource

The term "hazardous materials" refers to any biological, chemical or physical material that has the potential to harm humans, animals, or the environment, either by itself or through interaction with other factors. Issues associated with hazardous materials typically center around waste streams, underground storage tanks (USTs), aboveground storage tanks (ASTs), and the storage, transport, use, and disposal of pesticides, fuels, lubricants, and other industrial substances.

3.3.2 Existing Conditions

The Kawailoa site is located on land currently owned by Kamehameha Schools and formerly managed as agricultural plantation lands (former Kawailoa Plantation). There have been no known activities conducted that suggest hazardous waste was generated or that any hazardous materials were disposed of within this area. A Phase I Environmental Site Assessment has not yet been prepared for the proposed wind farm area.
The communications facilities are located on State land currently leased by Hawaiian Telcom. A subsurface UST is located at the current site of the Hawaiian Telcom communications facility. Based on available information it appears that a release from the UST may have been documented. Available information indicates that response actions for documented UST releases at Mount Ka`ala have been completed.

3.3.3 Potential Impacts

Because no hazardous material or hazardous wastes are known to be present within the proposed wind farm project site, construction of the project is not expected to uncover or result in the release of an existing contaminant into the environment. However, construction of the proposed project would require the operation of heavy equipment and construction vehicles. Various hazardous materials, such as oil, diesel fuel and petroleum-based lubricants, would be used at the site during construction activities. The Draft EIS will provide a detailed evaluation of the potential impacts associated with these construction activities relative to hazardous materials.

Because there are no known existing environmental conditions at the two communications facilities sites at Mount Ka`ala, it is not expected that installation of the new microwave dishes will uncover or result in the release of an existing contaminant into the environment. However, because a UST release was reported at the existing Hawaiian Telcom facility, the Draft EIS will address measures that will be taken to identify and mitigate potential issues that could arise during construction if residual contamination is encountered.

Operation of the proposed project would require the use of the NaS battery storage system, as well as the potential need for heavy equipment for maintenance and replacement activities. These activities would involve the use of hazardous materials, including oil, diesel fuel, petroleum-based lubricants and/or solvents, coolants, as well as the contents of

the battery system. The Draft EIS will provide a detailed evaluation of the potential impacts associated with use of these materials.

In addition, the EIS will outline the measures that would be implemented to mitigate potential impacts that could result from the use of the materials identified above during both construction and subsequent operation of the facility.

3.4 Natural Hazards

3.4.1 Definition of Resource

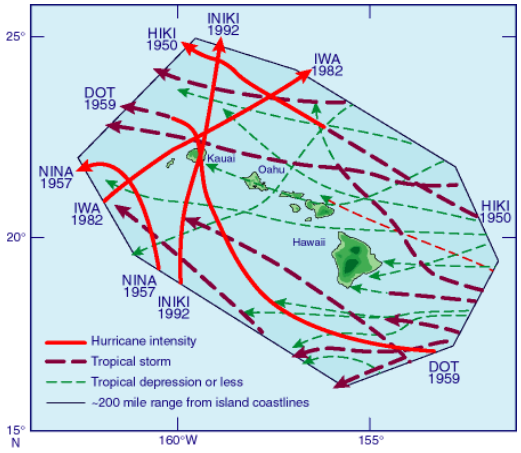
A natural hazard is a threat of a naturally-occurring event that could negatively affect people or the environment. Many natural hazards can be triggered by another event, though they may occur in different geographical locations (for example, an earthquake can trigger a tsunami).

3.4.2 Existing Conditions

Natural hazards that can affect Hawai`i include hurricanes and tropical storms, tsunamis, volcanic eruptions, earthquakes, flooding, and wildfire.

3.4.2.1 Hurricanes and Tropical Storms

Hurricanes develop over warm tropical oceans, and have sustained winds that exceed 74 miles/hour. Tropical storms are similar to hurricanes, except that the sustained winds are below 74 miles/hour. These events can also produce torrential rains. Given the steep and complex topography of the islands, wind can amplify across ridges and through channels, and rain can be focused down valleys, resulting in destructive flash floods and landslides. As a result, even a relatively weak tropical storm can potentially result in considerable damage (Businger, 1998). The Central Pacific Hurricane season runs from June 1 to November 30.



Hurricanes Located Within 200 Miles of Hawai`i, 1949-1997 (Businger, 1998)

True hurricanes are very rare in Hawai`i, indicated by the fact that only five have affected the islands over the last 50 years (Businger, 1998). Tropical storms occur more frequently than hurricanes, and typically pass sufficiently close to Hawai`i every 1 to 2 years to affect the weather in some part of the Islands (WRCC, 2008). Historically, the hurricanes have made landfall, or passed more closely to the northern Hawaiian Islands, such as Kaua`i (Businger, 1998). No hurricane or tropical storm has ever made landfall on O`ahu.

3.4.2.2 Tsunamis

Tsunamis are large, rapidly moving ocean waves triggered both by disturbances around the Pacific Rim (that is, teletsunamis) and earthquakes and landslides near Hawai`i (that is, local tsunamis). The Pacific Disaster Center reports that tsunamis have resulted in more lost lives in Hawai`i than the total of all other natural disasters (Pacific Disaster Center, 2010a). In the

20th century, an estimated 221 people have been killed in Hawai`i by tsunamis. One of the largest and most devastating tsunamis to hit Hawai'i occurred in 1946, resulting from an earthquake along the Aleutian subduction zone. Wave runup heights reached a maximum of 33 to 55 feet and 159 people were killed. A total of 32 tsunamis with run-up greater than one meter have occurred in Hawai'i since 1811 [U.S. Geological Survey (USGS), 2010]. The western-most edge of the wind power facility, consisting of onsite access roads, is within the Civil Defense Tsunami Evacuation Zone (Hawai`i State Civil Defense, 2010).

3.4.2.3 Volcanic Eruptions

There are no active volcanoes on O`ahu.

3.4.2.4 Earthquakes and Seismicity

Earthquakes in Hawai`i are linked with volcanic activity. Small earthquakes are generally triggered by eruptions and magma movement within the active volcanoes (for example, Kilauea, Mauna Loa). Larger earthquakes (that is, tectonic earthquakes) tend to occur in areas of structural weakness at the base of these volcanoes or deep within the Earth's crust beneath the island. Several strong tectonic earthquakes (magnitude 6 to 8) have occurred in Hawai`i and caused extensive damage to roads, buildings, and homes, triggered local tsunami, and resulted in loss of life. The most destructive earthquake in Hawai`i had a magnitude 7.9 and occurred on April 2, 1868, when 81 people lost their lives (USGS, 2001).

3.4.2.5 Flooding

Potential flood hazards are identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program and are mapped on the Flood Insurance Rate Maps (FIRM). According to 2005 FEMA data, only the western-most edge of the wind power facility, consisting of onsite access roads, is within potential flood hazard areas. Designation for the project area is Flood Zone X and Flood Zone X500. Zone X is assigned to those areas that are determined to be outside the 500-year floodplain with less than 0.2 percent annual probability of flooding (FEMA, 2010). The X500 designation is assigned to areas that are between the limits of the 100-year and 500-year flood. The proposed Mount Ka`ala communications sites are in an area designated by FEMA as unstudied, and therefore are not classified.

3.4.2.6 Wildfire

Wildfire occurs on all of the major Hawaiian Islands, with human activity as the primary cause. Because Hawai`i's native ecosystems are not adaptive to wildlife, they can result in extinction of native species and increased coverage of nonnative, invasive species. Other effects include soil erosion, increased runoff and decreased water quality (Pacific Disaster Center, 2010b).

3.4.3 Potential Impacts

Neither construction nor operation of the proposed project is expected to affect the incidence rate of a natural hazard, with the exception of an increased potential for wildfires associated with use of vehicles and electrical equipment in the project area. Although the occurrence rate is very low, construction and operation of the project could be adversely affected by a natural hazard, such as a hurricane or earthquake, should one occur. The Draft EIS will evaluate the effect of the proposed project on wildfire occurrence, as well as

the potential for natural hazards to adversely affect project operations. Mitigation measures that would be implemented to minimize or avoid impacts relative to natural hazards would also be presented.

3.5 Air Quality

3.5.1 Definition of Resource

Under the authority of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) has established nationwide air quality standards to protect public health and welfare. These federal standards, known as National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations for six criteria pollutants: ozone, NO_2, carbon monoxide, sulfur dioxide (SO_2), lead, and particulate matter (respirable particulate matter less than or equal to 10 micrometers in diameter [PM_{10}] and respirable particulate matter less than or equal to 2.5 micrometers in diameter [$PM_{2.5}$]). The Clean Air Branch of the State of Hawai`i Department of Health (HDOH) is responsible for implementing air pollution control in the state and has established Hawai`i ambient air quality standards (HAAQS). These state and national ambient air quality standards are listed in Table 3-5.

Based on measurements of ambient criteria pollutant data, EPA designates areas of the United States as having air quality equal to or better than NAAQS (attainment) or worse than NAAQS (non-attainment). The CAA general conformity rule requires that projects occurring in non-attainment and maintenance areas be consistent with the applicable State Implementation Plan. Because Hawai`i is, and always has been, in attainment for all pollutants, a general conformity analysis is not required for the Proposed Action.

TABLE 3-5
Federal and State Ambient Air Quality Standards

Air Pollutant	Averaging Time	Ambient Air Quality Standards	
		Hawai`i State Standard ($\mu g/m^3$)	Federal Primary Standard ($\mu g/m^3$)
Carbon Monoxide	1-Hour	10,000	40,000
	8-Hour	5,000	10,000
Nitrogen Dioxide	Annual	70	100
Sulfur Dioxide	3-Hour	1300	—
	24-Hour	365	365
	Annual	80	80
Ozone	8-Hour	157	157
PM_{10}	24-Hour	150	150
	Annual	50	—
$PM_{2.5}$	24-Hour	—	35
	Annual	—	15
Lead	Calendar Quarter	1.5	1.5
Hydrogen Sulfide	1-Hour	35	—

SOURCE: Hawai`i Administrative Rules, Chapter 59 and Code of Federal Regulations, Title 40, Part 50

3.5.2 Existing Conditions

In general, air quality in the state of Hawai`i is some of the best in the nation, primarily because of consistent trade winds and limited emission sources. HDOH and EPA maintain a network of air quality monitoring stations throughout the islands. Data collected from these monitoring stations indicate that criteria pollutant levels remain well below state and federal ambient air quality standards (HDOH, 2009; HDOH, 2010).

In general, the existing air quality in the vicinity of the wind farm project is considered to be relatively good because of the low levels of development and automobile emissions, and the exposure to consistently strong winds which help to disperse any emissions. Because the proposed project site is undeveloped, the main sources of pollutant air emissions within or directly adjacent to the wind farm site are associated with fuel combustion emissions from vehicles on Kamehameha Highway and the agricultural operations on the irrigated portions of Kawailoa. There are no significant emissions sources known near the Mount Ka`ala communications facilities, with the exception of motor vehicle emissions from vehicles using the Mount Ka`ala summit access road. The wind farm and communication facilities locations are currently in attainment of all criteria pollutants established by the CAA and the HAAQS.

The closest air quality monitoring station to the wind farm and communications facilities project sites is the Pearl City Station, located in the Leeward Health Center near Pearl Harbor. The areas surrounding this station are predominantly commercial, residential and light industrial. The only measurements collected at the Pearl City Station are $PM_{2.5}$ and PM_{10}, speciation, and air toxics (HDOH, 2009). With the exception of lead, there are no ambient air quality standards for the individual components of speciated $PM_{2.5}$, and there are no ambient air quality standards for air toxics.

$PM_{2.5}$ and PM_{10}

The most recent measurements reported by HDOH were recorded in 2008 (HDOH, 2009). The 24-hour PM_{10} readings in 2008 ranged between 7 and 73 micrograms per cubic meter ($\mu g/m^3$). The 24-hour $PM_{2.5}$ readings ranged between 2 and 26 $\mu g/m^3$. The annual averages of PM_{10} and $PM_{2.5}$ reported at the Pearl City Station for 2008 were 18 $\mu g/m^3$ and 4.5 $\mu g/m^3$, respectively.

In March 2008, a second vent opened at the Kilauea volcano. The increased emissions from the volcano caused the exceedances of SO_2 and $PM_{2.5}$, with occasional exceedances of the NAAQS for those pollutants. The EPA considers the volcano a natural, uncontrollable event and therefore the state is requesting exclusion of these NAAQS exceedances from attainment/non-attainment determination. Excluding the exceedances because of the volcano, in 2008 the state of Hawai`i was in attainment of all NAAQS (HDOH, 2009).

3.5.3 Potential Impacts

The EIS will summarize the potential air quality impacts associated with construction activities at the wind farm and communications facilities. The discussion will identify the mitigation measures that Kawailoa Wind proposes to use to ensure that construction-related emissions are kept to the lowest level practicable.

The EIS will also present a detailed analysis of the effect that the proposed new wind generating facility would have on air quality. Cumulative air quality impacts are expected to be beneficial, as the facility would ultimately result in reduced emissions of several gases that contribute to global climate change and air pollution.

3.6 Noise

3.6.1 Definition of Resource

Acoustics is the study of sound, and noise is defined as unwanted sound. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Acoustical terms used in this section are summarized in Table 3-6

TABLE 3-6
Definitions of Acoustical Terms

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location. The ambient level is typically defined by the L_{eq} level.
Background Noise Level	The underlying ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically makeup the background. The background level is generally defined by the L_{90} percentile noise level.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal content, the prevailing ambient noise level as well as the sensitivity of the receiver. The intrusive level is generally defined by the L_{10} percentile noise level.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Level (dBA)	The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level, on an equal energy basis, during the measurement period.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (for example, L_{90})

The most common metric is the overall A-weighted sound level measurement that has been adopted by regulatory bodies worldwide. The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving a very good correlation in terms of how to evaluate acceptable and unacceptable sound levels.

A-weighted sound levels are typically measured or presented as equivalent sound pressure level (Leq), which is defined as the average noise level, on an equal energy basis for a stated period of time and is commonly used to measure steady state sound or noise that is usually

dominant. Statistical methods are used to capture the dynamics of a changing acoustical environment. Statistical measurements are typically denoted by Lxx, where "xx" represents the percentile of time the sound level is exceeded. The L90 is a measurement that represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L10 represents the noise level exceeded for 10 percent of the measurement period.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, learning
- Physiological effects such as startling and hearing loss

In most cases, environmental noise may produce effects in the first two categories only. However, workers in industrial plants may experience noise effects in the last category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise would be, as judged by the exposed individual.

Table 3-7 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

TABLE 3-7
Typical Sound Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Qualitative Description
Carrier Deck Jet Operation	140	
	130	Pain threshold
Jet takeoff (200 feet)	120	
Auto Horn (3 feet)	110	Maximum Vocal Effort
Jet takeoff (2,000 feet) Shout (0.5 feet)	100	
N.Y. Subway Station Heavy Truck (50 feet)	90	Very Annoying Hearing Damage (8-hr, continuous exposure)
Pneumatic drill (50 feet)	80	Annoying
Freight Train (50 feet) Freeway Traffic (50 feet)		
	70	Intrusive Telephone Use Difficult
Air Conditioning Unit (20 feet)	60	
Light auto traffic (50 feet)	50	Quiet

TABLE 3-7
Typical Sound Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Qualitative Description
Living Room Bedroom	40	
Library Soft whisper (5 feet)	30	Very Quiet
Broadcasting Studio	20	Recording studio
	10	Just Audible

Adapted from Table E, "Assessing and Mitigating Noise Impacts", NY DEC, February 2001.

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978 [42 USC Parts 4901-4918]), delegates the authority to regulate environmental noise to each state. HAR 11- 46 ("Community Noise Control") set forth maximum permissible sound levels to protect public health and welfare, as well as the environment and quality of life. The stated purpose of these rules is to "provide for the prevention, control, and abatement of noise pollution in the State from the following noise sources: stationary noise sources; and equipment related to agricultural, construction, and industrial activities" (HAR 11-46). The maximum permissible sound levels for the various classes of land in the State, as established in the Community Noise Control Rules (HAR 11-46), are presented in Table 3-8.

