Environmental Impact Statement Preparation Notice/ Environmental Assessment

Auwahi Wind Farm Project Ulupalakua Ranch, Maui, Hawai‘i

Prepared for:
Maui County Planning Commission

Prepared by:
Tetra Tech EC, Inc.

On behalf of:
Auwahi Wind Energy LLC

March 10, 2010

Project Summary

Project Name:	Auwahi Wind Farm Project
Applicant and Project Owner:	Auwahi Wind Energy LLC 101 Ash St, HQ 14 San Diego, CA 92101
Summary of Proposed Activity:	**Auwahi Wind Energy LLC** is proposing to construct a wind farm with a generating capacity of approximately 22 megawatts (MW), augmented with an energy storage system. In addition to wind turbines, the proposed project would include a substation, operations and maintenance facility and related infrastructure, a 34.5-kilovolt (kV) transmission line and a construction access route along existing public roadways and pastoral roads (pastoral roads are collectively referred to as Papaka Road).
Project Location:	Ulupalakua Ranch; District of Hana; Maui, Hawai'i
Land Ownership:	• Private (Ulupalakua Ranch) • State of Hawai'i • County of Maui • Other Private (three parcels along Papaka Road)
Tax Map Keys (TMK):	Wind Farm Site—(2) 1-9-001:006 Transmission Line—(2) 1-9-001:006, (2) 2-1-009:001, (2) 2-1-009:999, (2) 2-1-008:001 Papaka Road—(2) 2-1-004:006, (2) 2-1-004:049, (2) 2-1-004:106, (2) 2-1-005:022, (2) 2-1-005:023, (2) 2-1-005:027, (2) 2-1-005:032, (2) 2-1-005:034, (2) 2-1-005:045, (2) 2-1-005:055, (2) 2-1-005:077, (2) 2-1-008:090, (2) 2-1-005:108
Project Size:	Footprint of Wind Farm Facilities—approximately 120 acres Transmission Line—approximately 9 miles long Papaka Road—approximately 4.6 miles long
State Land Use Designations:	Wind Farm Site—Agriculture Transmission Line—Agriculture Papaka Road—Agriculture, Urban, Conservation
County Zoning:	Wind Farm Site—Agriculture Transmission Line—Agriculture Papaka Road—Agriculture, Urban
Special Designations:	Special Management Area (SMA) (Wind farm site and a portion of Papaka Road)

Approving Agency:	County of Maui, Planning Commission/Department 250 South High Street Wailuku, Maui, Hawai'i 96793 (808) 270-7512 Contact: Joe Prutch
Project Consultants:	Tetra Tech EC 737 Bishop Street, Suite 3020 Honolulu, Hawai'i 96813 (808) 533-3366 Contact: George Redpath
Anticipated Determination:	Environmental Impact Statement Preparation Notice Pursuant to Chapter 343, Hawai'i Revised Statutes
Consulted Parties:	<u>Federal</u> • U.S. Fish and Wildlife Service • U.S. Army Corps of Engineers • Federal Aviation Administration <u>State</u> • State of Hawai'i, Department of Business, Economic Development and Tourism • State of Hawai'i, Department of Hawaiian Home Lands • State of Hawai'i, Department of Transportation • State of Hawai'i, Land Use Commission • State of Hawai'i, Department of Land and Natural Resources (DLNR) • DLNR, Commission on Water Resource Management • DLNR, Division of Forestry and Wildlife • DLNR, Division of State Parks • DLNR, Historic Preservation Division • DLNR, Land Division • DNLR, Office of Coastal and Conservation Lands <u>County</u> • County of Maui, Department of Management, Energy Coordinator • County of Maui, Department of Planning • County of Maui, Office of Economic Development • County of Maui, Public Works • County of Maui, Zoning Administration and Enforcement Division <u>Public</u> • Neighbors and Ranch Employees

Contents

Tables

Figures

Appendices

This page was intentionally left blank.

Abbreviations and Acronyms

$\mu g/m^3$	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
C&D	construction & demolition
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CWA	Clean Water Act
CWRM	Commission on Water Resource Management
CZMA	Coastal Zone Management Act of 1977
dB	decibel
dBA	A-weighted sound level (decibels)
DBEDT	(Hawai'i) Department of Business, Economic Development & Tourism
DHHL	Department of Hawaiian Home Lands
DLNR	Department of Land and Natural Resources
DOE	U.S. Department of Energy
DOFAW	Division of Forestry and Wildlife
EA	Environmental Assessment
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
EMF	Electric and magnetic fields
ESA	Endangered Species Act of 1973
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps

GIS	geographic information system
Hz	Hertz
HAAQS	Hawai‘i ambient air quality standards
HAR	Hawai‘i Administrative Rules
HCP	Habitat Conservation Plan
HDOH	State of Hawai‘i Department of Health
HDOT	State of Hawai‘i Department of Transportation
HECO	Hawaiian Electric Company
HELCO	Hawai‘i Electric Light Company
HRS	Hawai‘i Revised Statutes
IBC	International Building Code
KOP	Key Observation Point
kV	kilovolt
kV/m	kilovolts per meter
L_{eq}	Equivalent Noise Level
L_n	Percentile Noise Level
LUC	Land Use Commission
MCE	maximum considered earthquake
MECO	Maui Electric Company
met	meteorological
mG	milligauss
MGD	million gallons per day
mHz	megahertz
mm	millimeter
MOU	Memorandum of Understanding
mph	miles per hour
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAR	Natural Area Reserve
NaS	sodium sulfur

NEPA	National Environmental Policy Act
NIEHS	National Institute of Environmental Health Sciences
NO_2	nitrogen dioxide
NRCS	Natural Resource Conservation Service
O&M	operation and maintenance
OCCL	Office of Conservation and Coastal Lands
OEQC	Office of Environmental Quality Control
PCB	polychlorinated biphenyl
PM_{10}	respirable particulate matter less than or equal to 10 micrometers in diameter
$PM_{2.5}$	respirable particulate matter less than or equal to 2.5 micrometers in diameter
POI	Point of Interconnection
PPA	Purchase Power Agreement
PUC	Public Utilities Commission
ROI	region of influence
ROW	right of way
rpm	revolutions per minute
RPS	Renewable Portfolio Standards
SCADA	Supervisory Control and Data Acquisition
SHPD	(DLNR) Historic Preservation Division
SMA	Special Management Area
SO_2	sulfur dioxide
SSA	Shoreline Setback Area
TMK	Tax Map Key
US DOT	U.S. Department of Transportation
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
UST	underground storage tank
WRCC	Western Regional Climate Center
WTG	wind turbine generators

1.0 Introduction

Auwahi Wind Energy LLC (Applicant) proposes to develop the Auwahi Wind Farm Project (Project) to provide approximately 22 megawatts (MW) of clean, renewable energy to the island of Maui. This Environmental Impact Statement Preparation Notice (EISPN) / Final Environmental Assessment (EA) was prepared pursuant to the State of Hawai'i (State) environmental review process, as defined and required by Chapter 343 of the Hawai'i Revised Statutes (HRS) and Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR).

The Proposed Action will require the use of State and Maui County (County) lands and work within the State Conservation District, which triggers the requirement for compliance with HRS Chapter 343. It is anticipated that the Proposed Action may have a significant impact to the human and/or natural environment; therefore, an Environmental Impact Statement (EIS) was planned from the project's inception. Pursuant to HRS § 343-5, this EISPN/Final EA has been prepared as a mechanism for public comment and scoping for the EIS. This document provides a detailed description of the Proposed Action and presents the environmental setting for the full range of potentially affected resources, as well as the scope of potential impacts that would be analyzed in the EIS.

1.1 Purpose and Need

1.1.1 Project Need

Being one of the world's most remote island chains and having no fossil fuel resources of its own, Hawai'i is the most dependent on imported energy of all the fifty United States. In 2005, approximately 95 percent of Hawai'i's primary energy was derived from imported fossil fuels, such as petroleum and coal (Global Energy Concepts, 2006). Consequently, Hawai'i's consumer energy prices are some of the highest in the nation and the State is exceedingly vulnerable to fluctuations in resource availability.

In an attempt to alleviate its dependence on imported fuels, the State has established Renewable Portfolio Standards (RPS) (HRS § 269-92), which require Hawaiian Electric Company (HECO) 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 year 2010, 15 percent by 2015, 25 percent by 2020, and 40 percent by 2030. In addition, the Global Warming Solutions Act of 2007 requires that Hawai'i's greenhouse gas emissions be reduced to levels at or below 1990 levels by January 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.

These regulations and initiatives reflect the State's commitment to move away from petroleum-based energy generation and increase its portfolio of renewable energy projects.

Collectively, they demonstrate the overwhelming need for the development and implementation of renewable energy projects throughout the State.

1.1.2 Project Purpose

The Applicant is proposing to construct and operate the Auwahi Wind Farm Project on Ulupalakua Ranch, on the southern coast of East Maui. The purpose of the project would be to provide clean, renewable energy for the island of Maui. Implementation of the project would contribute to the State's portfolio of renewable energy projects, as well as provide environmental and economic benefits to the State and the local community.