TABLE 3-8
Maximum Permissible Sound Levels By Zoning District

Zoning District	Maximum Permissible Sound Levels [dB(A)] [1]	
	Daytime (7am—10pm)	Nighttime (10pm—7am)
Class A: All areas equivalent to lands zoned residential, conservation, preservation, public space, open space or similar type	55	45
Class B: All areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type	60	50
Class C: All areas equivalent to lands zoned agriculture, country, industrial, or similar type	70	70

NOTES:
[1] These maximum permissible sound levels apply to the following excessive noise sources: stationary noise sources; and equipment related to agricultural, construction and industrial activities (HAR 11-46-4).

Pursuant to HAR 11-46-7, a permit may be obtained for operation of an excessive noise source beyond the maximum permissible sound levels. Factors that are considered in granting of such permits include whether the activity is in the public interest, and whether the best available noise control technology has been incorporated into the activity.

3.6.2 Existing Conditions

A field survey was conducted on February 19, 2010, and March 2, 2010, to identify potential noise-sensitive locations within the project site and in the surrounding community. Sound level measurements will be taken at the wind farm facility site and in the surrounding community to obtain existing ambient noise levels in and around the current project location. The ambient noise levels would be used to determine if there will be a significant noise impact on the surrounding community because of the project. Essentially, future turbine noise can be compared to the existing ambient noise levels to assess the amount of noise impact. The results of the study will be included in detail as part of the Draft EIS.

3.6.3 Potential Impacts

Construction of the proposed project would require the operation of heavy equipment and construction vehicles for various activities including construction of access roads, excavation and pouring of foundations, installation of buried and above ground electrical interconnects, and the erection of turbine components. The Draft EIS will provide a detailed evaluation of the potential noise impacts associated with these construction activities, including a comparison to the established noise limits. In addition, the Draft EIS will outline the measures that would be implemented to minimize unnecessary noise from these activities.

Operation of wind turbines commonly generates some broadband noise (for example, a "swishing" or "whooshing" sound) as the blades rotate. The EIS will describe the predicted noise levels associated with the turbines and the associated wind farm facilities, and will compare those noise levels to existing ambient conditions and the applicable noise standards. In addition, the EIS will describe any mitigation measures that would be implemented to reduce noise resulting from project operations, as appropriate.

3.7 Hydrology and Water Resources

3.7.1 Definition of Resource

Hydrology and water resources include groundwater, surface water features, as well as other resources such as watersheds and floodplains. Groundwater refers to the subsurface hydrologic resources, which often are described in terms of depth to the aquifer or water table, water quality, and surrounding geologic composition. Surface water features include lakes, rivers, streams, and wetlands.

3.7.2 Existing Conditions

3.7.2.1 Wind Farm

The proposed wind farm project site is located within the boundaries of five watersheds. The north tip of the project site is within the Waimea watershed, which discharges to Waimea River and then into Waimea Bay. The central part of the project site is located within the Keamanea watershed, which discharges to Ka`alaea, Kawailoa, and Laniakea streams. The south part of the project site is within the Loko Ea watershed, which discharges to Loko Ea Stream; the Anahulu watershed, which discharges to Anahulu River; and the Kawailoa watershed, which also discharges to Anahulu River [Hawai` i Department of Business, Economic Development, and Tourism (DBEDT), 2008].

SWCA Environmental Consultants (SWCA) was tasked by First Wind to conduct a Preliminary Determination of Jurisdiction of waters governed by the Clean Water Act (CWA) within the proposed Kawailoa Wind Power project area. Wetland identification and delineation fieldwork was conducted by SWCA on July 1, 8, and 9, 2010. Investigations were performed in accordance with the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual and the 2007 joint EPA-USACE guidance on wetland jurisdictional determinations (post-Rapanos). The Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai`i and Pacific Island Region (draft for peer review and field testing dated June 20, 2009) was also consulted, along with additional references and standards for Hawai`i soils and wetland vegetation.

Several intermittent streams occur on portions of the project area. The Waimea River and its three tributaries— ʻElehaha, Kaiwikoʻele, and Kamananui Streams—flow near the northern boundary of the project area and drain into Waimea Bay (U.S. Army Environmental Command, 2008). Only Kaiwikoʻele Stream occurs within the project area.

The Anahulu River runs near the southern portion of the project area and discharges into Waialua Bay. This river is approximately 66.8 miles (107.5 kilometers) in length. Portions of the Anahulu River are dry during low flow conditions (SWCA, 2008). The Anahulu River has two perennial tributaries, Kawainui and Kawaiiki Streams, which join immediately mauka of the eastern boundary of the project area at roughly 400 feet (120 meters) elevation. Each of these tributaries is diverted once, supplying water to the Kaiwainui Ditch System (DAR, 2008; SWCA, 2008). There are several reservoirs within the ditch system. Two are located on Anahulu River at 295 meters (967.6 feet) and 238 meters (780.64 feet) (SWCA, 2008).

ʻOpaeʻula Stream flows along the southeastern boundary immediately outside of the project area. This stream is joined by Helemano Stream before flowing into Kaiaka Bay. ʻOpaeʻula Stream is diverted once near an elevation of 366 meters (1,200 feet) just *mauka* of the project area. Water from this diversion feeds into the ditch from the Kawaiiki Diversion on the Anahulu River (SWCA, 2008). Downstream of the diversion dam the military access road crosses ʻOpaeʻula Stream with a bridge at an elevation of 245.4 meters (805 feet).

Other streams or gulches that occur within the property include Ka`alaea, Kawailoa, Laniakea, and Loko Ea. These are primarily dry throughout most of the year. Two fishponds, ʻUkoʻa Pond and Loko Ea, occur makai of the project area. ʻUkoʻa Pond is situated near the intersection of Kawailoa Drive and Kamehameha Highway. The extent of this basal, spring-fed pond was reduced because of dumping and filing of the old Kawailoa Landfill (Elliott and Hall, 1977; Miller et al., 1989). Loko Ea is located immediately north of the mouth of Anahulu Stream. Historically, this pond was connected across the marshland to ʻUkoʻa Pond (Miller et al., 1989).

In the late 1970s, the U.S. Fish and Wildlife Service (USFWS) Division of Ecological Services biologists used orthophoto quadrangle maps and spot field checks to map wetlands in Hawai`i as a part of the National Wetlands Inventory (NWI) Program according to the Cowardin et al. (1979) classification system. In the generalized wetland maps prepared by the NWI, several wetland types were identified within the project area including: Freshwater Pond (PUBH, PUBHh, PUBHx), Riverine (R4SBCx), Freshwater Emergent Wetland (PEM1Cx), and Freshwater Forested/Shrub Wetland (PFO3C).

The FIRM prepared by the FEMA National Flood Insurance Program depict flood hazard areas through the state. The maps classify land into four zones depending on the expected flood inundation. The project area is almost entirely within Flood Zone D where analysis of flood hazards has not been conducted and flood hazards are undetermined. Near the mouths of several streams (Kawailoa, Laniakea, Loko Ea, and Anahulu) the land is identified as Flood Zone X, an area defined as having less than 0.2 percent annual risk of flood inundation.

No wetlands meeting the three established criteria of hydrophilic vegetation, soils, and water regime were found to occur within the surveyed portions of the project area. In addition, streams and tributaries within the property are intermittent and therefore do not have continuous or seasonal flow.

Several intermittent streams, including Loko Ea, Laniakea, Kawailoa, Ka`alaea, and the Waimea tributary, may be subject to discretionary Department of the Army jurisdiction because of their "significant nexus" with 'Uko'a Pond and the Pacific Ocean (Figure 2-9). It is not currently anticipated that any activities associated with the construction or operation of the wind farm will be conducted within these areas.

3.7.2.2 Mount Ka`ala Communication Facility Sites

There are three major water drainage systems surrounding Mount Ka`ala: the Wahiawa system to the east, the Waialua-Haleiwa system to the north, and the Ewa-Waianae-Waipahu system to the southwest (CH2M HILL, July 2003). A permanent surface water feature exists on the summit plateau of Mount Ka`ala in the form of a large bog. Other surface water feature in the area include intermittent streams, ditches, and small standing pools. A review of available wetland information indicated that there are no NWI designations at the site.

3.7.3 Potential Impacts

Construction of the proposed project would require excavation and grading activities, which could affect adjacent surface water features or groundwater resources. The Draft EIS will evaluate whether the Proposed Action would (1) increase surface water runoff or alter drainage patterns; (2) result in a point source discharge that exceeds state water quality or discharge requirements, standards, or objectives; (3) cause substantial erosion or downstream sedimentation; and/or (4) substantially affect groundwater supply or quality. Mitigation measures that would be implemented to minimize or avoid impacts to hydrology and water resources would also be presented.

3.8 Biological Resources

3.8.1 Definition of Resource

Biological resources consist of plants and animals, and their habitats. Species that are federally listed as threatened or endangered, and areas that have been designated as "critical habitat" for those species are protected under the Endangered Species Act of 1973 (ESA) 16 U.S. C. 1531-1544) as amended. Threatened and endangered species are further protected in accordance with Hawai`i state law (HRS §195D-4).

3.8.2 Biological History

3.8.2.1 Wind Farm

In pre-contact times the sloping uplands at the wind farm location would have been forested with native 'öhi'a (*Metrosideros polymorpha*) and koa (*Acacia koa*) trees with a dense understory of smaller native trees, shrubs, ferns and vines in great diversity and profusion. Gulches would have had an even denser growth of delicate shade-loving species.

In the late 1800s the area was cleared and converted to sugar cane agriculture. The fields were plowed, burned, harvested and planted in continuous cycles for about 100 years. Some of the broader gulches were used to pasture plantation horses and mules. These uses greatly reduced the numbers and overall diversity of native plants, and these were gradually replaced by increasing numbers of non-native agricultural and pasture plants. A number of tree species were planted along the edges of fields to serve as windbreaks. Other species deemed to be useful or ornamental were also planted in gulches and along ditches. Many of these have proliferated and some have become invasive. Feral pigs have spread throughout the area and have had a negative impact on native vegetation. They also are an important vector for the spread of weed species throughout the forests.

Today, little remains of native plant diversity in the wind farm project area. A few native species persist on steep gulch slopes in the upper parts of the property, but most of the area is covered with a few invasive non-native species.

3.8.2.2 Mount Ka`ala Communication Facility Sites

The upper slopes of Mount Ka`ala have always been one of O`ahu's best examples of intact wet native forest. Numerous species of rare plants inhabit its steep terrain. The adjacent Mount Ka`ala Natural Area Reserve and the nearby Pahole Natural Area Reserve provide enhanced levels of protection from destructive ungulates such as pigs and goats. While many of the native plants that grow on the lower slopes of the Wai'anae Mountains have been heavily impacted and have suffered endangerment, those species that extend into the upper slopes are faring better.

The ridge where Site 2 is located has been a hiking trail (known as the Dupont Trail) for many years and as a result has a number of non-native weeds scattered along its length, but the slopes on either side of it are quite intact and nearly weed free. The slopes around Site 1 are likewise an example of beautiful native forest. With the current levels of protective management these upper forests are expected to thrive well into the future.

3.8.3 Existing Conditions

Botanical surveys were performed at the project site in February and July 2010 and the results of the surveys are presented in the following sections.

3.8.3.1 Flora

Wind Farm

The vegetation on the project site is a mixture of aggressive weedy species that have taken over since the abandonment of sugar cane agriculture, but there are significant remnants of native vegetation on steep slopes of the gulches at upper elevations. One non-native species that is truly abundant across the property, Guinea grass (*Urochloa maxima*), which forms

a sea of deep growth on all the ridge tops and in many of the gulches. Also common and non-native are common ironwood (*Casuarina equisetifolia*), albizia (*Falcataria moluccana*), Formosa koa (*Acacia confusa*), koa haole (*Leucaena leucocephala*), padang cassia (*Cinnamomum burmanni*), Java plum (*Syzygium cumini*), strawberry guava (*Psidium cattleianum*), cork bark passion flower (*Passiflora suberosa*) and swamp mahogany (*Eucalyptus robusta*). Padang cassia and strawberry guava form extremely dense stands in the upper, wetter gulches to the near exclusion of anything else. A fair number of common native trees, shrubs, vines and ferns still occupy the steep slopes of the upper gulches in a few spots.

A total of 223 plant species were recorded during the course of the survey (Hobdy, 2010a; Hobdy, 2010b). Of this total, 27 were common native species, and seven species were of Polynesian origin. None of these are rare species and all but one are known to exist on multiple islands. One species of halapepe (*Pleomele halapepe*) is known only from O`ahu but is not uncommon on this island. The remaining 149 species were non-native plants that were agricultural weeds, windbreak tree species, forestry plantings or ornamentals. Table 3-9 summarizes native and Polynesian plant species identified at the wind farm property.

TABLE 3-9
Native Plant Species Identified at the Wind Farm Site

Common Name	Scientific name
kilau	(*Pteridium aquilinum* var. *decompositum*)
hapu'u	(*Cibotium chamissoi*)
uluhe	*Dicranopteris linearis*
pala'ā	*Sphenomeris chinensis*
ni'ani'au	*Nephrolepis exaltata*
pakahakaha	*Lepisorus thunbergianus*
moa	*Psilotum nudum*
halapepe	*Pleomele halapepe*
no common name	*Carex meyenii*
no common name	*Carex wahuensis*
no common name	*Cyperus polystachyos*
'ie'ie	*Freycinetia arbore*
lama	*Diospyros sandwicensis*
pukiawe	*Leptecophylla tameiameiae*
koa	*Acacia koa*
nanea	*Vigna marina*
naupaka kuahiwi	*Scaevola gaudichaudiana*
kauna'oa pehu	*Cassytha filiformis*
'uhaloa	*Waltheria indica*
huehue	*Cocculus orbiculatus*

TABLE 3-9
Native Plant Species Identified at the Wind Farm Site

Common Name	Scientific name
‘öhi’a	*Metrosideros polymorpha* var. *polymorpha*
olopua	*Nestegis sandwicensis*
kopiko	*Psychotria mariniana*
alahe’e	*Psydrax odorata*
‘iliahi	*Santalum freycinetianum* var. *freycinetianum*
‘a’ali’i	*Dodonaea viscosa*
‘akia	*Wikstroemia O`ahuensis*
niu	*Cocos nucifera*
kö	*Saccharum officinarum*
ki	*Cordyline fruticosa*
pa’ihi	*Rorippa sarmentosa*
kukui	*Aleurites moluccana*
‘ihi	*Oxalis corniculata*
noni	*Morinda citrifolia*

Mount Ka`ala Communication Facility Sites

The vegetation on the two small project sites is mostly low, non-native and open from previous clearing work, and has been maintained in this condition for over 30 years. It is dominated by species of grasses, sedges and rushes. These areas, however, are fringed by steep expanses of nearly pure native forests. These fringes were also surveyed out to distances of about 30 feet to assess the species makeup of this adjacent forest.

A total of 63 plant species were recorded during the survey with 30 species being non-native weeds and a couple ornamentals, and 33 native species. The non-native plants did not extend into the dense fringing native forest. Five plant species were found to be common on the two sites including uluhe (*Dicranopteris linearis*), narrow-leaved carpetgrass (*Axonopus fissifous*), ‘öhi’a (*Metrosideros polymorpha varieties var. glaberrima* and *polymorpha*) and broad-leaved plantain (*Plantago* major). A total of 22 native species were observed that are endemic to the Hawaiian Islands. The native plant species identified are summarized in Table 3-10.

TABLE 3-10
Native Plant Species Identified at Mount Ka`ala Communication Facility Sites

Common Name	Scientific Name
'äkolea	Athyrium microphyllum
'ama'u	Sadleria cyatheoides
'ama'u	Sadleria pallida

TABLE 3-10
Native Plant Species Identified at Mount Ka`ala Communication Facility Sites

Common Name	Scientific Name
häpu'u pulu	Cibotium glaucum
häpu'u 'i'i	Cibotium menziesii
uluhe lau nui	Diplopterigium pinnatum
pai	Adenophorus hymenophylloides
palai hinahina	Hymenophyllum lanceolatum
hoi kuahiwi	Smilax melastomifolia
olomea	Perottetia sandwicensis
'öhelo	Vaccinium calycinum
naupaka kuahiwi	Scaevola mollis
pü'ahanui	Broussaisia arguta
käpana	Phyllostegia grandiflora
kämakahala	Labordia waiolani
'öhi'a	Metrosideros polymorpha var. glaberrima
'öhi'a	Metrosideros polymorpha var. polymorpha
lehua 'ähihi	Metrosideros tremuloides
'ala'ala wai nui	Peperomia macraeana
pilo	Coprosma longifolia
manono	Kadua affinis
kükae moa	Melicope clusiifolia

The vegetation identified at the sites can be segregated into two components in two ways. First they can be segregated into vegetation growing on the two cleared ridge top sites, and the vegetation growing on the steep, forested, fringing slopes. Secondly the vegetation on the cleared ridge top sites can be characterized as being almost exclusively non-native while the vegetation on the steep, forested fringes can be characterized as being almost exclusively native in makeup.

The ridge top sites have been maintained in their cleared, open state for several decades and are dominated by low-statured, non-native grasses, sedges, rushes and other herbaceous species. The fringing forests have not been disturbed by previous construction activities associated with installation of the existing antennas and they are in excellent condition and retain a good diversity of species.

The existing antennas have small footprints within the ridge top clearings. The components of these antennas were airlifted into place, minimizing site disturbance. Plans for the

proposed structures call for a similar method of deployment of components by helicopter. This should result in similar results with minimal site disturbances beyond the antenna footprints.

Access by personnel to facilitate construction work on Site 2 will be on foot down the existing 0.25 mile long concrete stairway. This should minimize additional disturbance along this ridge line route.

No federally listed Threatened or Endangered plant species were encountered within the ridge top clearing or the fringing native forests, and none were encountered that are candidates for such status. Nonetheless, the overall quality of the forests fringing these sites is excellent and Kawailoa Wind will make every effort to prevent unnecessary impacts during installation. The EIS will describe in detail procedures that will be used to mitigate potential for unnecessary disturbance to the forests fringing the antenna sites.

3.8.3.2 Fauna

Wind Farm

Mammals

Six species of mammals were observed during the survey: feral pigs, mongoose, domestic dogs, rats, cats (*Felis catus*), and Hawaiian hoary bat (*Lasiurus cinereus semotus*). The Hawaiian hoary bat is listed as endangered by state and federal wildlife agencies and is protected under state and federal laws (see Section 3.8.3.3 below). Pigs and mongoose are common throughout this site. Major trails were found in every gulch and diggings and droppings associated with this species were widespread. Many individuals and family groups were seen. Pig hunters frequent this area regularly with their dogs.

Dense vegetation prevented good visibility of other ground-dwelling mammals, but a significant population of mice (*Mus domesticus*) would be expected, as they are known to frequent this type of habitat.

Avifauna

There was moderate avian diversity observed across the breadth of the project site during surveys. Twenty-six species of birds were recorded, including twenty-two nonnative birds, three native waterbirds, and one seasonal migrant.

Regurgitated owl pellets of rodent hair and bones were observed on a trail on a grassy ridgetop in the upper part of the site (Hobdy 2010) and numerous pellets have been found during the monitoring of the met towers at Kawailoa (SWCA pers comm.). Owls tend to consume small rodents whole, then regurgitate the indigestible remains in these pellets. The pellets could have come from either a barn owl (*Tyto alba*) or the native pueo (*Asio flammeus sanwichensis*) as both can inhabit habitat similar to that found on site. However, only the barn owl has been positively identified to be present in the area to date. The pueo is listed as an Endangered species on the island of O'ahu by the State of Hawai`i, but is not a federally listed species.

Hybrid hawaiian ducks- mallards and black-crowned night herons have been seen flying overhead at the lower elevations of the project site, and have also been observed utilizing

the irrigation ponds near the project site and other waterbodies in the vicinity. One Hawaiian coot was observed at an irrigation pond near the project area in September 2010. The Hawaiian coot is listed as an Endangered species. While the pure Hawaiian duck is considered an Endangered species, the hybrid is not. The black-crowned night heron is a native species, but is not protected. These observations indicate that other waterbirds such as the Endangered Hawaiian stilt and Endangered Hawaiian moorhen, may occasionally transit the lower portions of the project site. The Endangered Hawaiian moorhen is resident at the ponds and streams of Waimea valley.

No native forest birds are expected in the project area. Hawai`i's native forest birds occupy native forests at higher elevations beyond the range of mosquitoes and the lethal avian diseases they transmit. No native forest birds were seen even at the highest part of the property. The avian species identified are summarized in Tables 3-11 and 3-12.

TABLE 3-11

Avian Species Identified at the Wind Farm Site

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
Zebra dove	*Geopelia striata*		
Common waxbill	*Estrilda astrild*		
Japanese white-eye	*Zosterops japonicus*		
House finch	*Carpodacus mexicanus*		
Common myna	*Acridotheres tristis*		
Japanese bush-warbler	*Cettia diphone*		
Kölea, Pacific golden-plover	*Pluvialis fulva*		
Spotted dove	*Streptopelia chinensis*		
Red-vented bulbul	*Pycnonotus cafer*		
Hwamei	*Garrulax canorus*		
Gray francolin	*Francolinus pondicerianus*		
White-rumped shama	*Copsychus malabaricus*		
Northern cardinal (	*Cardinalis cardinalis*		
Red-crested cardinal	*Paroaria coronata*		
Red avadavat	*Amandava amandava*		
Red-whiskered bulbul	*Pycnonotus jocosus*		
unknown owl species	*Tyto alba, or Asio flammeus sanwichensis*		

Molluscs

Endangered molluscs have not been documented in recent times in native forests at elevations lower than 1,312 feet above mean sea level on Oahu. As the project site is lower in elevation and dominated by non-native vegetation, these snails are not expected to be found at the project site. Thus, no mollusc survey was conducted at the project site, though the non-native predatory snail, the rosy wolf snail (Euglandina rosea), has been incidentally encountered.

Mount Ka`ala Communication Facility Sites

Mammals

No mammals or evidence of mammals were observed on either of the two communication facility sites. The habitat is the type often frequented by pigs but no evidence of pig activity was observed. Also expected within this habitat are mice, rats, feral cats, and mongoose.

Avifauna

Avian diversity and numbers appeared to be rather sparse in this cloud forest habitat, although the survey was limited to a single day because of access restrictions. Just four species of non-native birds were observed or heard. That even the O'ahu 'amakihi and the 'apapane were not seen or heard was surprising, given the good quality of the forest. Taxonomy and nomenclature follow American Ornithologists' Union standards (2010).

Native forest birds likely still frequent this pristine native forest. Most likely to be seen would be the O'ahu 'amakihi (H*emignathus flavus*) and the 'apapane (*Himantione sanguinea*). Rarer of occurrence would be the O'ahu 'elepaio (*Chasiempis ibidis*) and the 'i'iwi (*Vestiaria coccinea*). A non-native bird that also would occur here is the red-billed leiothrix (*Leiothrix lutea*), which is common in O'ahu wet forests.

No sightings or signs of any native seabirds such as the Newell's shearwater (*Puffinus newelli*) were detected in this area, although the open ridgetop habitat around Site 2 would seem to be suitable for these birds.

TABLE 3-12
Avian Species Identified at the Mount Ka`ala Communication Facility Sites

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
Japanese bush-warbler	*Cettia diphone*	non-native	uncommon
Red-vented bulbul	*Pycnonotus cafer*	non-native	rare
Japanese white-eye	*Zosterops japonicus*	non-native	rare
House finch	*Carpodacus mexicanus*	non-native	rare

Molluscs

Endangered molluscs are known to be present in native forests at elevations above 1,312 feet above mean sea level on Oahu. As the project sites are higher in elevation and dominated by native vegetation, these snails are expected to be found at the project site. Therefore,a mollusc survey was conducted at the project sites and is described in Section 3.8.3.3.

3.8.3.3 Threatened or Endangered Species

Hawaiian Hoary Bat

Wind Farm

A survey to detect the possible presence of the Endangered Hawaiian hoary bat was conducted at the Kawailoa Wind Farm site on the evening of February 12, 2010 by Bob Hobdy (Hobdy 2010), bat surveys were also conducted by Cooper during the fall and summer radar surveys (Cooper et. Al. 2010). Year-long acoustic monitoring to detect bat echolocation calls was also conducted by SWCA from October 2009 to September 2010 and surveys are on-going. Hobdy (2010) surveys were conducted at five locations, four at the top of the site adjacent to the forest and one in the lower southwest corner of the site close to a reservoir. These locations were selected as most likely to have nocturnal flying insect activity that would attract bats if they were in the vicinity. A few faint calls were heard at the first location near the military gate along Drum Road, and a few calls were heard at the third location at the highest part of the property. No calls were heard at the other three locations.

During radar surveys, two bats were observed during the summer survey and none in the fall.

For the year-long acoustic monitoring, bats have been detected throughout the project site. The bat activity in the area is low (approximately 0.01 bat passes per detector at night) and detections were highest during the summer months.

These findings are consistent with historical and recent bat sightings in the northern Ko'olau Range between Kahuku and Pupukea.

Mount Ka`ala Communications Sites

While not surveyed for, the Hawaiian hoary bat could possibly visit this forested habitat at the two communication facilities sites at least seasonally. These bats are thought to be rare on O'ahu, but recent detections have been made in rural and forested parts of the island indicating that at least a moderate population may be present. Mount Ka`ala would appear to provide good habitat for these endangered bats.

Seabirds

Wind Farm

A survey was conducted between October 13 and 22, 2009, at the wind farm site to evaluate for the presence of threatened or endangered seabirds. Two locations were sampled: one near mile 4.0 on the Kawailoa Road, at 21°35.425'N 158°02.238'W (at 1,005 feet ASL) and the second at mile 1.7 up the Ashley Road, at 21°36.916'N 158°03.310'W (at 613 feet ASL). Surveillance radar and audio-visual (AV) sampling were conducted during the evening (18:00–21:00 h) and morning (04:30–06:30 h) peaks in shearwater activity for five nights at each location.

No Newell's Shearwaters or Hawaiian Petrels were detected by visual movement rates of inbound and outbound targets (that is, targets headed toward and away from potential nesting habitat in the Ko`olau Range) measured with surveillance radar were low on all ten nights: inbound targets were recorded on only one of the ten evening sessions, while zero to eight outbound targets were recorded per session. Further, Golden Plovers (a species that

can be confused with shearwaters on radar) were common in the study area during fall, and 12 flocks were observed during visual sampling. In addition, the typical Shearwater pattern of inbound movements during the evening followed by outbound movements during the morning were not observed, and there are no known Newell's Shearwater colonies in the vicinity. Thus, the identity of the radar targets observed during nocturnal hours is unknown, but it is very likely that some species other than Newell's Shearwaters (such as Golden Plovers) are included in the radar data. That said, it cannot be ruled out that at least some of the targets were Newell's Shearwaters.

Mount Ka`ala Communications Sites

No radar studies were conducted at the off-site microwave tower sites because the low heights of the towers (30 feet or less) and their small profiles would present minimal collision risk to shearwaters. It is expected that Newell's shearwater individuals could occasionally transit over the off-site microwave tower sites, but at much higher altitudes than the towers themselves (average flight height estimated at 410 ± 13 feet, Day and Cooper 1995).

Plant Species

No federally listed Endangered or Threatened plant species (USFWS, 2009) were found on the wind farm or communication facility sites, nor were any found that are proposed for such status. No special plant habitats or communities were identified.

Molluscs

Wind Farm

Endangered molluscs have not been documented in recent times in native forests at elevations lower than 1,312 feet above mean sea level on Oahu. As the project site is lower in elevation and dominated by non-native vegetation, these snails are not expected to be found at the project site. Thus, no mollusc survey was conducted at the project site, though the non-native predatory snail, the rosy wolf snail (Euglandina rosea), has been incidentally encountered.

Mount Ka`ala Communications Sites

No state or federally listed candidate, threatened, or endangered molluscs or species of concern were identified or are known to occur at the two communication facility sites. However, one of the endemic species identified, *Kaala subrutila*, may be assessed for candidate species listing in the near future (C. King, DOFAW, personal communication). Snails in the family *Achatinellidae* are widely distributed throughout the Pacific Islands; however, they are most diverse in Hawai'i. Most of the snails observed could not be identified to the species level, and genetic testing would be required to reach a positive identification.

The majority of the native snail diversity was found on native plants along the edges of each site. The most abundant native taxa observed during the survey were *Succinea* spp. Only two non-native mollusc species (*Oxychilus alliarius* and *Deroceras laeve*) were identified. These two species were found primarily in areas disturbed previously by construction activities. *Oxychilus alliarius* is known to feed on other molluscs and represents a potential

ecological threat to native molluscs at Mount Ka'ala. The invasive slug *Deroceras laeve* competes with other molluscs and is also considered a treat to native ecosystems in Hawai'i.

Hawaiian Telcom Station site: The area surrounding this installation has been cleared previously by construction activity and the only snail species found in the immediate area was the non-native *Oxychilus alliarius*. The other snail species found at this site was *Succinea sp*. However, this native snail was found only along the edges of this area outside of the green fence, where the vegetation is primarily native.

Repeater Station site: The 3 meters (10 feet) study radius surrounding the towers and shack contained primarily native mollusc species, most of which were common in the area. The predatory snail *Oxychilus alliarius* was observed at the trailhead; however, there was no evidence of the species on the trail toward the site. This snail is most likely spread via equipment and supplies transported to and from sites. The endemic snail *Kaala subrutila*, while not found at the Repeater Station site, may occur at or near the site as it was documented along the trail at 50 meters to the Repeater Station.

Waterbirds

Wind Farm

One the Endangered Hawaiian coot has been observed at an irrigation pond near the project site. The lower portions of the project area are also used by waterbirds such as the Hawaiian duck-mallard hybrid and the black crowned night heron. Other waterbirds that may occasionally occur but have not been observed include the Endangered Hawaiian stilt, coot and the Endangered Hawaiian moorhen. The Endangered Hawaiian moorhen is resident at the streams and ponds of Waimea valley.

Mount Ka`ala Communications Sites

No study to evaluate for the presence of waterbirds has been conducted at the communications sites. Because there are no water bodies present at either site, it is considered unlikely that waterbirds would be present.

Insects

Wind Farm

Insects in general were not tallied, but a search was made for one native sphingid moth, Blackburn's sphinx moth (*Manduca blackburni*), which is listed as an Endangered species (USFWS, 2000). Blackburn's sphinx moth was known to occur on O'ahu in the past, although it has not been found here recently. Its primary native host plants are species of 'aiea (*Nothocestrum spp*.) and alternative host plants are tobacco (*Nicotiana tabacum*) and tree tobacco (*Nicotiana glauca*). None of these host plant species were found on the site. No Blackburns' sphinx moth or their larvae were found.

Mount Ka`ala Communications Sites

Insects in general were not tallied, but a few Endangered species of Drosophila fruit flies and a few candidate species of Megalagrion damsel flies listed on O'ahu that were looked for. None were observed. Drosophila species feed on decomposing vegetation and other plant exudates, and one O'ahu damselfly (*Megalagrion koelense*) is known to breed in the wet axils of the 'ie'ie vine (*Freycinetia arborea*). None of these activities were seen. The small sites involved in this survey provided a very limited search area. The large expanse of intact

native forest surrounding these sites undoubtedly harbors some of the above organisms as well as other native insects and their associations.

3.8.4 Potential Impacts

3.8.4.1 Flora

Because of the lack of any protected species or habitats, significant impacts are not expected. The proposed project is likely to affect only small areas on ridge tops at the wind farm site, and only previously disturbed areas at the Mount Ka`ala communications sites, and therefore is not expected to have a measurable negative impact on the botanical resources in this region.