Wind energy is an abundant, infinitely renewable resource that is not depleted over time. Generation of energy from wind decreases fossil fuel consumption, thereby reducing greenhouse gas emissions, particulate-related health effects, and other forms of pollution associated with coal or diesel fuel generation. By capturing Maui's characteristically strong wind resources, the proposed project would generate approximately 22 MW of energy, enough to power as many as 6,600 homes, based on the average statistics reported by the American Wind Energy Association (AWEA). The addition of wind-generated energy would diversify Maui's power supply and contribute to the State's energy independence and security, as well as help to meet the State's established regulatory requirements and initiatives.

The proposed project would also result in economic benefits, as it would contribute to the local economy, generate new jobs, and provide a stable, long-term source of tax revenue for the State and County. Furthermore, the power generated by the wind farm would be sold under a long-term, set base price contract with fixed annual escalation, and as such, the proposed project would provide long-term price stability for energy production.

1.2 Project Objectives

Given the documented need for renewable energy projects in the State of Hawai'i and the purpose of the proposed project, in combination with the known environmental and infrastructural constraints on Maui, the Applicant established the following objectives for the Proposed Action, pursuant to HAR § 11-200-17(e)(2):

- Construct and operate a wind farm on Ulupalakua Ranch in an area with adequate wind resources to provide dependable, efficient and economically feasible renewable energy;
- Implement a project that allows Ulupalakua Ranch to maintain its ongoing ranching operation and commitment to preserve the natural environment;
- Generate as much wind-derived energy as can be integrated into MECO's existing grid, as currently determined by MECO and the Applicant;
- Locate the project in an area where the wind farm would be compatible with existing land use and would have a minimal visual impact; and
- Minimize the biological and cultural impacts of the project by designing the infrastructure around the known resources.

These project objectives were used to develop the suite of project alternatives, evaluate and eliminate those alternatives that were not practicable, and identify and refine the Proposed Action, as further discussed in Section 2.0.

This page was intentionally left blank.

2.0 Proposed Action and Alternatives

2.1 Proposed Action

The proposed Action is the development of an approximately 22 MW wind farm on the Auwahi parcel of Ulupalakua Ranch (Figure 1). The following is a detailed description of the Proposed Action, including a discussion of the project background and history; project location; and construction, and operation and maintenance (O&M) activities as well as a general project schedule. This chapter also describes the "No Action" alternative and alternatives that were rejected from further consideration.

2.1.1 Background and History

The State has been pursuing opportunities to diversify its energy portfolio to bring energy security and price stability to the islands. The Hawai'i Wind Working Group was formed in 2002 under the DOE Wind Powering America program to identify specific concerns, barriers, and obstacles to wind development in Hawai'i. The working group is a collaboration of government agencies, nonprofit organizations, businesses, and industries interested in wind development. This collaboration includes HECO; MECO; the Hawai'i Department of Business, Economic Development & Tourism (DBEDT); and the DOE National Renewable Energy Laboratory.

Based on high-resolution wind resource maps developed by the Hawai'i Wind Working Group (Hawai'i Wind Working Group, 2004), the Auwahi parcel of Ulupalakua Ranch was identified as a suitable location for a wind farm project as it has a consistent wind power density regime. The Auwahi parcel is also located in a remote and undeveloped portion of the island, and is zoned for agriculture, within which wind farms are considered a compatible use, further contributing to its suitability for development of a wind farm project.

2.1.1.1 Prior Proposal By Shell Wind Energy

Development of the Auwahi Wind Project was originally proposed by Shell Wind Energy. Shell Wind Energy signed a 25-year property lease agreement with Ulupalakua Ranch in 2006, securing the Auwahi parcel for construction and operation of the proposed wind farm project. Within the Auwahi parcel, two potential project areas were identified: 1) the area just north of Pi'ilani Highway and 2) the area just south of the highway. In addition, a separate parcel on Ulupalakua Ranch was identified as a suitable location for a potential pumped hydro storage facility, which could store power from the wind turbines during off-peak periods that could then be used to help meet peak demand. This pumped hydro storage facility has been eliminated from further consideration for this Project due to commercial feasibility and potential environmental impact issues. In 2006, three 50-meter meteorological towers were installed to measure and document wind speeds, shear, turbulence intensity, temperature, and pressure in the north and south portions of the Auwahi parcel. Using the data collected from these three towers, a site energy assessment was conducted for the two potential project areas. Although the assessment results showed

This page was intentionally left blank.

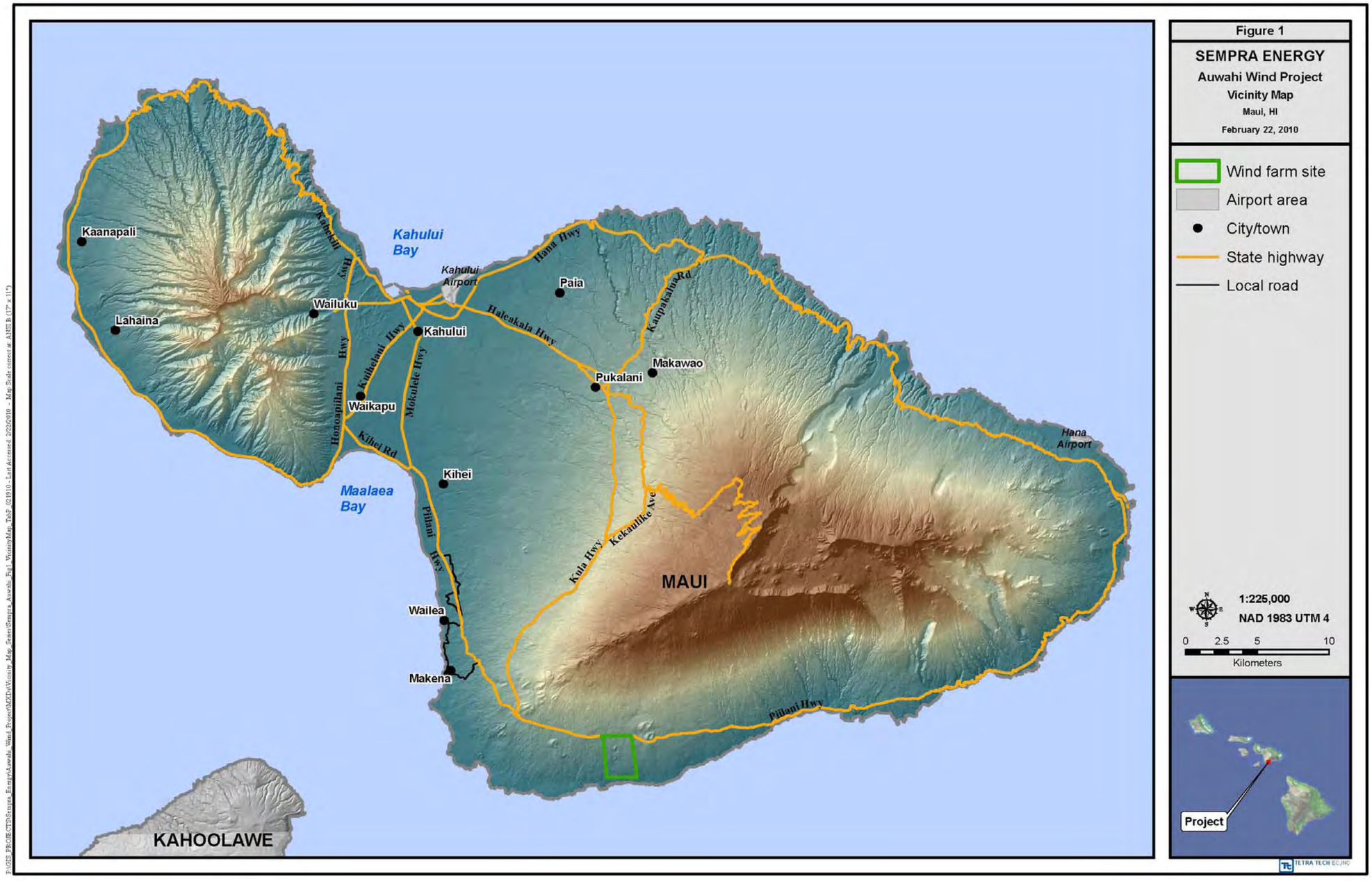


Figure 1. Project Vicinity Map

commercially viable wind regimes at both the north and south site, it was determined that the south site would have a higher estimated net annual energy production. As a result, the development site north of Pi'ilani Highway was eliminated.

Using the results of the energy assessment and an initial site evaluation, a preliminary site layout was developed for the purpose of identifying the approximate location and configuration of the turbines as well as assessing the site capacity under full build-out conditions. The preliminary layout indicated that the project area could accommodate a total of 39 turbines, with a maximum generating capacity of up to 117 MW depending on the size of the turbine selected for the project. For the first phase of the project, the Applicant targeted a generating capacity of approximately 42 MW, with the potential for future expansion based on whether pumped hydro storage was determined to be feasible. In order to provide an economical energy storage solution for the first phase of the project, battery storage technology was incorporated into the proposed project as a means to smooth sudden increases or decreases of the energy output and potentially time-shift some of the off-peak production to the on-peak period.

Subsequently, MECO determined that, given the intermittent nature of wind energy, the existing electrical grid could not accommodate all of the wind energy projects that were planned for Maui. As such, they initiated a structured negotiation process, to serve as the basis for the selection of a project for which they would enter into negotiations for a Purchase Power Agreement (PPA). The Auwahi Wind Farm Project was selected but was downsized to a generating capacity of 22 MW, to meet the requirements set forth by MECO regarding the maximum allowable wind energy-to-grid capacity.

2.1.1.2 Acquisition By Sempra Energy

Sempra Energy acquired Auwahi Wind Energy, LLC and an assignment of the Auwahi parcel lease in October 2009. Environmental surveys and engineering studies developed under the direction of Shell Wind Energy were used as the basis for the development of this EISPN. Specifically, the "Existing Conditions" described herein are primarily based on the work of a previous environmental consultant (CH2MHill) and numerous sub-consultants. Sempra Energy has retained Tetra Tech who have updated and revised this information to reflect the current project design and level of information necessary for an EISPN.

2.1.2 Location of Proposed Action

The proposed Auwahi Wind Farm Project is located almost entirely on Ulupalakua Ranch, approximately 10 miles south of Kula, in the Hana District of Maui. The proposed project is comprised of three major components: the wind farm site, a transmission line corridor, and a construction access route. The location of each of these components is shown in Figure 1, and is described below.

The wind farm site is located on the Auwahi parcel of Ulupalakua Ranch, which is bordered by the Pacific Ocean to the south, the Kanai'o parcel to the west, and the Lualailua parcel to the east. The parcel is bisected into a northern and southern section by Pi'ilani Highway. As shown in Figure 2, the proposed wind farm site would be located within the southern portion of the parcel, with the northern edge of the site defined by Pi'ilani Highway and the southern edge located more than 1,000 feet from the shoreline. The primary access route to the proposed wind farm site would be via Kula and Pi'ilani Highways.

This page was intentionally left blank.

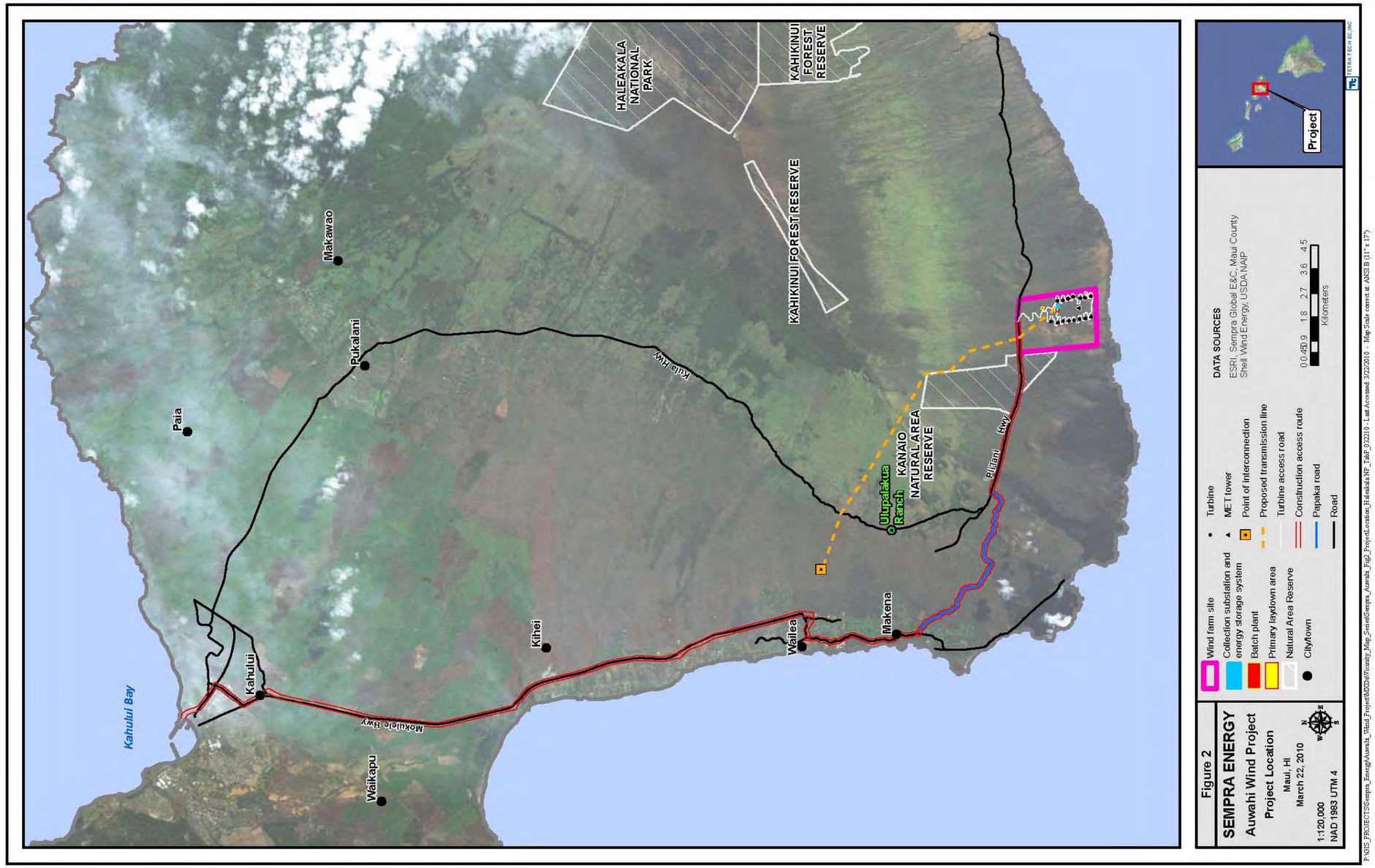


Figure 2. Project Location Map

The electrical power generated on the wind farm site would be transmitted to MECO's existing electrical grid via a new 34.5-kilovolt (kV) transmission line. The transmission line would originate within the proposed wind farm site and travel approximately 9 miles north and west on Ulupalakua Ranch property, crossing both Pi'ilani Highway and Kula Highway. The transmission line will be mounted on approximately 60 foot high wooden poles, similar to other transmission lines in the area.

The transmission line would connect to the existing Wailea-Kealahou 69-kV transmission line, at the proposed Point of Interconnection (POI) approximately one-mile east of the Wailea substation (Figure 2). An interconnect substation would be constructed to step up the electricity from 34.5-kV to 69-kV.

The construction access route would be used to transport equipment from Kahului Harbor to the proposed wind farm site (Figure 1). The route is primarily comprised of existing State and County highways, as well as approximately 4.6 miles of pastoral roads between Makena Road and Pi'ilani Highway that would require some modifications and improvements. These pastoral roads are collectively referred to as Papaka Road, and are located both on Ulupalakua Ranch, as well as several privately and publicly owned parcels. On Papaka Road, there are also a few short segments of new road that would have to be constructed, which will tie into the existing Papaka Road in order to keep the project on Ulupalakua Ranch property. The road would only be used during construction and infrequently for major maintenance activities. Both ends of the road would be gated to limit access on private land. Sections of the Pi'ilani Highway will also require some improvements to remove excessive bumps and increase curve radii. Details of the construction access routes will be discussed in the Draft EIS.

2.1.2.1 Land Ownership

The wind farm site is located entirely on land owned by Ulupalakua Ranch. The transmission line is also located on Ulupalakua Ranch property, although it crosses Pi'ilani Highway, which is within a County easement, and Kula Highway, which is owned by the State. Papaka Road crosses a total of 14 parcels, most of which are owned by Ulupalakua Ranch. Four of the parcels are jointly owned by Ulupalakua Ranch and the State, one is jointly owned by Ulupalakua Ranch and another private party, and two are owned entirely by Makena Golf Corporation.

2.1.3 Description of Proposed Activity

The proposed project is comprised of three major components: the wind farm site, a transmission line corridor, and a construction access route. The construction and O&M activities required for each component are described below.

2.1.3.1 Wind Farm Site

The wind farm site would include the following facilities: access roads and turbine pads, construction staging and equipment laydown area, a temporary concrete batch plant, wind turbine generators (WTG), an underground electrical collection system, a collector substation, an O&M building, and one permanent meteorological tower (Figure 3). Following is a description of each facility, and the associated proposed construction and O&M activities.

This page was intentionally left blank.