However, because the project design was not finalized at the time of the survey, a follow-up botanical survey may be conducted within the footprint of the proposed facilities within the project site as necessary as the project description solidifies. The Draft EIS will report the results of all follow-up botanical surveys, and will evaluate the impacts to vegetation as a result of the proposed project. Assuming the findings are consistent with the current results, the project would not be expected to significantly affect botanical resources, given the general degradation of the habitat and minimal distribution of sensitive species within the project area. Mitigation measures designed to avoid and minimize impacts to sensitive vegetation will be presented in the Draft EIS.

3.8.4.2 Fauna

In compliance with Section 10 of the ESA and HRS §195D-4(g), the Applicant has made a commitment to prepare a Habitat Conservation Plan (HCP) and may apply for an Incidental Take Permit and Incidental Take License from the USFWS and the Division of Forestry and Wildlife (DOFAW), respectively, for the wind farm facility. The purpose of the HCP is to ensure that a net conservation benefit is provided for any listed species covered under the plan.

In addition to discussing the potential for "take" of a threatened or endangered species, as defined by the ESA, the EIS will evaluate the impacts of the Proposed Action, including the following: (1) loss or impairment of native habitats, (2) interference with the movement of any native resident or migratory wildlife, or (3) introduction or spread of invasive or otherwise undesirable non-native species. Mitigation measures that would be implemented to minimize or avoid impacts to natural or biological resources would also be presented. It is anticipated that mitigation measures specific to the threatened and endangered wildlife species would be developed and presented as part of the HCP for the wind farm facility.

The HCP will cover seven species, the Newell's shearwater (*Puffinus auricularis newelli*) ʻaʻo, Hawaiian duck (*Anas wyvilliana*) koloa, Hawaiian stilt (*Himanotopus mexicanus knudseni*) aeʻo, Hawaiian coot (*Fulica alai*) ʻalae keʻokeʻo, Hawaiian moorhen (*Gallinula chloropus sandvicensis*) ʻalae ʻula, Hawaiian short-eared owl (*Asio flammeus sandwichensis*) pueo and the Hawaiian hoary bat (*Lasiurus cinereus semotus*) ʻopeʻapeʻa.

3.9 Cultural Resources

3.9.1 Definition of Resource

HRS Chapter 6E (Historic Preservation) establishes a comprehensive program of historic preservation as a means to preserve, restore and maintain historic and cultural properties, which are defined as "any building, structure, object, district, area, or site which is more than fifty years old" (HRS Chapter 6E-2).

3.9.2 Existing Conditions

3.9.2.1 Wind Farm

As part of this EIS process, Rechtman Consulting, LLC has been retained to conduct an archaeological study for First Wind's Kawailoa and Mount Ka`ala project areas. The study involved comprehensive archival as well as detailed field investigation of the proposed tower locations, access roadways, and microwave sites. While this work is on-going, preliminary results indicate that the proposed tower locations are within former plantation agricultural areas and that the proposed project would have no significant impact on archaeological resources in these areas.

Numerous Historic Period features were recorded that relate to plantation use of the land for large-scale agricultural endeavors; primary among these features are stone-lined and concrete irrigation channels. All of the plantation-related features within the Kawailoa study area will be fully documented as part of the archaeological study. Locations for proposed access roads that lead to the wind tower locations were also intensively studied. Given the local geomorphic conditions, any access road must traverse an escarpment that is situated at the mauka edge of the coastal plain. This escarpment area is known to contain traditional Hawaiian archaeological sites that predate the plantation use of the land. Such sites have been identified in the field and their locations mapped as part of the current study.

This work is on-going and will be used to establish access roadway corridors for the project that completely avoid archaeological sites and thus would not have a significant impact on any such resources.

3.9.2.2 Mount Ka`ala Communication Facility Sites

The use of existing facilities on Mount Ka`ala for the placement of a communication tower and a repeater station will effectively negate the possibility of any potential impacts to historic properties. Upon completion of the study a comprehensive archaeological survey report will be prepared and submitted to the State Historic Preservation Office for review and appended to the EIS.

3.9.3 Potential Impacts

Given the history of land preparation and ground disturbance over the past 100 years, it is reasonable to assume that any surface pre-Contact archaeological sites within the project area have been obliterated. However, the gulches that bisect the project area may not have been disturbed to the same extent as the fields, and could possibly contain pre-Contact archaeological resources. If present, these resources would probably consist of agricultural and possibly some habitation sites.

Other potential historic sites within the project area could include reservoirs with associated ditches, flumes, siphons, and tunnels, as well as other plantation-era features. In addition, the project area could contain military sites associated with training or defenses during World War II.

Cultural resource studies would be conducted within the project area before construction, and the results of those studies would be provided to the Hawai`i State Historic Preservation Division (SHPD) during the permitting phase of the project. Appropriate mitigation measures, including avoidance and minimization to the extent practicable, would be developed and implemented in coordination with SHPD, if warranted.

3.10 Transportation and Traffic

3.10.1 Definition of Resource

This section addresses publicly-accessible transportation infrastructure, including harbors, airports and roadways. Transportation and traffic resources primarily include motor vehicles, but may also consider the movement of pedestrians and bicycles.

3.10.2 Existing Conditions

3.10.2.1 Harbors

Kalaeloa Harbor is the only harbor on O`ahu suitable for unloading heavy equipment and construction materials needed for the proposed project. Construction materials would arrive at Kalaeloa Harbor and be transported to the site.

3.10.2.2 Roadways

The wind farm and communications facility project areas are served by a network of state, county, and privately owned roadways. These roads range from multi-lane highways with paved shoulders to privately owned dirt roads. The existing dirt roads within the proposed wind farm project area are privately owned and maintained by Kamehameha Schools. The existing single lane access road at Mount Ka`ala is owned and maintained by the Kaala Joint Use Coordinating Committee.

3.10.2.3 Airports or Airfields

The nearest airfield to the Kawailoa wind power facility is Dillingham Airfield in Waialua, Hawai`i approximately 9 miles away, Wheeler Army Airfield is approximately 12 miles away, and the Honolulu International Airport is located approximately 25 miles away. Because of the height of the proposed wind turbines, Kawailoa Wind is required to submit a Notice of Intent to the Federal Aviation Administration (FAA) for construction of the proposed Kawailoa wind power facility.

Components of the Kawailoa wind power facility are either within or in the vicinity of tactical flight training area features currently used by the Department of Defense (DoD) United States Army. Kawailoa Wind is required to coordinate with the DoD and other applicable departments or agencies to ensure operation of the facility will not interfere with military exercises being conducted at or near the wind power facility.

3.10.3 Potential Impacts

Construction and operation of the proposed facility would not significantly affect existing road rights-of-way. There would be temporary disruptions and increased traffic along segments of highways between Kalaeloa Harbor and the project site. During the construction period, large pieces of equipment would be transported to the site. The equipment may require upgrades to the existing public road system, and the existing roads onsite. The facility equipment, project design, and transportation plans have not been finalized; however, as the project evolves, the EIS will be updated to discuss the implications that the proposed action would have on traffic movement within the affected area.

The height and operation of the WTGs requires Kawailoa Wind to consult with the FAA, DoD, and submit a construction Notice of Intent. The results of the FAA and DoD consultation will be incorporated into the EIS.

3.11 Land Use

3.11.1 Definition of Resource

Land use classifications reflect either natural or human activities occurring at a given location. Natural land uses include forest, open water, agriculture, conservation and other undeveloped areas. Developed land uses are generally classified as residential, commercial, industrial, and other types of development. Comprehensive plans, policies, and zoning regulations regulate the type and extent of land uses allowable in specific areas and often protect environmentally sensitive land uses. Land use impacts typically result from actions that negatively affect or displace an existing use, or the suitability of an area for its current, designated, or formally planned use.

3.11.2 Existing Conditions

3.11.2.1 Current Use

Wind Farm

The wind power facility would be located on land that is designated by the State of Hawai`i as an agricultural district, and is zoned by the County as an AG-1 Restricted Agricultural District. The proposed wind power facility consists of agricultural fields which have been left fallow because of lack of irrigation. The communications facility would be located on land that is designated by the State of Hawai`i as a conservation district, and is zoned by the County as P-1 Preservation District.

The wind power facilities, in addition to the State and County land use regulations, is also located within an area addressed by both the North Shore Sustainable Communities Plan (City & County of Honolulu, 2000) and the North Shore Master Plan (Kamehameha Schools, 2008). The North Shore Sustainable Communities Plan describes the vision for the future of the North Shore region, provides policy guidance for specific land use elements, and lists specific actions to support those policies. Some of the key elements include preservation of open space and the region's rural character, maintenance of agricultural uses, and protection of cultural resources. As previously described, the North Shore Master Plan provides the framework for management of approximately 26,000 acres of Kamehameha Schools' property on the North Shore. The Master Plan identifies specific uses and

opportunities that integrate the tenets of Kamehameha Schools' strategic vision relative to culture, education, environment, economics, and community. Implementation of the Master Plan revolves around seven catalyst projects, including the development of a wind energy project in the Kawailoa region.

The majority of the proposed project area is not currently cultivated because of lack of irrigation, but implementation of the proposed project would not preclude agricultural uses. The proposed project has been sited to avoid areas that are currently in production. In addition, Kamehameha Schools is pursuing an agroforestry operation within the undeveloped portions of the wind site, as part of the diversified agriculture project identified in the North Shore Master Plan. As such, the project is considered to be compatible with agricultural uses and would not be expected to result in more than a minimal adverse effect on agricultural lands in the project area.

The project area is part of the Kawailoa and Pa`ala`a properties that were bequeathed to Kamehameha Schools by Bernice Pauahi Bishop upon her death in 1884. As early as 1889, the makai (ocean-ward) portion of these lands, including the project area, was leased to Waialua Sugar Company for the cultivation of sugar cane. Given the coastal alluvial terrain that exists in this area, it was considered prime land for growing sugar cane. Production continued until 1996, when Waialua Sugar Company shut down because of Hawai`i's failing sugar industry (Kamehameha Schools, 2008). Throughout the period of cultivation, the fields were repeatedly disked and graded, and site features such as rocks and native vegetation were eliminated. Although most of the drainage features that flowed through these areas were not subjected to the same extent of land preparation, they were still heavily disturbed by activities including construction of site access roads, and stockpiling of soil and vegetative debris.

Since 1996, the fields with access to irrigation have been leased for a variety of small farming operations, which cultivate diversified agricultural products such as papaya, banana, lettuce, seed corn, and tuberose. The fields without access to irrigation, which includes most of the wind project site, have been left fallow

Mount Ka`ala Communication Facility Sites

The Mount Ka`ala Microwave Communication Facility sites will be installed on two small parcels of State-owned land situated on adjacent ridge tops on the north slope of Mount Ka`ala about 5 miles southwest of Waialua Town. The proposed sites are currently being used as communication facilities by Hawaiian Telcom, and are accessed via a paved single-lane road. The sites are within the State of Hawai`i Department of Land and Natural Resources (DLNR) Mount Ka`ala Natural Area Reserve. The Natural Area Reserve, administered by the DLNR Division of Forestry and Wildlife, is part of a statewide system aimed at preserving specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora, fauna, and geological sites of Hawai`i.

The two communication facility sites each have footprints of only about 0.1 acre and presently have small structures that have been in place for several decades. The first site which is adjacent to the paved access road at 3,600 feet elevation has a small building which supports a metal scaffold tower, and several antennas. The second site is located approximately 0.25 mile from the access road down an adjacent mountain ridge, and is accessed from the paved road via an existing concrete stairway. This site lies at about

3,200 feet elevation and has two metal scaffold towers, one of which supports two existing antennae dishes. Both sites have been used as communication facilities. Prior to establishment of the existing communications facilities the sites were forested.

3.11.2.2 Land Ownership

Wind Farm

The wind power facilities site, including all areas required for site access, is owned by Kamehameha Schools. Kamehameha Schools exclusively selected First Wind to negotiate the Site Lease Development Agreement (SLDA). Negotiation of the SLDA is underway and will be completed before the execution of the PPA.

Mount Ka`ala Communication Facility Sites

The proposed communication facilities sites are currently owned by the State of Hawai`i and Hawaiian Telcom is a current lessee of the site. Kawailoa Wind is in discussion with Hawaiian Telcom regarding a sub-lease agreement for use of the sites. Kawailoa Wind will establish an agreement with Hawaiian Telcom in order to install new microwave dishes at the existing communications facilities.

3.11.2.3 Land Use Designations and Zoning

Wind Farm

The proposed wind power facilities site is located on land that is designated by the State of Hawai`i as an agricultural district, and is zoned by the City & County of Honolulu as an AG-1 Restricted Agricultural District. The project is consistent with the State and County land use regulations, as discussed below, and no zoning amendments would be required.

Mount Ka`ala Communication Facility Sites

The proposed communication facilities site is located on land that is designated by the State of Hawai`i as Conservation District, and is zoned by the City & County of Honolulu as a P-1 Preservation District.

3.11.2.4 State Land Use

The State Land Use Law (HRS Chapter 205) gives the State Land Use Commission (LUC) the authority to designate all land within the State into one of four districts—urban, rural, agricultural, or conservation—based on the general activities and uses of the land, as outlined in HRS Chapter 205-2.Wind Farm

Permitted uses within the agricultural district are described in HRS Chapter 205-4.5 and the State LUC's Administrative Rules (Title 15, Subtitle 3, Chapter 15, HRS), and take into consideration the Land Study Bureau (LSB) land classification system, which rates the productivity of soils throughout the State based on characteristics including texture, slope, salinity, erodibility, and rainfall. The productivity ratings designate areas in categories ranging from A to E, with Category A representing the most productive soils and Category E representing the least productive soils.

HRS Section 205-4.5(c) and HAR 15-15-25 state that permissible uses on agricultural district lands with an overall LSB productivity rating of C, D, E, or N (unrated) shall be restricted to the uses listed in HRS 205-5(b) (which in turn references the uses listed in HRS 205-2), which includes:

> "(4) Wind generated energy production for public, private and commercial use; and… (7) Wind machines and wind farms;"
>
> Pursuant to HRS Section 205-4.5(a) and HAR 15-15-25, permissible uses on agricultural district lands with an overall LSB productivity rating of A or B include:
>
> "Wind energy facilities, including the appurtenances associated with the production and transmission of wind generated energy; provided that such facilities and appurtenances are compatible with agriculture uses and cause minimal adverse impact on agricultural land."

The LSB productivity rating of the soils within the proposed site are as follows: A (13 percent), B (22 percent), C (17 percent), D (4 percent), E (43 percent), and N (1 percent), as shown in. Although the proposed site is not currently being cultivated because of lack of irrigation, implementation of the project would not preclude agricultural uses. In each of its projects around the United States, First Wind typically applies the shared use concept with the wind project coexisting with one or more other consistent agricultural uses. In fact, Kamehameha Schools is pursuing an agroforestry operation within the undeveloped portions of the site, as part of the diversified agriculture project identified in the North Shore Master Plan. The wind project is considered to be compatible with such agricultural uses and would not be expected to result in more than a minimal adverse effect on agricultural lands in the project area.

Mount Ka`ala Communication Facility Sites

HAR 13-5-22 states that permissible uses on conservation district lands shall be restricted to uses it lists, which includes:

> "(D-2) Transportation systems, transmission facilities for public utilities, water systems, energy generation facilities utilizing the renewable resource of the area (e.g. hydroelectric or wind farms) and communications systems and other such land uses which are undertaken by non-governmental entities which benefit the public and are consistent with the purpose of the conservation district."

The communication facilities site is considered to be compatible with such Conservation District uses and would not be expected to result in more than a minimal adverse effect on conservation lands in the site area. Construction of these facilities could potentially require a Conservation District Use Permit.