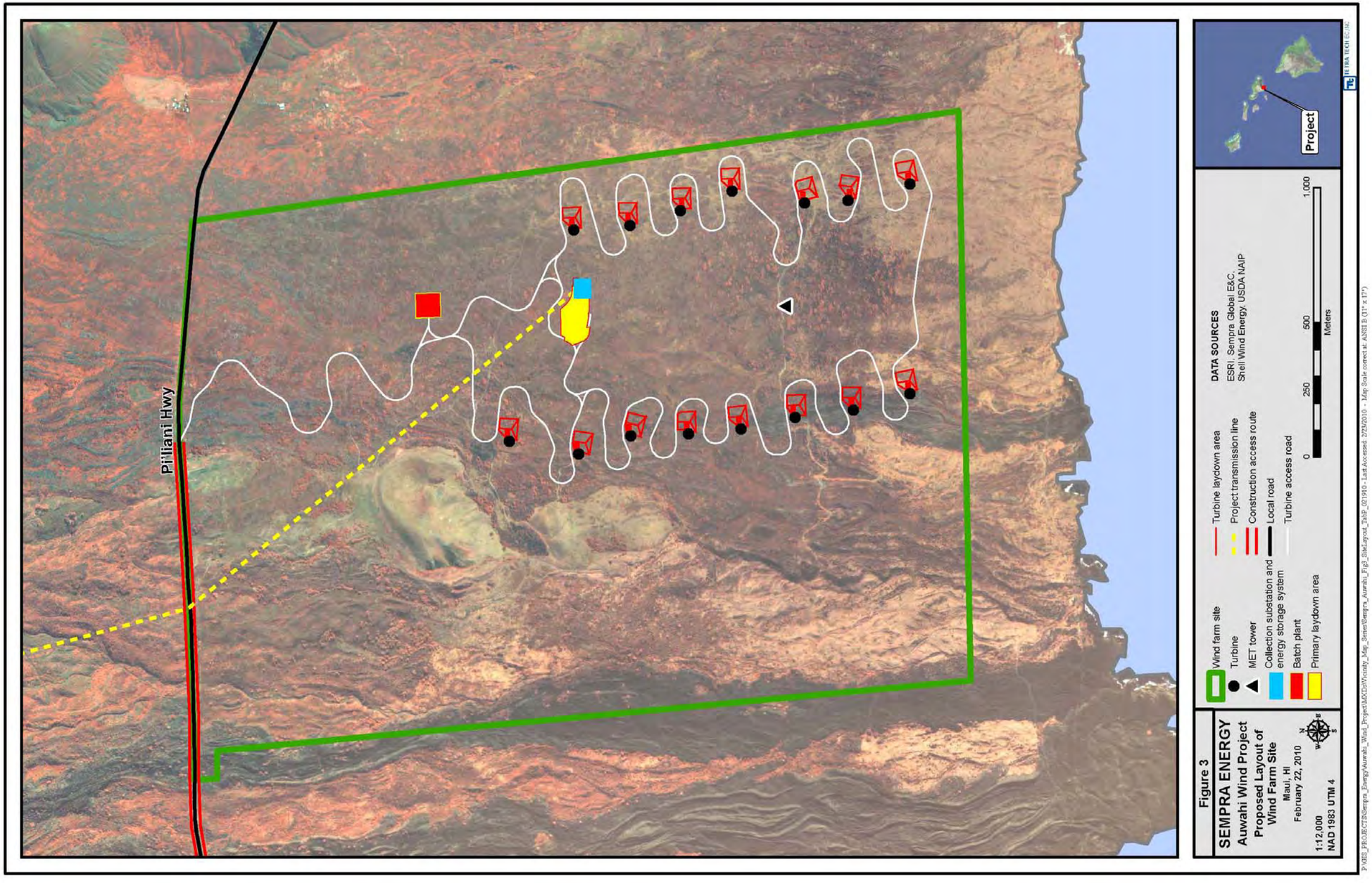


Figure 3. Layout of Wind Farm Site

Access Roads and Turbine Pads

- **Construction Activities.** A series of internal access roads would be constructed within the proposed wind farm site to accommodate construction and maintenance activities (Figure 3). The internal access roads would be approximately 20 feet wide with 9 foot shoulders on each side (38 feet total width) and approximately 9 miles long. Shoulders may be expanded to 16 feet wide in certain areas to allow for adequate passage for the crawler crane and transport trucks, and would include designated turn-around areas at each WTG pad location. All access roads would have a gravel surface, and would be maintained as such throughout project construction and operations.

  The road layout includes adequate switchbacks to maintain a maximum gradient of approximately 7 percent and is designed to have less than a 2 percent crown or in-slope. Ditches and culverts would be installed on the uphill side of the roads to capture and convey stormwater runoff, as required. Depending upon the selection of the WTG model, the site roads may be modified to reduce impacts by reducing the width and length and increasing the grade up to 10 percent.

  As currently designed, the site will include up to 15 WTG pads locations along the access road. Depending on the WTG model selected, fewer WTG pads may be required. A typical WTG pad will require a total cleared area of approximately 1.5 acres. Within the cleared area, approximately 1 acre will be graded flat to off-load WTG components for assembly and erection. The graded slope within the leveled area will be no greater than 1 percent. Within the leveled area, approximately 0.4 acres will be graveled and compacted to support delivery vehicles and erection cranes.

- **Operation and Maintenance Activities.** During operations, the access roads will be maintained in good working order by grading and compacting to minimize naturally occurring erosion. Maintenance vehicles and service trucks will continue to use the access roads for routine maintenance of the WTGs. The cleared and leveled areas at the WTG pads will be reseeded with natural vegetation. The graveled areas around the WTG pads will be maintained similar to the access roads.

Construction Staging and Equipment Laydown Area

- **Construction Activities.** A construction staging and equipment laydown area will be constructed and used during construction for temporary storage of plant equipment, construction materials, construction equipment, vehicle parking and refueling, water storage, waste disposal and collection receptacles, sanitary facilities, and temporary modular office space. Ultimately, the permanent Operations and Maintenance facility will also be constructed within the laydown area.

  The construction staging and equipment laydown area will consist of a gravel pad, approximately five acres in size, and would be located adjacent to the proposed collector substation (see Figure 3). It will be graded to control stormwater runoff and drainage.

- **Operation and Maintenance Activities.** Following construction, gravel will be removed from the temporary construction staging and laydown area and the area will be restored with natural vegetation. A permanent, one acre storage area will be maintained during operations and maintenance to store spare WTG components such as blades, if required. The permanent O&M building providing offices for the plant operations and maintenance staff will also be located in this area. Vehicle parking will also be provided for plant operations. The graveled areas for parking and spare parts will be maintained by the operations staff to minimize erosion and control stormwater runoff and drainage.

Temporary Concrete Batch Plant

- **Construction Activities.** The proposed project would require more than several thousand cubic yards of concrete for construction of foundations for the wind turbines, met towers, collector substation, the O&M building and other equipment pads. Depending upon local availability and weather conditions, concrete typically needs to be poured within 90 minutes of being mixed with water. To accommodate this time constraint, it is anticipated that a temporary concrete batch plant would be constructed within the wind farm site (Figure 3).

  If required, the concrete plant would likely be a 65-foot-by-12-foot Rustler R3 portable plant, transported by tractor truck and operated on a gravel pad. The gravel pad would likely cover an area of approximately 2.5 acres. The gravel pad would be graded to control stormwater runoff and minimize erosion.

  The plant would produce approximately 50 cubic yards of concrete per hour. For operation of the plant, it is estimated that a total of 30 tons of sand, 45 tons of aggregate, 15 tons of cement, and 3,000 gallons of water would be needed per hour while mixing concrete at peak production. The gravel, cement and sand would be transported to the site from nearby concrete plants, and would be stored next to the batch plant. The water would be either trucked onto the site or pumped to the site from a local source and stored in an approximately 10,000 gallon temporary above-ground tank.

- **Operation and Maintenance Activities.** Following construction, the batch plant equipment, excess material, and gravel pad would be removed following construction and the area would be restored with natural vegetation. The temporary pad area would not be used during the operation of the project.

Wind Turbine Generators

General Information: WTGs consist of three basic parts: a tower, rotor, and nacelle. The tower elevates the rotor and nacelle above the ground. In general, wind speeds increase with height and thus taller towers can allow for more energy to be captured. The rotor includes the hub and blades and is attached by a low-speed shaft to the nacelle, which houses mechanical components including the gear box, generator, and controller (Figure 4).

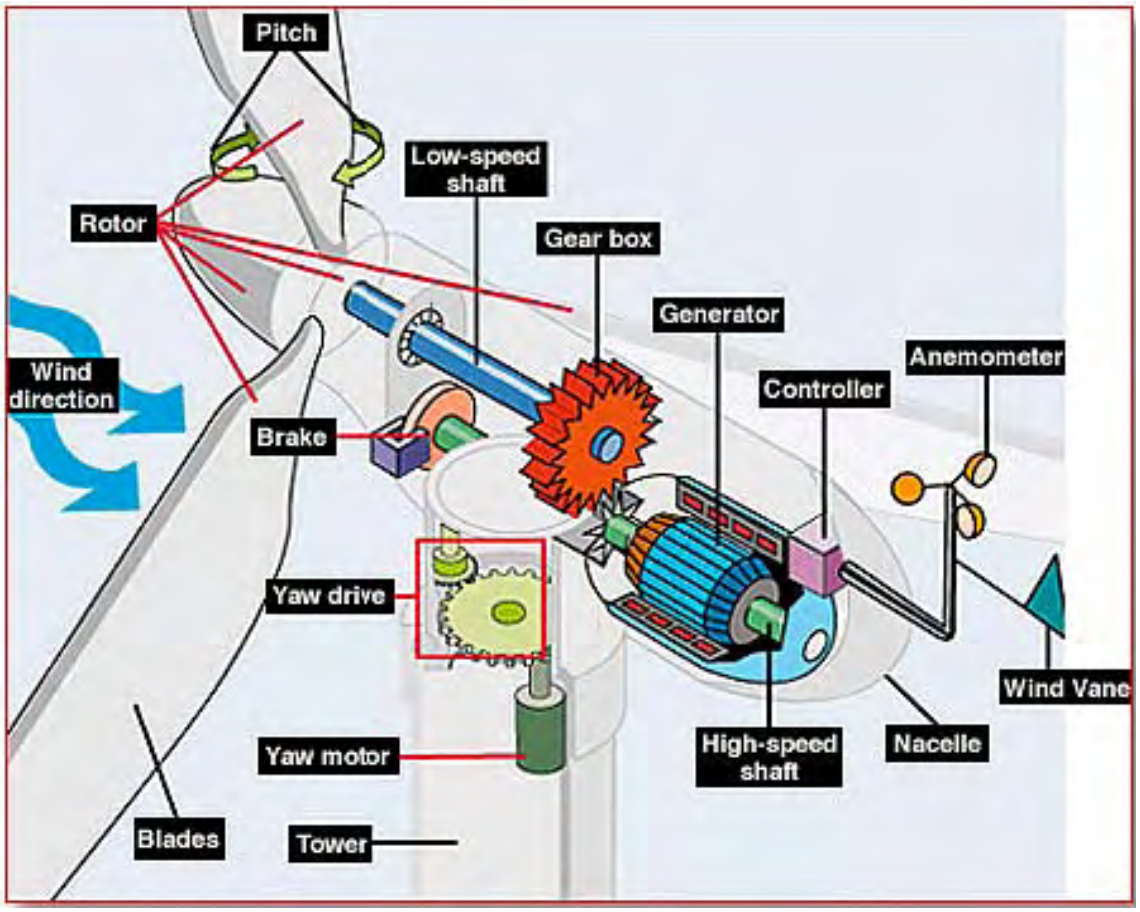


Figure 4. Cut Away View of a Wind Turbine Generator
Source: Department of Energy, 2006 (http://www1.eere.energy.gov/windandhydro/wind_how.html#sizes)

As the blades are activated by the wind, the rotor turns the low-speed shaft. The gear box connects the low-speed shaft to a high-speed shaft, which increases the rotational speed of the rotor from 6 to 23 rotations per minute (rpm) (depending on the wind turbine generator model and blade length, and wind conditions) to about 1,000 to 1,800 rpm, which is the rotational speed required by most generators to produce electricity. The controller determines when the turbine is operational, generally activating the system when wind speeds reach approximately 8 to 16 miles per hour (mph) and shutting down when winds exceed 55 to 60 mph, as high wind speeds can damage the equipment.

The Applicant is currently evaluating several different turbine models for constructability, reliability, performance, and availability. Because of the dynamic nature of the turbine market (for example, ongoing changes in supply, demand, and pricing), the final turbine model would likely not be selected until the project permitting process is well underway. Depending on the turbine model that is selected, the project would require between 8 and 15 turbines, as each turbine has a different generating capacity. As a result, the layout and configuration of the wind farm site would vary by model. In addition, the dimensions of each turbine are unique, with tower heights ranging from approximately 212 to 295 feet (65 to 90 meters) and blade lengths ranging between 115 and 166 feet (35 to 50.5 meters) (Table 1).

To allow for flexibility in the turbine selection process while still adequately assessing the project-related impacts, the Draft EIS will consider the number and dimensions of the specific turbine models being considered. Table 1 provides a summary of the minimum and maximum dimensions for the various WTG models currently being considered The impact analyses will account for the greatest degree of impact associated with each of these features, and collectively would represent the maximum extent of impacts. Regardless of which of the turbine models is ultimately used, the actual impacts would fall within the envelope of impacts presented in the Draft EIS.

TABLE 1
Range of Dimensions of the Wind Turbine Generators Under Consideration

Component	Minimum Dimension	Maximum Dimension
General		
Turbine Generator Capacity (MW)[1]	1.5	3.0
Tower		
Diameter at Narrowest Point (Top)	6.6 feet (2.0 meters)	7.5 feet (2.3 meters)
Diameter at Widest Point (Base)	11.5 feet (3.5 meters)	13.8 feet (4.2 meters)
Height	212 (65 meters)	295 (95 meters)
Rotor		
Number of Blades	3	3
Rotations Per Minute	6.0	23.0
Radius	115.8 feet (35.3 meters)	165.6 feet (50.5 meters)
Nacelle		
Height	12.5 feet (3.8 meters)	13.5 feet (4.1 meters)
Width	11.5 feet (3.5 meters)	11.8 feet (3.6 meters)
Length	28.9 feet (8.8 meters)	31.5 feet (9.6 meters)

[1] Total MW to be installed is 22 MW, Build out configuration will range from 8 turbines at 3.0 MW or 15 turbines at 1.5 MW

- **Construction Activities.** At each WTG location, an approximately 1.5-acre crane pad and laydown area would be required for off-loading and storage of the tower sections, nacelle, rotor hub, and blades. These crane pad and laydown areas would be cleared and graded to provide a level and stable surface for the tower components and erection crane. The WTGs would be assembled at each laydown area immediately before installation, using a crane (as large as 600 tons) located on the crane pad. Construction access to these areas would include both wheeled and tracked vehicles.

  Based on the surface exposure of rock encountered at the proposed wind farm site during the preliminary geotechnical investigations (Black & Veatch, 2008), the most

likely foundation type for the turbines would be spread footing with rock dowels (approximately 60 feet wide by 8 feet deep). Prior to construction, detailed geotechnical studies will be conducted to ensure that no voids, lava tubes or unsuitable soils exist beneath each of the proposed turbine locations. Each WTG foundation will consist of approximately 300 cubic yards of concrete, which may vary depending on the WTG model selected, reinforcing bars, and anchor bolts. Concrete placement activities are usually continuous and would require approximately 40 or more concrete trucks.

Each WTG will require multiple deliveries to each WTG pad location. Towers are generally delivered in three or four sections, each blade is delivered separately, nacelles and rotors are delivered separately, down tower components (switchgear, controllers, ladders and platforms, pad-mount transformers, pad-mount transformer vaults, etc.) are also delivered separately. In total each WTG will require about ten separate loads. The WTGs would be assembled at each WTG pad area immediately before installation. Erection will require multiple cranes including a main erection crane (as large as 600 tons) and a tailing crane located on the compacted gravel, crane pad. Construction access to these areas would include both wheeled and tracked vehicles.

- **Operation and Maintenance Activities.** During the operations phase of the project, preventative maintenance and troubleshooting activities would be routinely performed on each WTG. These activities would typically include an inspection and servicing of all major mechanical components, lubrication systems, gearboxes, generators, blades, electrical and transformer components, communication and Supervisory Control and Data Acquisition (SCADA) components, and meteorological instrumentation. Routine servicing typically does not require heavy equipment, such as large cranes, but does require small truck access. However, in the event of a major component replacement (for example, blades, gearboxes, or generators), heavy equipment, similar to that used during construction, would be required.

Underground Electrical Collection System

- **Construction Activities.** Power generated by each of the WTG will be connected to the collector substation within the wind farm site by a series of underground electrical collector cables. Medium voltage (690-V) cables would pass through each WTG foundation to a pad-mounted transformer located adjacent to the WTG foundation. The transformer will step-up the voltage from 690-V to 34.5-kV. From the pad-mount transformers, the cables would be placed underground in trenches and would terminate at the collector substation 34.5-kV bus. The electrical collection will consist of two separate 34.5-kV feeder circuits. The trenches for the underground cables will be excavated by rubber tire or tracked equipment to the required burial depth. Each trench will contain three cables (one for each phase), plus a ground wire, plus a fiber optic communication cable for the SCADA system (to transmit data between the WTG controllers and the collector substation). The cable trench will be backfilled with select fill material to protect the cables from damage or possible contact and to provide appropriate media for heat dissipation from the cables. The depth and number of trenches would be determined by the size

of the cable required and the thermal conductivity of the soil or rock surrounding the trench. Following construction, the collection system trenches will be marked to avoid inadvertent excavation and the surface will be restored and replanted with natural vegetation.

- **Operation and Maintenance Activities.** The communication and electrical collector cables would be routinely monitored, inspected and maintained by qualified personnel and maintenance technicians throughout the operation phase of the project. These maintenance activities would be accomplished with small trucks. Heavy construction or excavation equipment would only be required if any underground cable was determined to have failed.

Collector Substation

- **Construction Activities.** As described above, the energy generated by the wind turbines would be delivered via an underground electrical collection system to the collector substation. Depending on the results of MECO's interconnection studies, the voltage at the collector substation may remain at 34.5-kV or it may be stepped-up to 69-kV before transmission to MECO's system at the point of interconnection, located one-mile east of the Wailea substation. As presently anticipated, the collector substation will include two 34.5-kV feeder breakers, a spare breaker position for reactive power compensation, should it be deemed necessary. The substation will also include a 34.5-kV breaker between the 34.5-kV bus and the transmission line take-off position. A small control enclosure will also be located inside the collector substation space to house breaker controls, protective relaying, and communications equipment.

  The approximate size of the collector substation footprint is 90-feet by 90-feet (0.2 acres). The substation will be located adjacent to the construction staging and laydown area within the wind farm site. The area would be cleared and graded to control storm water runoff and drainage. The substation base will be compacted with well graded material. Foundations will be installed for breakers, grounding transformers, 34.5-kV bus supports and the control building. Below-grade raceway (for example, the conduit, ductbank, and trench) and ground grid would also be installed in the sub-grade. Following installation of all equipment, a final layer of crushed rock surfacing would then be placed and a perimeter fence would be erected and grounded. Substation testing and commissioning would be conducted before energizing the facility.