County Land Use

The City & County of Honolulu's Land Use Ordinance (LUO) regulates land use and specifies development and design standards for activities within each of the City & County zoning districts. Under Section 21-10.1 of the LUO, wind machines are defined as "devices and facilities, including appurtenances, associated with the production and transmission of wind-generated energy". As shown in the LUO Master Use Table (Table 21-3), within the AG-1 Restricted Agricultural District, wind machines are considered a Special Accessory Use, subject to the development standards contained in Section 21-5. The development standards for wind machines, as listed in LUO Section 21-5.700, require that "all wind machines shall be setback from all property lines a minimum distance equal to the height of the system. Height shall include the height of the tower and the farthest vertical extension

of the wind machine." In addition, wind machines with a rated capacity of more than 100 kilowatts require a Conditional Use permit (minor).

Mount Ka`ala Communication Facility Sites

In accordance with HRS 205-5, jurisdiction is granted to counties to govern the zoning within the state land use districts other than the Conservation District, which is governed by the DLNR. As such, the communication facilities which would be zoned within City & County of Honolulu's P-1 Preservation, shall be governed by HAR 13-5-22, which would be an allowable use upon receipt of a Conservation District Use Permit issued by the DLNR.

3.11.3 Potential Impacts

Wind farm facilities are widely recognized as being compatible use of land on active ranch and farmlands, as operation of the wind farm does not inhibit continued ranching and/or farming activities. However, some aspects of the wind farm project construction as well as some of the ancillary project facilities could impact land use. The communications facilities will consist of addition of microwave dishes (with supporting towers) to existing facilities and is not expected to impact existing land use. The EIS will evaluate the temporary impacts to land use that would occur during construction, as well as any long-term changes in land use resulting from project operation. If appropriate, the EIS will present mitigation measures to minimize any land use impacts.

3.12 Visual Resources

3.12.1 Definition of Resource

Visual or scenic resources are the natural and built features of the landscape that contribute to the public's experience and appreciation of the environment. Visual resource or scenic impacts are generally defined in terms of a project's physical characteristics and potential visibility and the extent to which the project's presence would change the perceived visual character and quality of the environment in which it would be located. This section documents the existing visual conditions on the site and in the surrounding area and assesses the extent to which the proposed project has the potential to affect valued qualities of the area's scenic resources.

3.12.2 Existing Conditions

The project is located on the North Shore of O`ahu, a relatively rural area known for its scenic shoreline, agricultural lands, and open space. In general, the aesthetic quality of the region is high, which can be attributed to the sweeping views of the shoreline and adjacent open lands with the backdrop of the Ko`olau and Waianae mountain ranges. There are frequent opportunities for views of both the coastline and the mountains along Kamehameha Highway, which runs the length of the coastline. There are two small towns, Haleiwa and Waialua, and several residential communities, including Pupukea, located in the project vicinity. This section of the coastline also includes many well-known beaches, including Waimea Bay, Chun's Reef, Laniakea, Pua`ena Point, and Haleiwa Beach Park.

Wind Farm

The proposed wind farm project area can be characterized as broad upland plateaus interspersed with gulches. The uplands support either actively maintained agricultural

crops or overgrown, weedy vegetation. The gulches are densely vegetated with a well-developed canopy, which partially blocks some of the mauka views in this area. In addition, a steep bluff occurs along Kamehameha Highway, just makai of the proposed project area, further limiting the mauka views of the proposed project area from the highway. The proposed project site would be located at an elevation ranging between approximately 100 and 1,300 feet above mean sea level (msl). The turbines would be located a minimum of approximately 0.7 mile from Kamehameha Highway, 0.85 mile from Pupukea, and 3.8 miles from Haleiwa Town.

The North Shore Sustainable Communities Plan (City & County of Honolulu, 2000) addresses the scenic quality of this region and lists protection of scenic views as a general policy. Based on this policy, one of the planning principles identified in the plan is the preservation of views of the mountains, coastline, and Pacific Ocean from public places, including major roadways. The plan establishes specific guidelines including the need to evaluate the impact of land use proposals on the visual quality of the landscape but recognizes that the protection of roadway views should be balanced with the operating requirements of diversified agriculture. Scenic views listed in the North Shore Sustainable Communities Plan that include portions of the project area include (1) views of the Ko`olau Mountains from Kamehameha Highway, at the entrance to the North Shore and (2) *mauka* views from Kamehameha Highway between Haleiwa and Waimea Bay.

Mount Ka`ala Communication Facility Sites

The proposed communications sites can be characterized as rocky mountain ridges, surrounded by steep mountainous slopes. The ridges are part of the Mokuleia Forest Reserve, and are heavily vegetated with a well developed canopy and dense undergrowth.

3.12.3 Potential Impacts

The EIS will evaluate the impacts to the visual resources and aesthetics that would occur during construction and long-term changes resulting from project operation. The EIS will identify sensitive receptors near the project site, and the degree of visual impacts and shadow flicker that are typical of wind farms. The EIS will describe public vantage points on the island from which the wind farm and communications facilities will be visible and include an analysis of how the addition of the wind generating equipment to the Kawailoa site, and addition of new microwave towers to existing facilities, will incrementally affect views from those vantage points. Visual simulations will be prepared for the EIS. If appropriate, the EIS will present mitigation measures to minimize any land use impacts.

3.13 Public Safety

3.13.1 Definition of Resource

Public safety concerns associated with the construction of a wind power project involve fairly standard construction-related concerns. These include the potential for injuries to workers and the general public from (1) the movement of construction vehicles, equipment, and materials; (2) falling overhead objects; (3) falls into open excavations; and (4) electrocution. These types of incidents are well understood, and do not require extensive background information. Public safety concerns associated with the operation of a wind power project are somewhat more unique, and are the focus of this section.

In many ways, wind energy facilities are safer than other forms of energy production because a combustible fuel source and fuel storage are not required. In addition, use and/or generation of toxic or hazardous materials are minor when compared to other types of generating facilities. However, wind turbines are generally more accessible to the public, and risks to public health and safety can be associated with these facilities. Examples of such safety concerns include tower collapse, blade throw, stray voltage, fire in the nacelle, and lighting strikes.

3.13.1.1 Tower Collapse/Blade Throw

It is very rare for a wind turbine tower to collapse or a rotor blade to be dropped or thrown from the nacelle, but such incidents have been documented and are potentially dangerous for project personnel, as well as the general public. The reasons for a turbine collapse or blade throw vary depending on conditions and tower type.

Past occurrences of these incidents have generally been the result of manufacturing defects, poor maintenance, wind gusts that exceed the maximum design load of the engineered turbine structure, or lightning strikes (AWEA, n.d.). Most instances of blade throw and turbine collapse were reported during the early years of the wind industry. Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation have largely eliminated such occurrences.

3.13.1.2 Stray Voltage

Stray voltage is a phenomenon that has been studied and debated since at least the 1960s. It is an effect that is primarily a concern of farmers/ranchers whose livestock can receive electrical shocks. Stray voltage can be defined as a "low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system" (Wisconsin Rural Energy Management Council, 2000). In a farm setting, stray voltage typically originates from low levels of AC voltage on the grounded conductors of a farm wiring system. These voltages are termed "stray voltage" when they are large enough to form a circuit when a person or an animal simultaneously touches two objects which are part of an electrical system. The occurrence of stray voltage results from a damaged or poorly connected wiring system, corrosion on either end of the wires, or weak/damaged insulation materials on the "hot" wire. Livestock may encounter stray voltage when they contact two surfaces with voltage differences, resulting in a small electrical current flowing through the animal and creating a shock.

Stray voltage can occur at electric facilities (such as wind power projects) because of factors such as operating voltage, geometry, shielding, rock/soil electrical resistively, and proximity. Stray voltage from such facilities usually only occurs if the system is poorly grounded and located in proximity to ungrounded or poorly grounded metal objects (such as fences or buildings).

3.13.1.3 Fire

Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic), does create the potential for fire within the tower or the nacelle.

Other project activities create the potential for a fire or medical emergency because of the storage and use of diesel fuels, lubricating oils, and hydraulic fluids. Storage and use of these substances may occur at the collector substation, staging and lay-down area, and the O&M building.

3.13.1.4 Lightning Strikes

Because of their height and metal/carbon components, wind turbines and communications facilities are susceptible to lightning strikes. Statistics on lightning strikes to wind turbines are not readily available, but it is reported that lightning causes four to eight faults per 100 turbine-years in northern Europe, and up to 14 faults per 100 turbine-years in southern Germany (Korsgaard and Mortensen, 2006). Most lightning strikes hit the rotor, and their effect is highly variable, ranging from minor surface damage to complete blade failure. All modern wind turbines include lightning protection systems, which generally prevent catastrophic blade failure.

3.13.2 Existing Conditions

The proposed project area is currently comprised of private pastureland formerly used for agricultural operations. There are no significant public safety hazards associated with the existing pastureland.

3.13.3 Potential Impacts

Construction of the proposed project would require the operation of heavy equipment, movement of oversized equipment, installation of electrical conductors, and the erection of turbine components. The EIS will provide a detailed evaluation of the potential public safety hazards associated with these construction activities. In addition, the EIS will outline the measures that would be implemented to minimize those hazards.

As described above, public health and safety risk that can be associated with the operation of wind farms can include tower collapse, blade throw, stray voltage, fire in the nacelle, and lightning strikes. The EIS will evaluate the potential impact of project operation relative to these hazards, as well as measures that would be implemented to reduce the risk to the public.

3.14 Socioeconomic Characteristics

3.14.1 Definition of Resource

Socioeconomic data describe the population, economic condition and quality of life within the project area. Population data include the number of residents in the area and the recent changes in population growth. Data on employment, labor force, unemployment trends, income, and industrial earnings describe the economic health of a region. Income information is provided as an annual total by county and per capita. The number and type of housing units, ownership, and vacancy rate can be indicators of the regional quality of life. The geographic area that was selected as the basis on which socioeconomic impacts of the project will be analyzed, are the four Census Designated Places (CDPs) which are within the vicinity of the project location. The CDPs includes areas within Mokuleia, Waialua, Haleiwa and Pupukea, as defined by the U.S. Census Bureau (DBEDT, 2008a).

3.14.2 Existing Conditions

The proposed Kawailoa Wind Power facility is located in the community of Haleiwa-Kawailoa, within the Waialua District, on the island of O`ahu. The communications facility is located in the community of Waialua-Mokuleia which is also within the Waialua District. The total resident population of O`ahu is approximately 905,034 individuals (DBEDT, 2008a). The majority of the resident population on O`ahu lives in the District of Honolulu.

The Waialua District is not heavily populated compared to other districts on the island, representing approximately 1.6 percent of the entire island's population in 2000 (DBEDT, 2009). The district experienced a 21.5 percent change in population from 1990 to 2000. The economy of the area is based primarily on tourism. Haleiwa is the commercial center for the North Shore, consisting of local employment such as commerce, small shops, restaurants, banking, real estate, and insurance. The community shopping area at Haleiwa attracts and employs persons from many communities along the North Shore of O`ahu.

In 1999, the estimated median household income for the Mokuleia, Waialua, Haleiwa and Pupukea CDPs area was $48,432 and the estimated median per capita income was $20,932. In 1999, approximately 11.1 percent of families and 13.9 percent of individuals in the Mokuleia, Waialua, Haleiwa and Pupukea CDPs had an income below the poverty level, compared to O`ahu's 7 percent of families and 9.9 percent of individuals who had income below poverty level. Approximately 7.6 percent of families and 10.7 percent of individuals of the State of Hawai`i are considered to be living below the poverty level.

The population of the CDPs in 2000 was primarily composed of Caucasians (37.7 percent alone, 56.4 percent in combination) and Asians (28.3 percent alone, 47.6 percent in combination). The population of Native Hawaiians and other Pacific Islanders in the CDPs (6.2 percent alone, 22.8 percent in combination) represent a smaller a much smaller portion of the CDPs' population, as it does for the island of O`ahu (8.9 percent alone, 12.7 percent in combination) (U.S. Census Bureau).

3.14.3 Potential Impacts

Potential direct socio-economic effects of the proposed facilities would include: (1) construction employment and business activity; (2) State revenues in the form of excise taxes, lease revenues, and property taxes; (3) substantial fuel cost savings to Hawaiian Electric, which potentially translate into ratepayer savings; (4) ongoing employment of facility operation and maintenance staff (which would be relatively limited); and (5) ongoing expenditures for materials and outside services.

The EIS will enumerate project-related expenditures and employment, as well as the implication that the reduction in Hawaiian Electric fuel cost will have on the cost of electricity to its customers. It will also discuss the extent to which each alternative would directly affect employment and the level of business activity. It is not anticipated that the project would disproportionately affect low income or minority populations because the CDPs are not poverty areas and do not have a larger population greater than the island of O`ahu. Furthermore, no children congregate in daycares, schools, or parks in the immediate vicinity of the proposed project.

3.15 Public Infrastructure and Services

3.15.1 Definition of Resource

This chapter addresses the availability and capacity of public infrastructure and services, including utilities, waste disposal, police and fire protection, health care facilities, education facilities, and recreational facilities.

3.15.2 Existing Conditions

3.15.2.1 Energy

The State of Hawai`i uses a higher percentage of petroleum to generate electricity than any other state in the U. S. In 2005, oil was used to produce 80 percent of electricity sold by the State's utilities (Planning Solutions, Inc., 2009). The remaining electricity generation during that year was supplied by coal (13.9 percent), municipal solid waste (2.6 percent), geothermal (2 percent), hydroelectricity (0.7 percent), bagasse or sugarcane waste (0.6 percent), wind (0.1 percent), and a very small amount from solar photovoltaics. Imported oil costs the state between $2 and $4 billion annually (DBEDT, 2008b). As a result, Hawai`i pays among the highest electricity costs in the country and faces a high level of energy insecurity because of the volatility of oil prices and the potential for disruptions in petroleum supply and shipping.

Fortunately, Hawai`i has abundant renewable resources, including a robust wind resource on several islands. Significant potential for small or distributed wind energy projects exists throughout the Hawaiian Islands (Global Energy Concepts LLC, 2006). It has been estimated that the state has a combined wind energy potential of 1,000,000 kilowatt hours (kWh) (State of Hawai`i and Hawaiian Electric Companies, 2008). Because of increasing fossil fuel costs, energy security issues, and concerns over climate change, the State of Hawai`i is striving to use its own renewable energy (M & E Pacific, Inc., 2008). Hawai`i's RPS (HRS Chapters 269-91 to 269-95) present a timeline to increase the amount of electricity generated using renewable resources. According to these standards, each electric utility company that sells electricity for consumption in the state shall establish a renewable portfolio standard of 15 percent of its net electricity sales by December 31, 2015, and 20 percent of its net electricity sales by December 31, 2020. A proposal to increase the standard to 40 percent by 2020 is under consideration by the Hawai`i State Legislature.

In January 2008, the State of Hawai`i and DOE signed an agreement to establish the Hawai`i Clean Energy Initiative (HCEI). The goal of this agreement is to have 70 percent or more of the state's energy derived from clean, renewable energy for electricity and transportation by 2030. This goal has the potential of reducing Hawai`i's current crude oil consumption by 72 percent (State of Hawai`i and USDOE, 2008). Hawai`i also passed various House bills (HB2848 CD1, HB 2175 CD1, and SB 988 CD1, HB 2505 CD1, and HB 2863 CD1) to promote energy efficiency and renewable energy sources. In October 2008, the State of Hawai`i signed an Energy Agreement with Hawaiian Electric to help reach the state's energy objectives by facilitating the production of renewable energy sources on the islands, such as wind resources (State of Hawai`i and Hawaiian Electric Companies, 2008). The agreement includes a commitment by Hawaiian Electric to encourage and explore the development of known project proposals.

In order to meet the 70 percent clean energy goal, local renewable energy alternatives need to be developed in Hawai`i. Several wind energy facilities are already operating in the state and others are being proposed.