- **Operation and Maintenance Activities.** During the operations phase of the project, the collector substation would be managed by qualified personnel and maintenance technicians. Maintenance activities would include routine inspections of each component and monitoring of equipment and electronics, in accordance with the manufacturer's recommendations, owner's requirements, and regulatory requirements. Routine maintenance of the collector substation would not typically require heavy construction equipment. However, if a major component failure were to occur (for example, failure of a 34.5-kV breaker), appropriate construction equipment would be required to replace the component.

Operations and Maintenance Building

- **Construction Activities.** The project would require an O&M building, which would be located within the proposed laydown area, adjacent to the substation. The building footprint and concrete slab would be approximately 50 feet by 80 feet, for a total area of 0.1 acres (4,000 square feet). The O&M building would be a pre-engineered, metal building with an operations' room, offices, communications and SCADA equipment, a warehouse, storage space, a kitchen area, and bathrooms. A compacted gravel area around the building would be required for vehicle parking and for storage of major components (e.g., replacement WTG blades).
- **Operation and Maintenance Activities.** O&M activities associated with the O&M building would include basic maintenance and upkeep of the facility.

Meteorological Monitoring Tower

- **Construction Activities.** One permanent meteorological (met) tower would be installed within the wind farm site to measure and record weather data to track the performance of the wind turbines. Meteorological data would include wind speed and direction, barometric pressure, humidity, and ambient temperature. Given the onsite terrain and wind conditions, the met tower would typically be an 80-meter tall guyed monopole tower and would include anti-perch points on all horizontal surfaces. Construction of the met tower would require site preparation (for example, clearing and grubbing), grading, installation of a foundation, underground electrical and communication lines, and onsite assembly of the tower.
- **Operation and Maintenance Activities.** Met towers require routine monitoring maintenance activities during their operation, but do not typically require heavy equipment for servicing.

2.1.3.2 Transmission Line Corridor

The transmission line corridor will connect the proposed collector substation to MECO's existing grid system at the point of interconnection (POI). The collector substation is located on the wind farm site and the proposed POI is located on the existing Wailea-Kealahou 69-kV transmission line, approximately 1-mile east of the Wailea substation (see Figure 2). The transmission line corridor includes the following two facilities: the 34.5-kV transmission line and the 69-kV interconnection substation. Following is a description of each facility, and the associated proposed construction and O&M activities.

34.5-kV Transmission Line

- **Construction Activities.** The 34.5-kV transmission line connects the collector substation (located on the wind farm site) with the 69-kV interconnection substation (located at the POI). The transmission facilities will be constructed using wood poles or similar suitable materials. The poles will support a 3-phase, 34.5-kV transmission line (i.e., 3 conductors), associated insulators and accessories, and an overhead static ground wire with fiber optic core. All the required facilities would be located within the established corridor, which is approximately 100 to 150 feet wide and approximately 9.0 miles long (Figure 2). The transmission line poles are anticipated to be approximately 60 feet tall, similar to the existing wood poles supporting

MECO's Wailea-Kealahou transmission line. The exact location of each facility would be determined based on detailed engineering which will take into consideration a variety of factors, including existing access roads, terrain, environmental constraints, and cost. All transmission lines and structures would be designed to minimize the potential for perching of birds.

Transmission-line construction would utilize standard industry procedures including surveying, right-of-way (ROW) preparation, materials hauling, pull sites, staging areas, structure assembly and erection, ground wire, conductor stringing, cleanup, and re-vegetation. Specific methods of access have not yet been determined, but will use existing ranch roads or areas suited for off-road driving to minimize impacts.

- **Operations and Maintenance Activities.** The transmission facilities would be routinely monitored, inspected, and maintained by qualified personnel and maintenance technicians throughout the operation phase of the project. These maintenance activities would be accomplished with the use of off-road vehicles and light trucks. Heavy construction equipment would only be required if transmission facilities need to be repaired or replaced.

69-kV Interconnect Substation

- **Construction Activities.** The proposed 69-kV interconnect substation will be constructed at the POI located along MECO's existing Wailea-Kealahou 69-kV transmission line, approximately 1 mile east of the existing Wailea substation. The interconnect substation will be approximately 195 by 240 feet, for a total footprint of approximately 1.1 acres (46800 square feet). The substation area will be cleared and graded to control storm water runoff and drainage. The substation pad will be compacted with well graded material. Foundations will be installed for the facilities described below. Below-grade raceway (for example, the conduit, ductbank, and trench) and ground grid will be installed in the sub-grade. Following installation of all equipment, a final layer of crushed rock surfacing would then be placed and a perimeter fence would be erected and grounded. Substation testing and commissioning would be conducted before energizing the facility.

  As presently anticipated, the 69-kV interconnection substation will include the following facilities:

  A. A battery storage building with a footprint of approximately 85 x 85 feet. The battery storage building will provide housing for a series of utility-scale batteries to provide smoothing capability for power generated from the wind farm. It is anticipated that the battery storage building will be a metal, pre-fabricated structure erected on a concrete slab.

  B. Two small control enclosures with a footprint of approximately 12 x 30 feet. The control enclosures will provide housing for breaker controls, protective relaying, electric metering, and communications equipment. It is anticipated that the control enclosures will be pre-assembled and shipped to the site fully constructed and set on concrete slabs.

  C. Several transformers, electrical buses, breakers and various electrical structures.

- **Operation and Maintenance Activities.** O&M of the interconnect substation would be performed by qualified personnel and maintenance technicians. Maintenance activities would include routine inspections of each component and monitoring of equipment and electronics according to the manufacturer's recommendations and owner's requirements, and in accordance with regulatory requirements. Routine maintenance of the interconnect substation would not typically require heavy construction equipment. However, if a major component failure were to occur (for example, a failure of a main transformer), then appropriate construction equipment would be required to replace the component.

69-kV Interconnection Substation Access Road

- **Construction Activities.** To secure access to the proposed substation site a new access road will be constructed. The most direct route is from the Pi'ilani Highway at the intersection with Wailea Ike Drive. A road approximately 0.3 miles long exists between the highway and the Wailea Substation. From the Wailea Substation, the newly constructed road to the interconnection substation will be approximately 2 miles long. Alternative routes, using existing Ulapalakua Ranch Roads are being considered. The proposed road width is 20 feet, the maximum grade is 7 percent and the minimum turning radius is 100 feet so that a truck similar to a WB-62 could access the site with the transformers. The road will have an all-weather, gravel surfaces and will have adequate compaction to accommodate the specialized transportation equipment. The road will be designed to adequately to collect stormwater runoff and minimize erosion. Drainage measures could include ditches and culverts on the uphill side to capture and convey stormwater, as required. Following construction, any deteriorated roadway surfaces that resulted from project-related construction traffic will be repaired and restored.
- **Operation and Maintenance Activities.** Following construction, the access road to the 69-kV interconnection substation will continue to be used for routine operations and maintenance activities, but it will be closed to public access. During operations, the access roads will be maintained in good working order by grading and compacting to minimize naturally occurring erosion.

2.1.3.3 Construction Access Route

Transportation Plan

Most of the materials and equipment required for the proposed project, including the turbine components, construction materials and construction equipment, would be imported to Maui via Kahului Harbor, the island's only commercial port, then transported to the wind farm site. Because most of the major turbine components are considered "superloads," special equipment (for example, multi-axle transport trailers, schnabel trailers with hydraulic lifts, and steerable blade trailers) would be used to transport these materials. In the early stages of project development, the project engineers conducted a transportation route assessment to document the existing transportation conditions and identify probable travel routes, constraints, and proposed improvements.

Based on the results of this assessment, it was determined that a direct route from Kahului Harbor to the wind farm site via Haleakala and Kula Highways is not practicable, as there

are several portions of Kula Highway (between Pukalani and Ulupalakua Ranch) where the turn radii and slopes are not passable for the size of transport truck required to haul the turbine components. The most practicable route was determined to be along a designated construction route, selected based on the minimal number and radii of turns and routed from Kahului to Mokulele Highway, then through Wailea to a series of privately owned pastoral roads (collectively referred to as "Papaka Road"), then finally along Piʻilani Highway to the wind farm site (Figure 1). For the purposes of this analysis, the construction access route has been broken apart into nine distinct segments, as listed in Table 2.

TABLE 2
Construction Access Route from Kahului Harbor to Wind Farm Site

Segment Number	Route	Approximate Distance (miles)
1	Ala Luina Street/Hobron Avenue	0.5
2	Hana Highway	0.7
3	Dairy Road (Highway 380)	0.8
4	Puʻunene Avenue/Mokulele Highway (Highway 311)	6.5
5	Piʻilani Highway	7.2
6	Wailea Ike Drive	0.6
7	Wailea Alanui Drive	2.9
8	Papaka Road (series of privately owned pastoral roads)	4.6
9	Kula Highway (turns into Piʻilani Highway)	3.3

The construction access route is entirely comprised of state and county roadways, with the exception of Papaka Road.

Papaka Road

- **Construction Activities.** Papaka Road will be used for transporting equipment during construction and for future transportation of replacement equipment, if required. Presently, both ends of the Papaka Road are gated and locked. During construction, it is anticipated that guards would be placed at either end to allow the passage of construction vehicles.