Currently, the largest source of renewable energy on O'ahu is burning refuse or municipal solid waste at the Honolulu Project of Waste Energy Recovery (H-Power) facility in the Campbell Industrial Park (Rocky Mountain Institute, 2008; R W Beck, 2008). Burning waste meets only 4 percent of the island's electrical load. O'ahu cannot draw on renewable energy generated on neighboring islands until inter-island transmission lines are constructed to connect the different island electrical grids, and the estimated date of construction of such transmission lines is unknown.

Hawaiian Electric provides all electrical service for the Island of O'ahu; utility-scale electricity sold by renewable energy producers is sold directly to Hawaiian Electric. Two 46 kV transmission lines runs through the project area. The Kawailoa wind project would tie into these lines and provide electricity to O'ahu's grid, powering approximately 15,000 homes.

3.15.2.2 Solid Waste

Solid waste generated by the residents in Haleiwa and Pupukea is disposed of at the Waimanalo Gulch landfill or burned at the H-Power facility. Solid waste generated by Kawailoa Wind is anticipated to be considered municipal waste and be disposed of as such.

3.15.2.3 Water and Wastewater

Water resources and distribution on O'ahu is managed by the Honolulu Board of Water Supply (BWS). A connection to City and County water facilities is not anticipated to be needed for the proposed project. Kawailoa Wind plans to truck in and store water in onsite holding tanks for its water requirements at the wind farm facility. Given the nature of the proposed project and small number of people working onsite, water usage would be very low. There is no expected need for water supply at the Mount Ka`ala communications facilities.

It is anticipated that an onsite septic tank system would be constructed to deal with project-associated wastewater generated from the few people working onsite. The wastewater discharge from the project area would be within the City and County requirement of less than 1,000 gallons per day. The waste that accumulates in the septic tank system would be collected by a private contractor and transported to an appropriate wastewater treatment facility or other approved location for disposal. The small amount of wastewater that this represents can easily be accommodated in the existing treatment and disposal facilities.

3.15.2.4 Police and Fire Protection Services

The Wahiawa Police Station located at 330 North Cane Street and is the closest police station to both the wind farm and communications facilities. It is approximately 11 miles from the entrance to the wind farm facility and approximately 17 miles to the communications facilities.

The Waialua Fire Station located at 66-420 Haleiwa Road is the closest fire department to both the wind farm and communications facilities. It is approximately 2 miles from the

entrance to the wind farm facility and approximately 2 miles from the entrance to the Mount Ka`ala access road.

3.15.2.5 Health Care Facilities and Emergency Medical Services

The nearest hospital to the proposed wind farm and communications facilities is Wahiawa General Hospital located at 128 Lehua Street, Wahiawa, HI 96786, approximately 9 miles away from the entrance to the wind farm facility and approximately 12 miles away from the from the entrance to the Mount Ka`ala access road. In case of emergencies, paramedic and ambulance services are available.

3.15.2.6 Education Facilities

Haleiwa Elementary School, located at 66-505 Haleiwa Road, is approximately 2.1 miles from the entrance to the Kawailoa wind farm facility and approximately 2 miles from the entrance to the Mount Ka`ala access road. Sunset Beach Elementary School, located at 59-360 Kamehameha Highway, is approximately 5.4 miles from the entrance to the Kawailoa wind farm facility, and approximately 8 miles from the entrance to the Mount Ka`ala access road.

3.15.2.7 Recreation Facilities

Multiple parks and recreation facilities are located near the western portion of the wind farm facility and within a two mile radius from the entrance of the Kawailoa wind farm facility. These parks and recreation facilities include Waimea Bay Beach Park, Waimea Valley, Laniakea Beach, Puaena Point Beach Park, Haleiwa Beach Park, and Haleiwa Alii Beach Park.

3.15.3 Potential Impacts

With the 70 MW of power potentially generated by the proposed facility, Hawaiian Electric would be able to eliminate the use of approximately 154,550 barrels of oil annually that would otherwise be used to produce conventional power. Reducing the proportion of its energy that comes from fossil fuel would decrease the amount of money that Hawaiian Electric spends on imported fuel and buffer the system from the energy cost fluctuations that accompany volatile oil prices.

The proposed action would contribute to the goals outlined in the Hawai`i's Renewable Portfolio Standards and the HCEI by increasing the percentage of the state's energy that is derived from clean, renewable sources. The exact percentage is unknown; however, Kawailoa Wind Power is expected to generate enough clean energy to power approximately 18,000 of the 337,152 homes on O'ahu (DBEDT, 2008). It also would support recently passed state statutes designed to promote energy efficiency and renewable energy sources.

The proposed project would consume only small amounts of electrical power, which would be either generated by the facility or back fed through utility's transmission lines.

Operation and maintenance of the facility could generate small amounts of solid waste, waste water and hazardous waste, which would be transported by truck to the appropriate local disposal facility for reclamation or landfill. It is not anticipated that operation of the Proposed Action will have significant negative impacts to local utilities and infrastructure.

Public services including fire and police, health care, education, and recreation would not be significantly impacted by the Proposed Action and will not be discussed further in the EIS.

The EIS will provide a detailed evaluation of the potential impacts associated with construction activities relative to utilities and infrastructure. In addition, the EIS will outline the measures that would be implemented to avoid and minimize those impacts

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4.0 Determination

4.1 EIS Determination

First Wind has briefed the Department of Business and Economic Development and Tourism (DBEDT) regarding the project and the DBEDT has agreed to be the accepting authority for the EIS under Hawai`i revised statutes (HRS) 201N. The Office of Environmental Quality Control has been consulted and agrees with the designation of DBEDT as Accepting Authority.

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5.0 Distribution

Kawailoa Wind will distribute this EISPN to the individuals and organizations listed in Table 5-1 and request their comments on the proposed scope of the analysis. It will provide a limited number of loan copies of this document to libraries.

TABLE 5.1
EISPN Distribution List

City and County of Honolulu	Federal Agencies
Department of Planning and Permitting	Environmental Protection Agency (PICO)
Department of Design and Construction	National Marine Fisheries Service
Department of Parks and Recreation	US Army Engineer Division
Honolulu Board of Water Supply	US Fish and Wildlife Service
Department of Transportation Services	US Federal Aviation Administration
Honolulu Fire Department	US Natural Resources Conservation Service
Police Department	US Geological Survey
O`ahu Civil Defense	**Libraries and Depositories**
State Agencies	DBEDT Library
Commission on Water Resource Management	Hawai`i State Library Hawai`i Documents Center
Department of Defense	Legislative Reference Bureau
Department of Hawaiian Homelands	Waialua Public Library
Hawai`i State Civil Defense	UH Hamilton Library
Office of Environmental Quality Control	Kahuku Public Library
Office of Hawaiian Affairs	**Elected Officials**
	Governor Linda Lingle
Department of Accounting and General Services	U.S. Representative Mazie Hirono
Department of Agriculture	U.S. Senator Daniel Akaka
Department of Business, Economic Development, and Tourism (DBEDT) Office of Planning	State Representative (to be determined)
DBEDT Energy, Resources & Technology Division	State Senator (to be determined)
Department of Health	Mayor of City and County of Honolulu
Department of Land and Natural Resources (5 copies)	**Local Utilities**
Department of Transportation	Hawaiian Telcom
DLNR Historic Preservation Division	Hawaiian Electric Company
UH Environmental Center	

TABLE 5.1
EISPN Distribution List

News & Media	Other Parties
Honolulu Star Advertiser	Sierra Club
	Life of the Land
	Kamehameha Schools

6.0 Consulted Parties

The list of parties consulted before the development of the EISPN is presented below in Table 6-1.

TABLE 6-1
Agencies and Other Parties Consulted before Development of the EISPN

Agency/Entity	Contact Name	Date of Consultation
State of Hawai`i Department of Business and Economic Development and Tourism	Ms. Malama Minn	September 9, 2010
State of Hawai`i Department of Land and Natural Resources	Mr. Sam Lemmo, Administrator	
State of Hawai`i, DLNR, Division of Forestry and Wildlife (DOFAW)	Ms. Sandee Hufana	
	Ms. Lauren Goodmiller	
US Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office	Mr. James Kwon	
Office of Deputy Assistant Secretary of the Army	Mr. Howard Killian	

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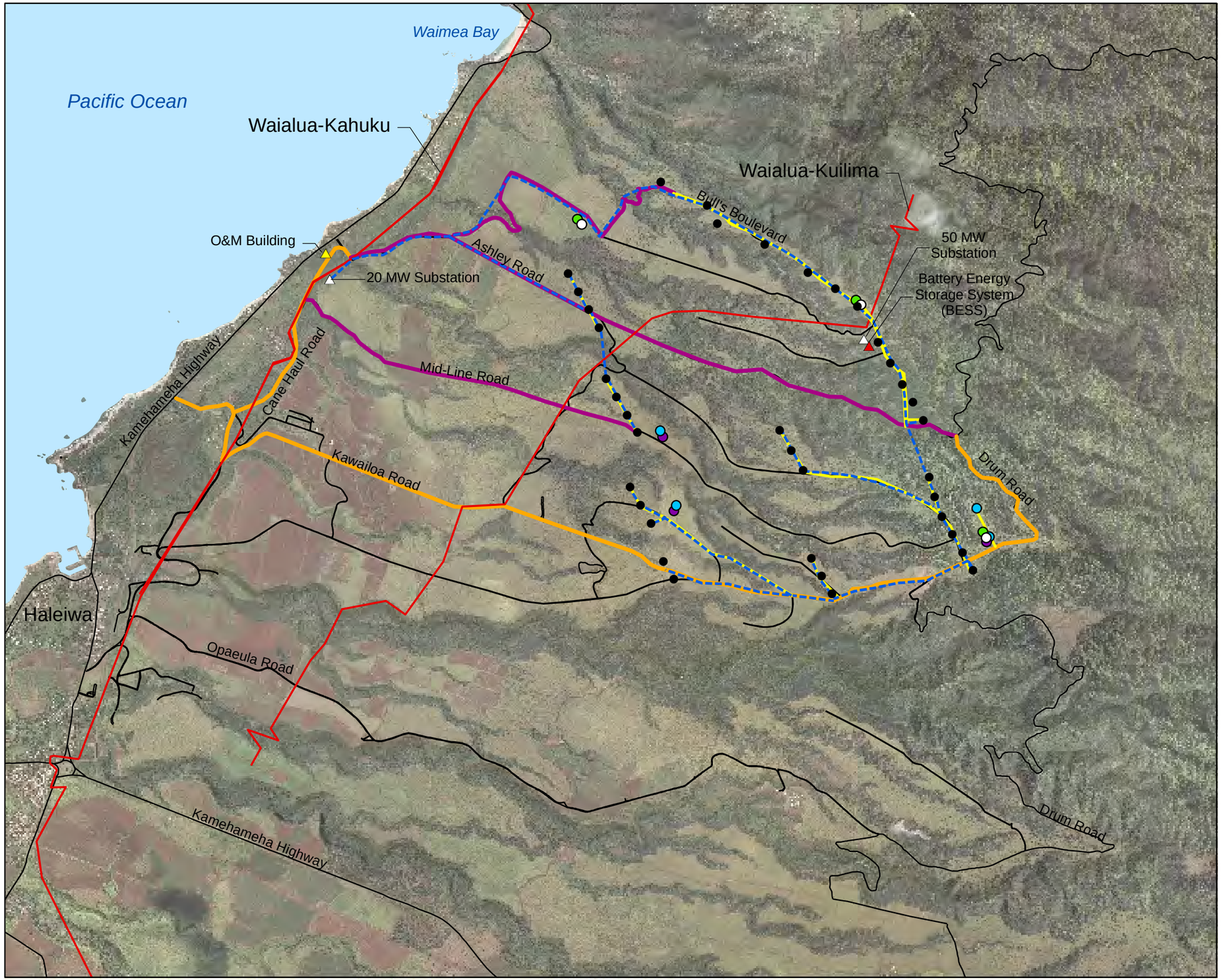
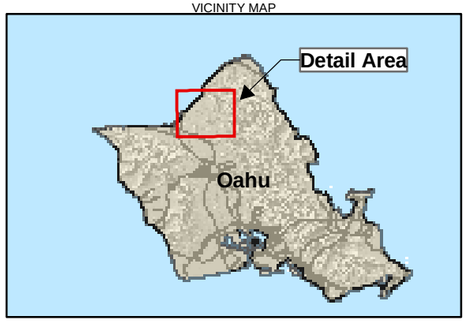
Figures



VICINITY MAP



LEGEND

- Turbine Layout
- Existing Meteorological Tower
- Existing SODAR Station
- Proposed Meteorological Tower
- Proposed SODAR Station
- Existing Road (No to Minor Grading Required)
- Existing Road (Substantial Grading or Other Upgrades Required)
- New Road
- Proposed Collector Line
- Road
- Existing HECO 46kV Line
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Ocean

Source:
Project Facilities - Kawailoa Wind
Existing Hawaiian Electric Lines - Kawailoa Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

N

0 0.25 0.5 1
Miles

Figure 1-1
Kawailoa Wind Farm Site
Potential Project Component Layout
Kawailoa Wind Project
Oahu, Hawaii

Pacific Ocean

Waimea Bay

Waialua-Kahuku

Waialua-Kuilima

O&M Building

20 MW Substation

50 MW Substation

Battery Energy Storage System (BESS)

Bull's Boulevard

Ashley Road

Mid-Line Road

Cane Haul Road

Kamehameha Highway

Kawailoa Road

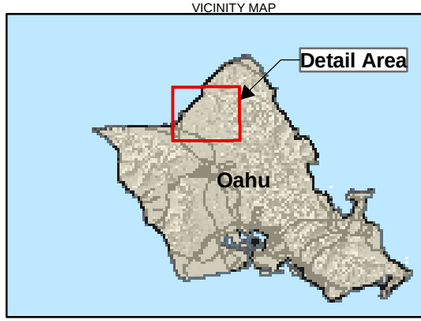
Drum Road

Haleiwa

Opaeula Road

Kamehameha Highway

VICINITY MAP



LEGEND

- Potential Turbine Location
- Existing SODAR Station
- Existing Meterological Tower
- Proposed Meterological Tower
- Proposed SODAR Station
- Existing Road (No to Minor Grading Required)
- Existing Road (Substantial Grading or Other Upgrades Required)
- New Road
- Other Road
- Existing HECO 46kV Line
- Proposed Collector Line
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Ocean

State Land Use District

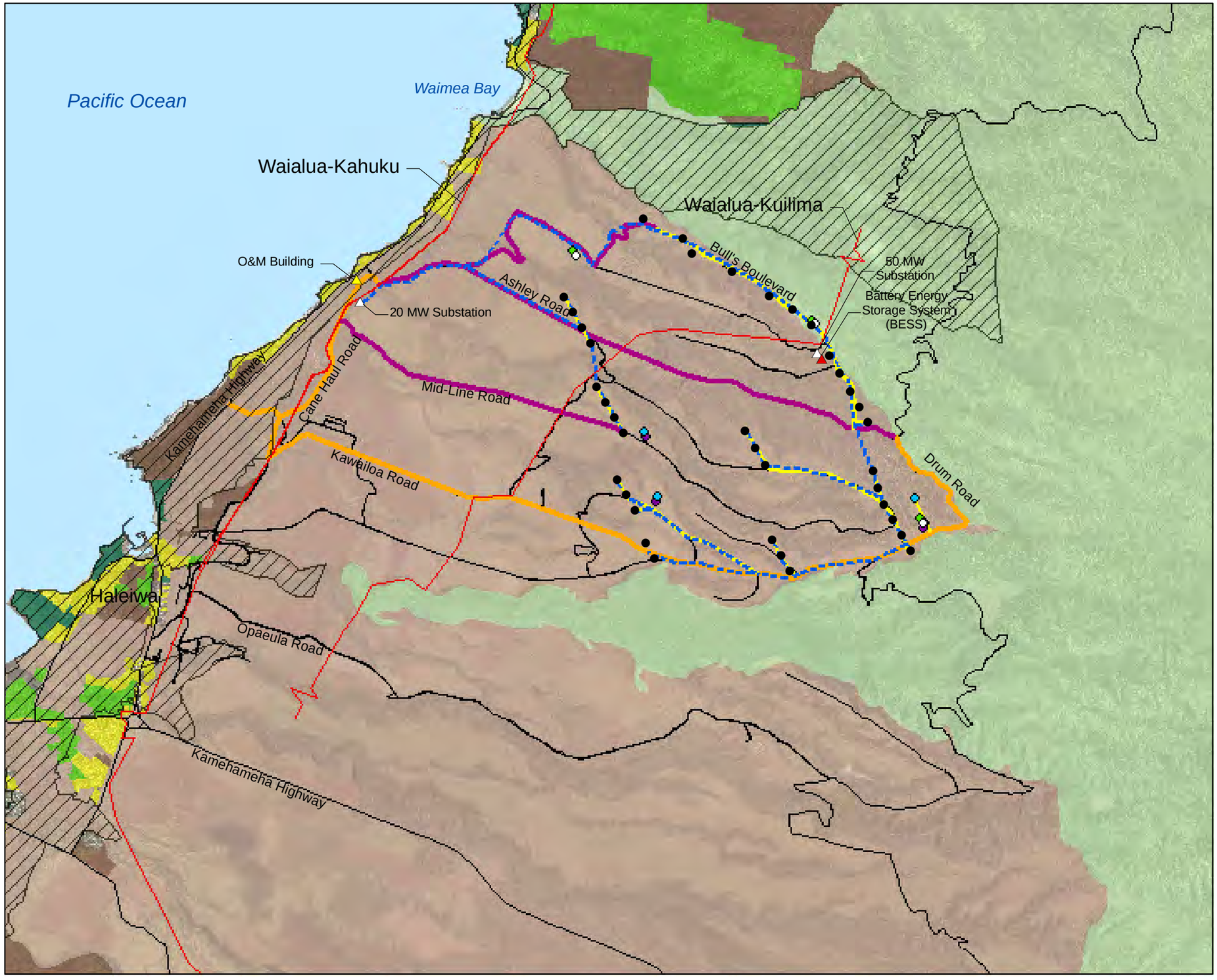
- Agricultural
- Conservation
- Urban

Source:
Project Facilities - Kawailoa Wind
Existing Hawaiian Electric Lines - Kawailoa Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

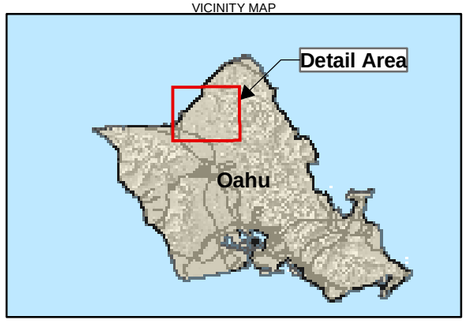
N

0 0.25 0.5 1
Miles

Figure 2-1
Kawailoa Wind Farm Site
State Land Use Districts
Kawailoa Wind Project
Oahu, Hawaii



VICINITY MAP



LEGEND

- Proposed Turbine Location
- Existing SODAR Station
- Existing Meterological Tower
- Proposed Meterological Tower
- Proposed SODAR Station
- Existing Road (No to Minor Grading Required)
- Existing Road (Substantial Grading or Other Upgrades Required)
- New Road
- Other Road
- Existing HECO 46kV Line
- Proposed Collector Line
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Ocean
- Special Management Area

City and County Zoning

- AG-1 Restricted Agriculture District
- AG-2 General Agriculture District
- Country District
- P-1 Restricted Preservation District
- P-2 General Preservation District
- R-5 Residential District

Source:
Project Facilities - Kawailoa Wind
Existing Hawaiian Electric Lines - Kawailoa Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

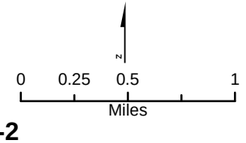
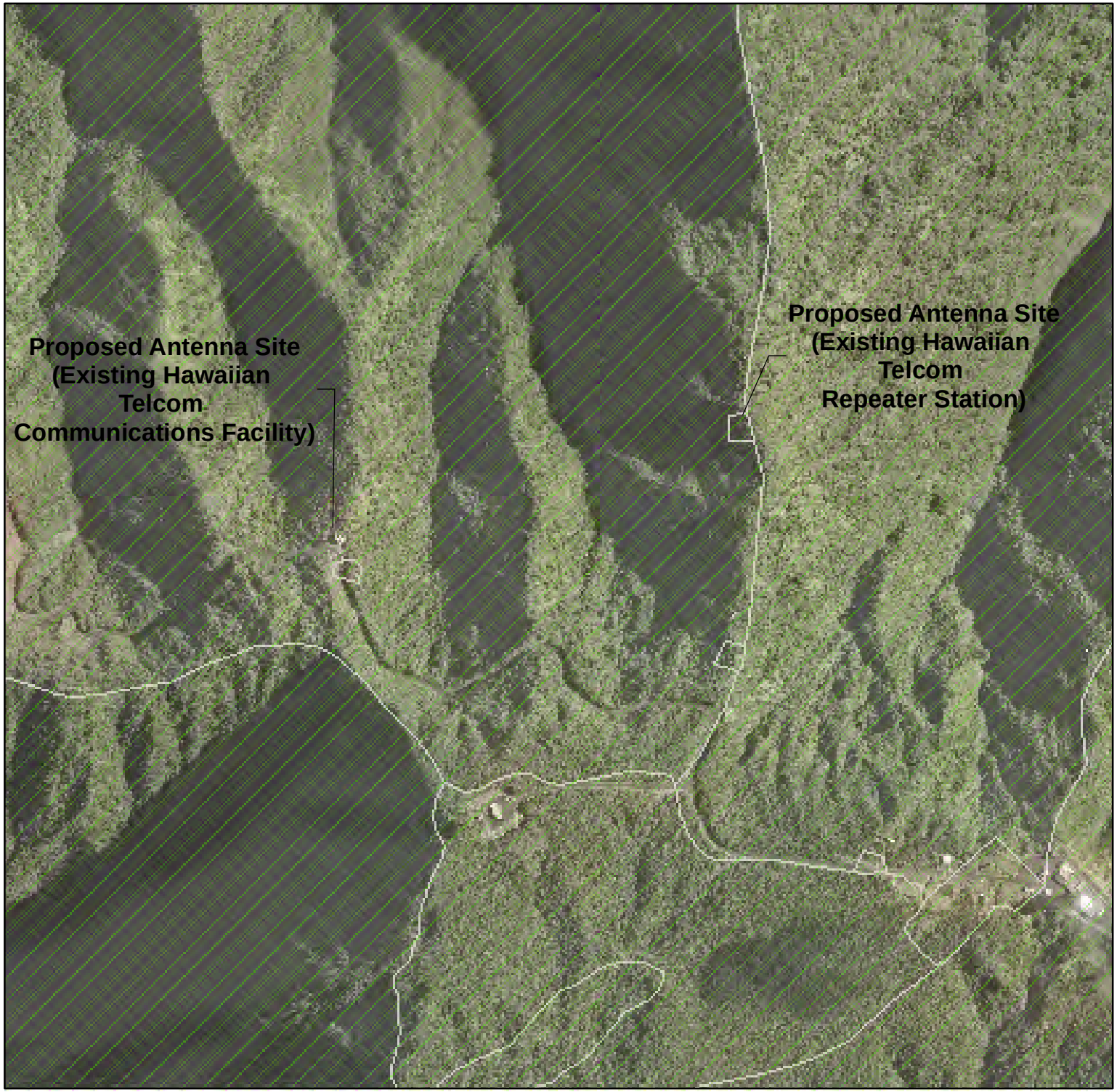
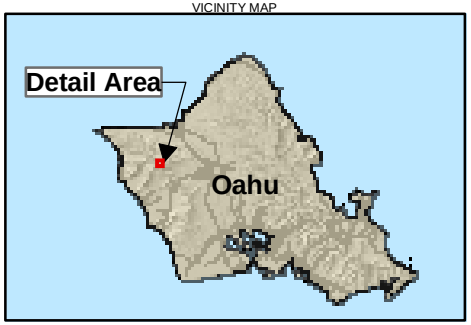


Figure 2-2
Kawailoa Wind Farm Site
County Zoning
Kawailoa Wind Project
Oahu, Hawaii



VICINITY MAP



LEGEND

State Land Use District

Conservation District

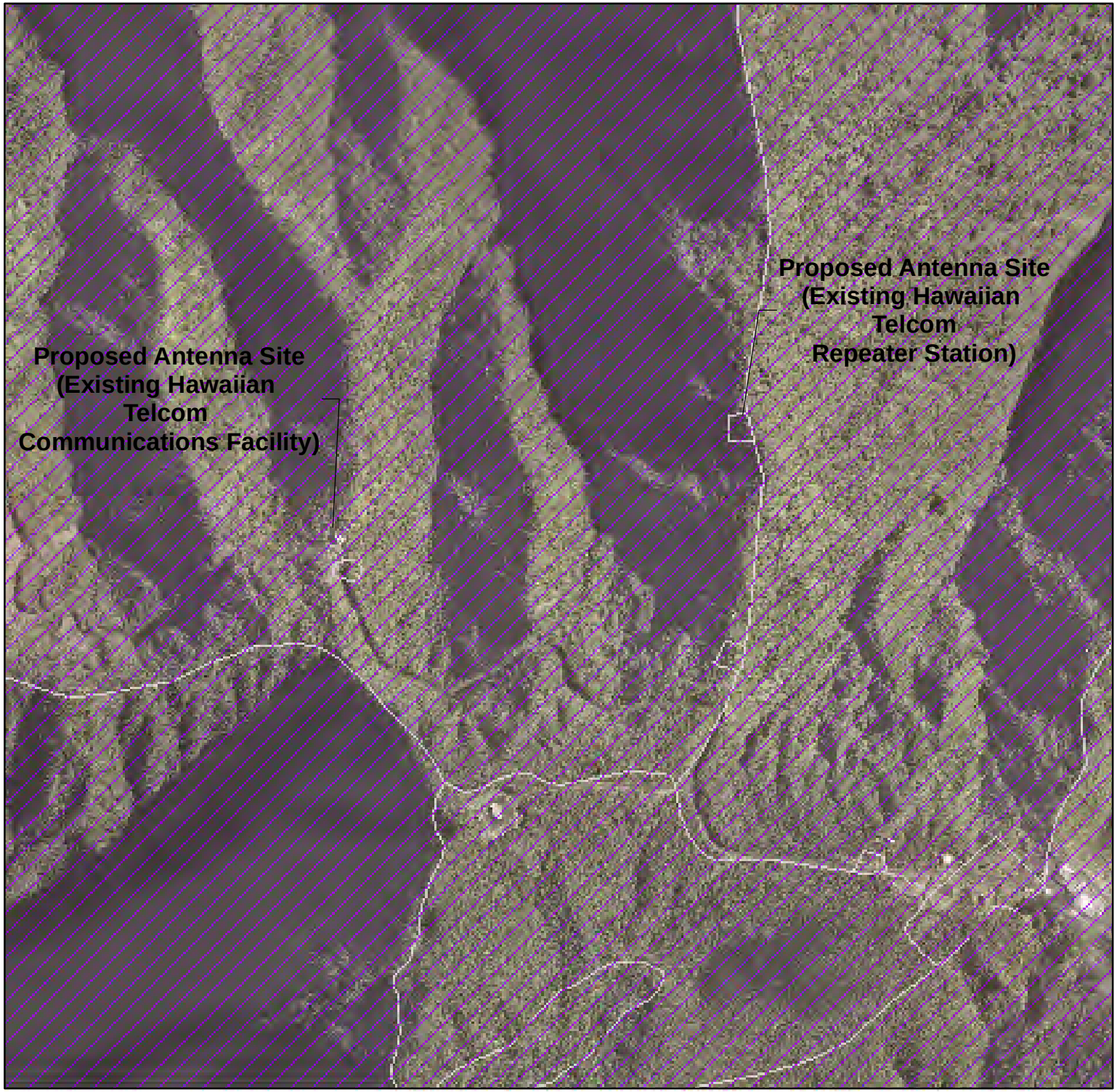
TMK Boundary

Source:
Basemap - Hawaii Statewide GIS Program
(http://hawaii.gov/dbedt/gis)

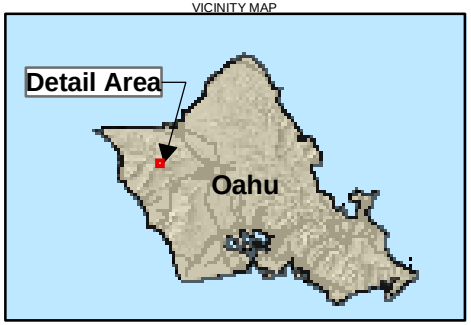
N

0 125 250 500
Feet

FIGURE 2-3
Kawailoa Wind Farm Site
Mount Ka'ala Communication Facility Sites
State Land Use Districts
Kawailoa Wind Project
Oahu, Hawaii



VICINITY MAP



LEGEND

County Zoning

P-1 Restricted Preservation District

TMK Boundary

Source:
Basemap - Hawaii Statewide GIS Program
(http://hawaii.gov/dbedt/gis)

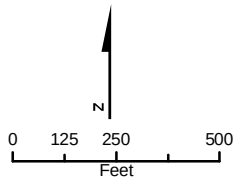
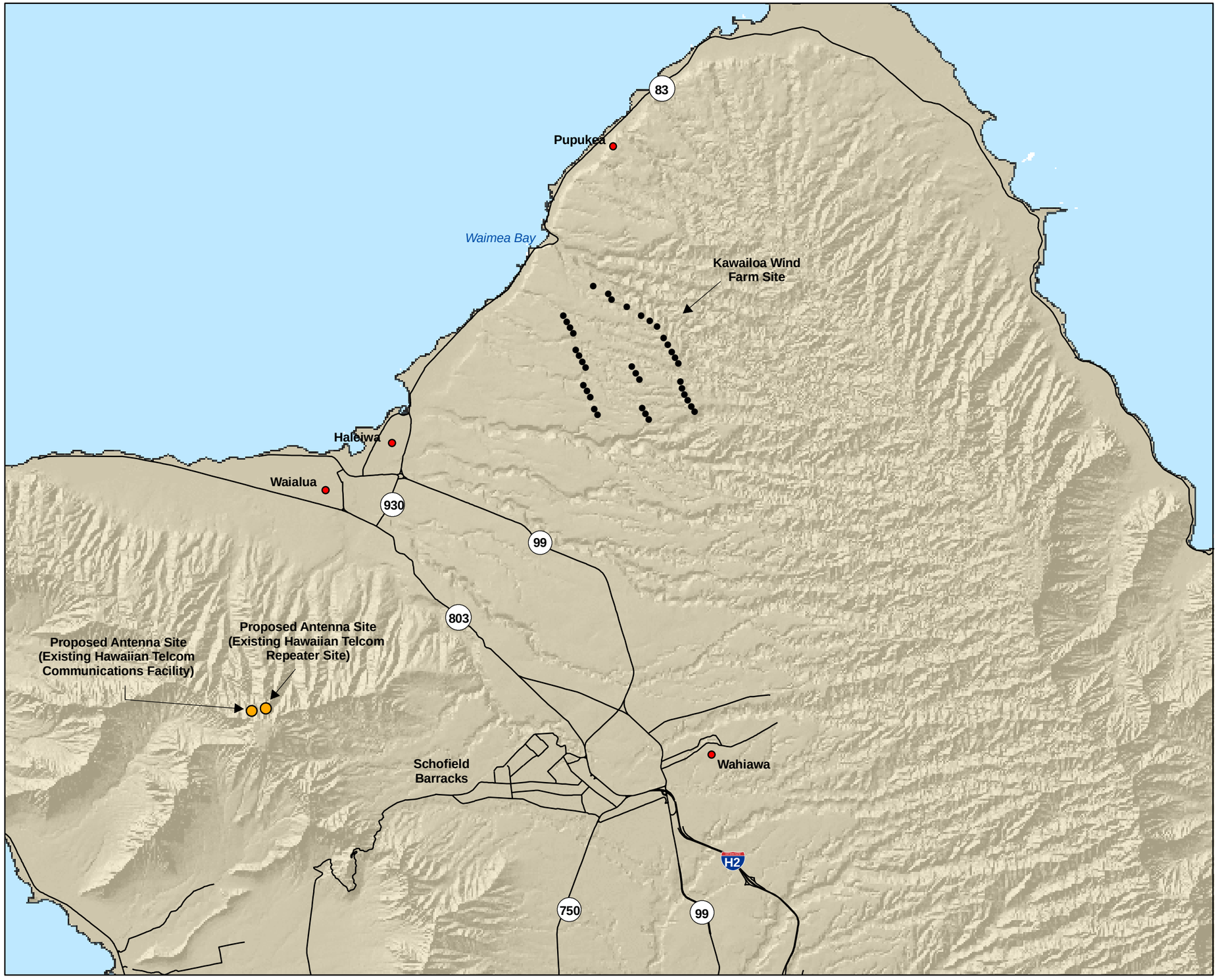
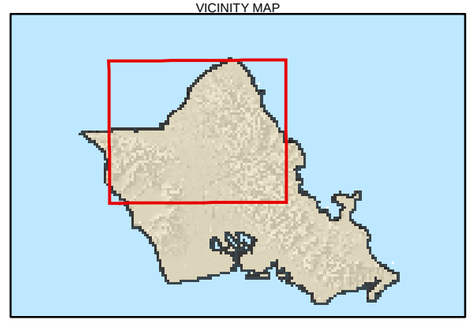