  The western portion of the existing road is approximately 24 feet wide with a paved surface, while the eastern portion is a single lane, four-wheel-drive road. To accommodate the specialized transport equipment, the Papaka Road will be widened to approximately 30 feet (including shoulders) and several short segments of new roadway would be constructed in order to keep the roadway alignment on Ulupalakua Ranch property. The roads would be all-weather (gravel surfaces) except where currently paved, and would have adequate compaction to accommodate the specialized transportation equipment. The road will be designed to adequately collect stormwater runoff and minimize erosion. Drainage measures could include ditches and culverts on the uphill side to capture and convey stormwater, as

required. Following construction, any deteriorated roadway surfaces that resulted from project-related construction traffic will be repaired and restored.

- **Operation and Maintenance Activities.** The Papaka Road will not be used for routine operations and maintenance activities, nor would it serve as the primary access route to the proposed wind farm following construction. It is anticipated that both ends of the road will remain gated and locked. The road would continue to be used by Ulupalakua Ranch employees, as well as private landowners of adjacent parcels, both during and after construction.

Pi'ilani Highway

- **Construction Activities.** The portion of the Pi'ilani Highway between the Papaka Road and the wind farm site (approximately 4 miles) will also be used for transporting equipment during construction and for future transportation of replacement equipment, if required. Based on surveys conducted by a specialized transportation consultant, approximately 11 bumps with a rise greater than 20 inches over a 100 foot length will require modification and at least one s-curve will have to be widened. The proposed road modifications will comply with County design criteria including requirements for road base, compaction, pavement thickness, shoulder width, stormwater collection and drainage requirements.
- **Operation and Maintenance Activities.** Following construction, the portion of the Pi'ilani Highway between the Papaka Road and the wind farm site will continue to be used for normal public traffic as well as routine operations and maintenance activities for the wind farm. It will continue to be maintained under its present jurisdiction.

2.1.3.4 Site Clean-Up

All portions of the project area will be maintained in an orderly and clean manner throughout construction. At the completion of the construction phase, a final clean-up of the project area would be conducted. All construction-related waste would be removed from the area and recycled or disposed of at approved facilities, and would be properly handled in accordance with state and federal policies and permit requirements. Areas with disturbed soil that would not be used during operation would be stabilized and returned to cattle grazing activities.

2.1.3.5 Future Expansion

The proposed wind farm site has the capability to be expanded to accommodate up to 39 turbines to meet Maui's future energy needs. Expansion opportunities would be dependent upon future demand and the ability of the MECO grid to accept additional wind-generated energy. The Applicant is not actively pursuing any expansion opportunities at this time, and as such, the project permits and the EIS will not address any future expansion activities. In the event that an expansion is deemed to be practical, the appropriate due diligence activities and environmental permitting would be conducted at that time.

2.1.3.6 Project Schedule

A preliminary proposed schedule is provided in Appendix A.

2.2 Alternatives

Following is a discussion of potential alternatives to the Proposed Action that have been identified to date and which will be evaluated in more detail in the EIS.

2.2.1 No Action Alternative

Under the "No Action" alternative, the Auwahi Wind Farm would not be constructed. The "No Action" alternative will be evaluated in more detail in the EIS, pursuant to HAR § 11-200-17(f)(1).

2.2.2 Alternatives Eliminated From Further Consideration

Several potential locations and alignments of the three project components were preliminarily identified as viable alternatives but were subsequently dismissed. These alternatives are briefly described below and will be evaluated in more detail in the EIS.

2.2.2.1 Alternative Wind Farm Site Within the Auwahi Parcel

As previously described, two potential project areas were identified within the Auwahi parcel: 1) the area just north of Pi'ilani Highway and 2) the area just south of the highway. In 2006, three 50-meter met towers were installed to measure and document wind speeds, shear, turbulence intensity, temperature, and pressure in the north and south portions of the Auwahi parcel. Using the data collected from these three towers, a site energy assessment was conducted for the two potential project areas. Although the assessment results showed commercially viable wind regimes at both the north and south site, it was determined that the south site would have a higher estimated net annual energy production. Therefore, the Applicant decided to pursue development of the wind farm on the south site.

2.2.2.2 Alternative Transmission Line Alignments

Roadside Alignment

During the early stages of project development, the Applicant identified a potential transmission line corridor between the wind farm site and the existing Wailea substation along the edge of Pi'ilani Highway and Kula Highway. The transmission line would be an overhead alignment located within the roadway easement. However, it was determined that this alignment would cross through the Kanai'o Natural Area Reserve (NAR), and was dismissed from further consideration.

Direct Route Alignment Across Ulupalakua Ranch Property

A direct route alignment within the mauka (inland) portions of the Ulupalakua Ranch property was considered for the proposed transmission line corridor, such that the alignment would have a minimal number of turns. However, it was determined that this alignment would traverse the Auwahi Reforestation Project site located on the northern edge of the Auwahi parcel, and as such was eliminated from further consideration.

2.2.2.3 Alternative Construction Access Routes

Direct Route via Haleakala Highway and Kula Highway

Based on a transportation route assessment conducted by the project engineers, it was determined that a direct route from Kahului Harbor to the wind farm site via Haleakala and

Kula Highways is not practicable, as there are several portions of Kula Highway, between Pukalani and Ulupalakua Ranch, where the turn radii and slopes are not passable for the size of transport truck required to haul the turbine components. Therefore, this alternative was eliminated from further consideration.

2.2.2.4 Alternative Alignment for Papaka Road

The vicinity of Papaka Road includes a network of pastoral roads, many of which were considered as possible segments of the construction access route. Specifically, an alternative alignment consisting entirely of existing roads was considered. However, this alignment passed through several privately owned parcels, and it was determined that the appropriate approvals could not be obtained for use of these parcels. As such, the alignment was modified to stay primarily within Ulupalakua Ranch property, and the existing road alternative was eliminated from further evaluation.

2.2.2.5 Alternative Project Size

As documented in Section 2.1, Project History, several variations in the generating capacity have been considered throughout the planning phase of the proposed project. However, the amount of wind-generated energy that the existing electrical grid can accept is limited. Consequently, MECO has determined that the grid can accept no more than approximately 22 MW of energy from the proposed project at this time.

Due to grid constraints outside of the Applicant's control, he Project has already been reduced from 42 MW to 22 MW. A further reduction in the generating capacity would further diminish the project's viability. In addition, a further reduction in project size would directly impact the price at which the energy could be sold to MECO, and therefore, would directly impact ratepayers.

Given the inability of MECO's grid to sustain more than approximately 22 MW and the economic barriers associated with a smaller project size, the generating capacity of the Proposed Action was determined to be the only feasible project size, and alternative project sizes were dismissed from further evaluation at this time.

This page was intentionally left blank.

3.0 Existing Environment, Potential Impacts and Mitigation Measures

This section describes the existing conditions of the physical and human environments within the proposed project area, to provide the context within which the proposed project is being considered. Additional detail will be included in the Draft EIS as necessary to support the impact analysis. The scope of the impact analysis anticipated to be provided in the Draft EIS is described for each resource category. Descriptions of resource categories for which no impacts are anticipated contain a statement of no impact, and no additional analysis is anticipated for the Draft EIS.

3.1 Climate

3.1.1 Definition of Resource

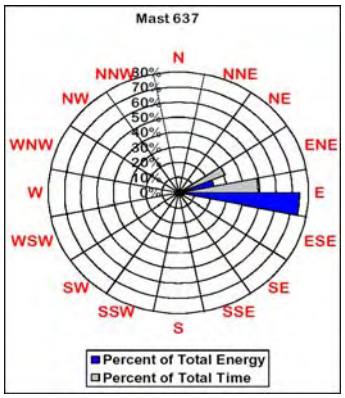
Climate refers to the average weather conditions in a region over a long period of time. The climate of a location is affected by its latitude and terrain, as well as its proximity to the ocean and its currents. Specific climate types can be described based on characteristics such as temperature and 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, thus decreasing the prevalence of the trade winds to about 50 to 80 percent of the time (Western Regional Climate Center [WRCC], 2009a).

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 Maui). 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, 2009a).

The proposed project area is located in the lowlands of the leeward side of Maui. In this vicinity, dry weather is prevalent, with the exception of sporadic trade wind showers and short-duration storms. Rainfall occurs primarily between the months of December and March. Based on data recorded between 1955 and 2009, the average annual rainfall in this vicinity is 30.9 inches, with monthly totals ranging between 1.6 inches (August) and 4.9 inches (January) (WRCC, 2009b). In general, the lowlands have a narrow range of diurnal temperatures, with daytime temperatures in the 70s to 80s (all degrees Fahrenheit)



Wind Rose for the Auwahi Parcel

and nighttime temperatures in the 60s to 70s. The prevailing wind direction in the project area is from the east, as shown on the wind rose for the project site.

3.1.3 Potential Impacts and Mitigation Measures

The proposed project has been sited to potentially benefit from the strong wind resources in this area and is not expected to be otherwise affected by the climate; nor is the project expected to affect climatic conditions or weather patterns. Therefore, no mitigation measures are proposed at this time.

3.2 Geology and Topography

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.