FIGURE 2-4
Kawailoa Wind Farm Site
Mount Ka'ala Communication Facility Sites
County Zoning
Kawailoa Wind Project
Oahu, Hawaii



VICINITY MAP



LEGEND

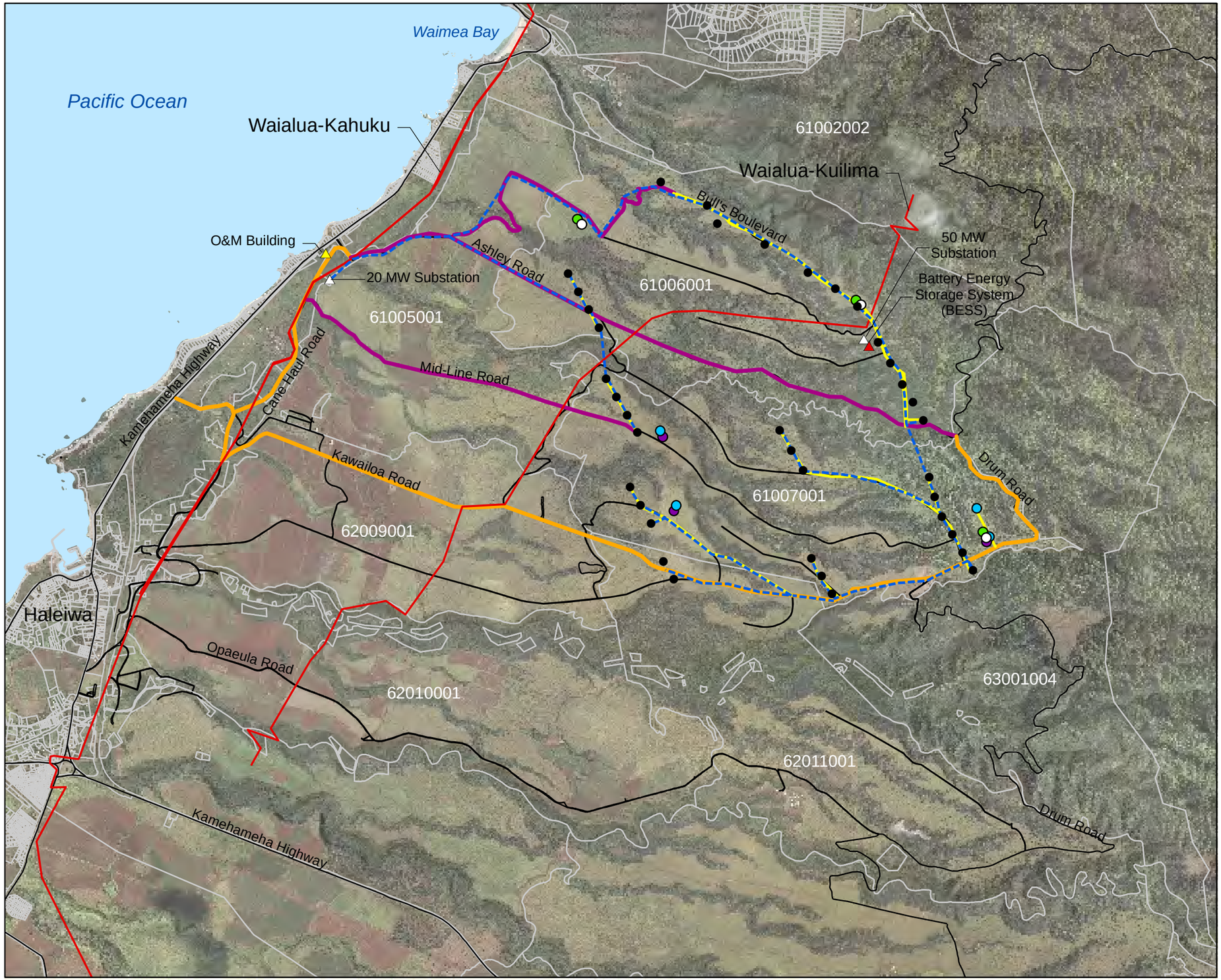
- Potential Turbine Location
- Road

N

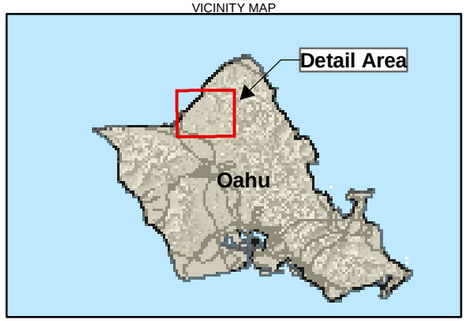
0 0.75 1.5 3

Miles

Figure 2-5
Kawailoa Wind Project
Site Vicinity Map
Kawailoa Wind Project
Oahu, Hawaii



VICINITY MAP



LEGEND

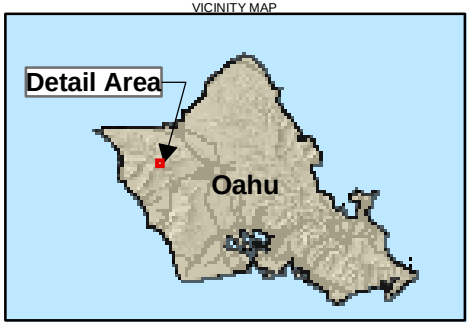
- Turbine Layout
- Existing Meteorological Tower
- Existing SODAR Station
- Proposed Meteorological Tower
- Proposed SODAR Station
- Existing Road (No to Minor Grading Required)
- Existing Road (Substantial Grading or Other Upgrades Required)
- New Road
- Proposed Collector Line
- Road
- Existing HECO 46kV Line
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- TMK Boundary
- Ocean

Source:
Project Facilities - Kawailoa Wind
Existing Hawaiian Electric Lines - Kawailoa Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

N

0 0.25 0.5 1
Miles

Figure 2-6
Kawailoa Wind Farm Site
City and County of Honolulu TMK Map
Kawailoa Wind Project
Oahu, Hawaii



LEGEND

TMK Boundary

Source:
Basemap - Hawaii Statewide GIS Program
(http://hawaii.gov/dbedt/gis)

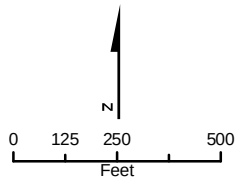
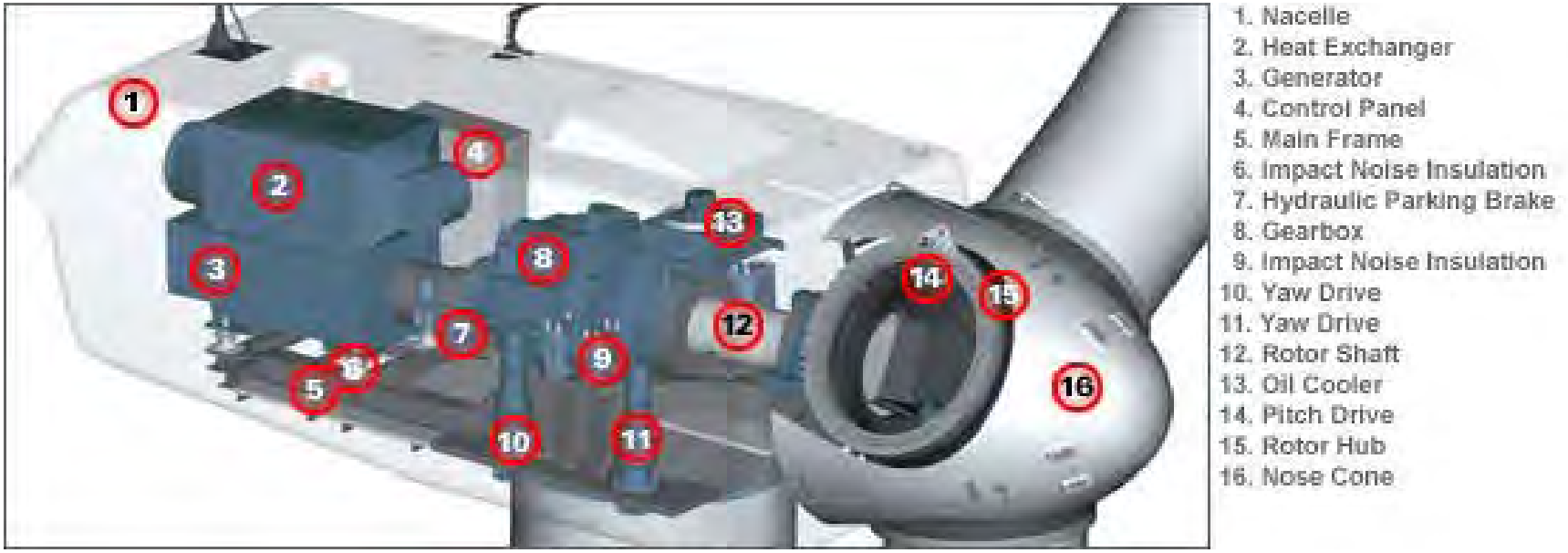
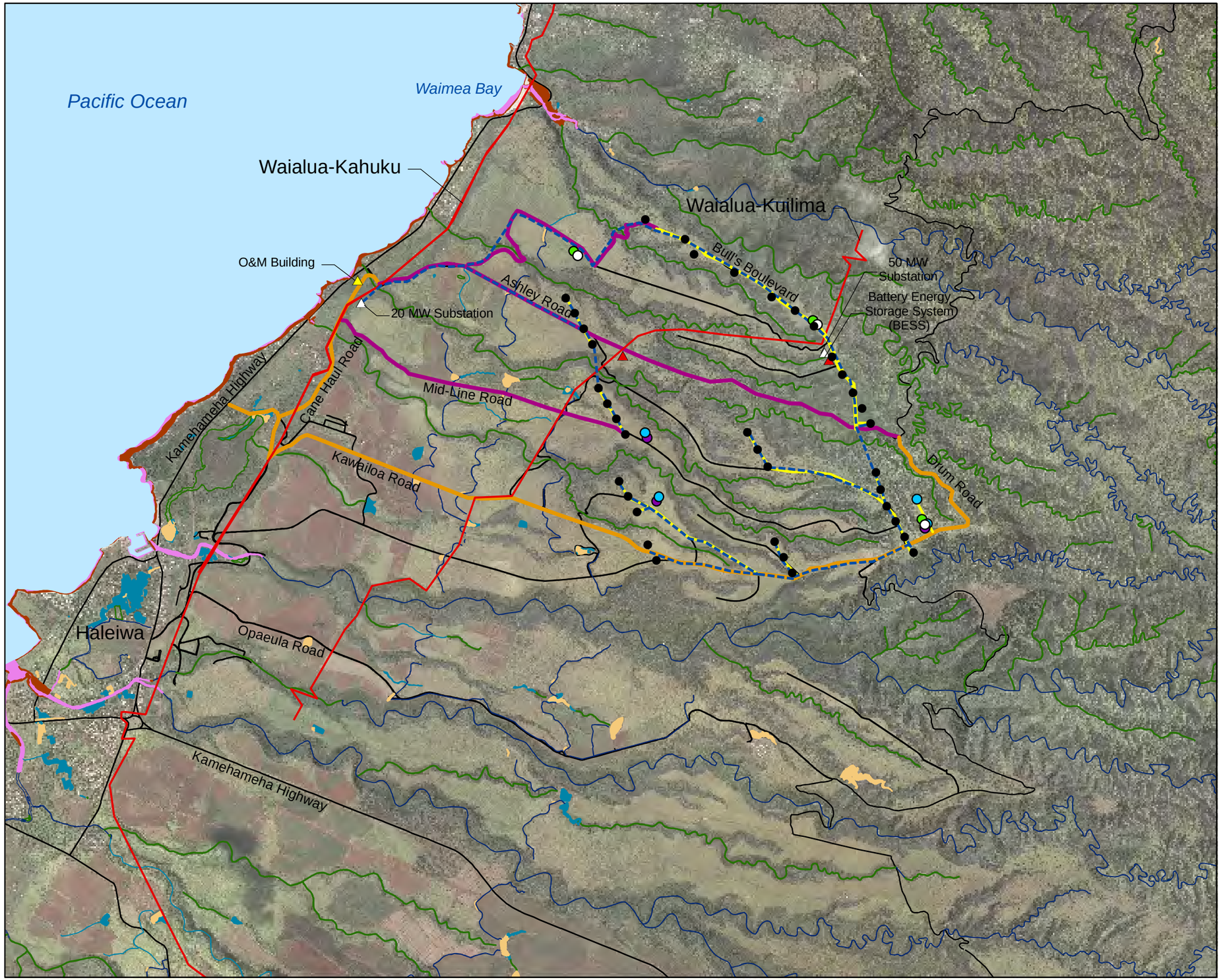


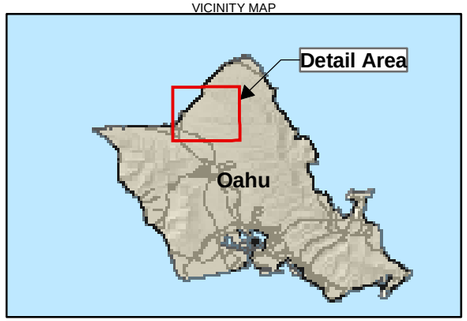
FIGURE 2-7
Kawailoa Wind Farm Site
Mount Ka'ala Communication Facility Sites
City and County of Honolulu TMK Map
Kawailoa Wind Project
Oahu, Hawaii

Figure 2-8
Schematic Drawing of 1.5 MW Wind Turbine Nacelle





VICINITY MAP



LEGEND

- Turbine Location
- Existing SODAR Station
- Existing Meterological Tower
- Proposed Meterological Tower
- Proposed SODAR Station
- Existing Road (No to Minor Grading Required)
- Existing Road (Substantial Grading or Other Upgrades Required)
- New Road
- Other Road
- Existing HECO 46kV Line
- Proposed Collector Line
- Substation
- Battery Energy Storage System (BESS)
- O&M Building

Wetland Types

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Pond
- Riverine
- Freshwater Forested/Shrub Wetland

Source: Project Facilities - Kawailoa Wind
Wetlands - National Wetland Inventory
Existing Hawaiian Electric Lines - Kawailoa Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

N

0 0.25 0.5 1
Miles

Figure 2-9
Kawailoa Wind Farm Site
National Wetland Inventory
Kawailoa Wind Project
Oahu, Hawaii