3.2.2 Existing Conditions

Maui is the second largest of the Hawaiian Islands and is 48 miles long and 26 miles wide, for a total area of 728 square miles. The island is composed of two volcanic mountains, Haleakala and West Maui, separated by a low-lying isthmus which was created as the lava from Haleakala flowed into West Maui. Haleakala forms East Maui, and is 10,025 feet above sea level (ASL) and 33 miles across. At 570 square miles, it comprises approximately 77 percent of the island (U.S. Geological Survey [USGS], 1996). West Maui is 5,788 feet ASL and 18 miles across.

Haleakala is a shield volcano that is believed to have started forming about 2 million years ago, reaching the ocean surface about 1.5 million years ago (USGS, 1996). Subsequently, its flows merged with other nearby volcanoes, including West Maui, Kahoʻolawe, Lanaʻi, East Molokaʻi, West Molokaʻi and Penguin Bank (Stearns, 1966), covering at least 6,200 square miles. Over the course of the last 400,000 years, the volcanoes have subsided to form four distinct islands: Maui, Molokaʻi, Lanaʻi, and Kahoʻolawe. Haleakala is built over three rift (fissure) zones, extending to the northwest, east and southwest, and are each marked by a series of cinder cones (Stearns, 1966). Volcanic activity at Haleakala in the past 30,000 years has occurred along the southwest and east rift zones, with approximately ten eruptions in the past 1,000 years (USGS, 1996).

The proposed wind farm site is located on the southwest flank of Haleakala, just east of the southwest rift zone. The results of the preliminary geotechnical study conducted within the wind farm site indicate that the geologic profile underlying the proposed site consists primarily of recent basalt flows of the Hana Volcanic series, which is considered to be suitable substrate for construction of the proposed project (Black & Veatch, 2008). Although no large lava tubes were encountered in the borings during the geotechnical investigation, a subsurface void was observed to the west of Puʻu Hokukano. In addition, a buried soil layer was found between basalt flows at a relatively shallow depth of approximately 6.5 to 10 feet,

north of Pu'u Hokukano (Black & Veatch, 2008). A detailed geotechnical investigation would be conducted prior to construction to confirm the absence of subsurface voids and buried soils within the footprint of the proposed project facilities.

In general, the topography of this region is steep and rugged, as is common on the slopes of shield volcanoes. The wind farm site ranges in elevation from approximately 1,600 feet ASL on the northern edge to 200 feet ASL on the southern edge, which equates to an approximately 14 percent slope. The slope is fairly uniform across the site, with the exception of Pu'u Hokukano, which rises to approximately 1,460 feet ASL near the center of the site, approximately 250 feet above the surrounding terrain. The transmission line spans from the wind farm site to approximately 960 feet ASL at the existing Wailea substation, with a maximum elevation of approximately 4,400 feet ASL as it crosses the southwest rift zone. Papaka Road ranges from approximately 80 feet ASL at its western end to approximately 1,780 feet ASL at its eastern end.

3.2.3 Potential Impacts and Mitigation Measures

3.2.3.1 Construction

Construction of the proposed project would require modification of the site, including excavation, fill, and grading for the wind farm infrastructure and access roads. The Draft EIS will provide an evaluation of the potential impacts to geological and topographical resources as a result of construction. In addition, the Draft EIS will outline the measures that would be implemented to minimize potential impacts resulting from these activities. These measures would include the performance of a detailed geotechnical investigation prior to construction, and refinement of the project design to avoid any subsurface voids or buried soil layers identified within the footprint of the proposed project facilities.

3.2.3.2 Operation

Operation of the proposed project is not expected to affect geologic or topographic resources; therefore, no mitigation measures are proposed at this time.

3.3 Soils

3.3.1 Definition of Resource

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.

3.3.2 Existing Conditions

Various studies have been conducted throughout the State for the purpose of describing the dominant soil types and assessing the relative productivity of different areas for agriculture. These include: (1) the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey (Foote, 1972); (2) the University of Hawai'i Land Study Bureau Detailed Land Classification (Land Study Bureau, 1967); and (3) the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawai'i

(ALISH) (State Department of Agriculture, 1977). A description of each of these studies, relative to the project site is presented below.

3.3.2.1 NRCS Soil Survey

According to the Soil Survey of the Islands of Kaua'i, Oahu, Maui, Moloka'i and Lana'i (Foote, 1972), the soils within the wind farm site predominantly consist of the Oanapuka Series (OED), with some areas of Very Stony Land (rVS) and Lava Flows (rLW) and a small inclusion of Cinder Land (rCl) on and directly adjacent to Pu'u Hokukano. The transmission line and Papaka Road traverse a broad spectrum of habitats over a range of elevations, which is reflected by a wide variety of soil types. Each soil type is briefly summarized in Table 3.

TABLE 3
Soil Types Present Within the Project Area

Soil Name	Slope	Description	Permeability [1]	Runoff [1]	Erosion Hazard [1]
Wind Farm Site					
Oanapuka extremely stony silt loam (OED)	7-25	Well drained, very stony soils on low uplands; developed in volcanic ash and material derived from cinders.	Moderately rapid	Slow	Slight to moderate
Very stony land (rVS)	7-30	Areas where 50-90% of the surface is covered with stones and boulders	--	--	--
Lava flows, a`a (rLW)	--	Consists of young lava flows	--	--	--
Cinder land (rCI)	--	Areas of bedded magmatic ejecta; mixture of cinders, pumice and ash	--	--	--
Transmission Line					
Very stony land (rVS)	7-30	Areas where 50-90% of the surface is covered with stones and boulders	--	--	--
Uma rocky loamy coarse sand (URD)	7-25	Excessively drained, sandy soils on intermediate mountain slopes, with rock outcrops over 5-10% of the surface	Very rapid	Medium	Moderate
Uma loamy coarse sand (UME)	15-40	Excessively drained, sandy soils on smooth, intermediate mountain slopes	Very rapid	Slow	Slight to moderate
Lava flows, a`a (rLW)	--	Consists of young lava flows	--	--	--
Uma loamy coarse sand (UMF)	40-70	Excessively drained, sandy soils on smooth, intermediate mountain slopes	Very rapid	Slow	Severe
Ulupalakua silt loam (ULD)	7-25	Soil on smooth, intermediate mountain slopes	Moderately rapid	Slow	Slight
Io silt loam (ISD)	7-25	Well-drained soils on smooth, low mountain slopes	Moderately rapid	Slow to medium	Slight to moderate
Kula very rocky loam (KxbE)	12-40	Well-drained soils on uplands with rock outcrops over 10-25% of the surface	Moderately rapid	Medium	Moderate

TABLE 3
Soil Types Present Within the Project Area

Soil Name	Slope	Description	Permeability [1]	Runoff [1]	Erosion Hazard [1]
Kamaole very stony silt loam (KGKC)	3-15	Well-drained soils on uplands; developed in volcanic ash	Moderate	Slow to medium	Slight to moderate
Kula loam (KxD)	12-20	Well-drained soils; nearly free of cobblestones	Moderately rapid	Medium	Moderate
Papaka Road					
Oanapuka extremely stony silt loam (OED)	7-25	Well drained, very stony soils on low uplands	Moderately rapid	Slow	Slight to moderate
Makena loam, stony complex (MXC)	3-15	Well drained soil on upland; developed in volcanic ash	Moderately rapid	Slow to medium	Slight to moderate
Lava flows, a`a (rLW)	--	Consists of young lava flows	--	--	--
Very stony land (rVS)	7-30	Areas where 50-90% of the surface is covered with stones and boulders	--	--	--
Kula very rocky loam (KxbE)	12-40	Well-drained soils on uplands with rock outcrops over 10-25% of the surface	Moderately rapid	Medium	Moderate
Io silt loam (ISD)	7-25	Well-drained soils on smooth, low mountain slopes	Moderately rapid	Slow to medium	Slight to moderate

NOTES;

[1] Ranking of permeability, runoff and erosion hazard is not provided for the following mapping units: a`a lava flows (rLW), cinder land (rCI), and very stony land (rVS), as indicated by "—".

SOURCE: Foote, D. E., E. L. Hill, S. Nakamura, and F. Stephens. 1972.

3.3.2.2 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 within the proposed wind farm area and Papaka Road are classified as Category "E" by the Detailed Land Classification System. The soils along the eastern half of the transmission line are also classified as Category "E", and along the western half as Category "C" and "D".

3.3.2.3 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.

Most of the project area, including the entire wind farm site, is not classified by ALISH. The western portion of the transmission line and two small segments of Papaka Road are classified as "Other Important Agricultural Land". These are defined as "important to agriculture in Hawai'i, yet they exhibit properties, such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, or drought potential that exclude them from the prime or unique agricultural land classifications" (USDA, 1977).

3.3.3 Potential Impacts and Mitigation Measures

3.3.3.1 Construction

Construction of the proposed project would require excavation, filling, and grading for the wind farm infrastructure and access roads, which would result in disturbance of the soil within the proposed project area. The Draft EIS will provide a detailed evaluation of the impacts to soils, including erosion and loss of productivity. Based on this evaluation, the Draft EIS will outline the measures that would be implemented to minimize or avoid impacts to soils.

3.3.3.2 Operation

Operation of the proposed project would not involve any excavation, filling, grading or other activities that would disturb the soils within the proposed project area. Site inspections and maintenance activities would be conducted using the proposed onsite roads, and would not be expected to affect soils; therefore, no mitigation measures are proposed at this time.

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.

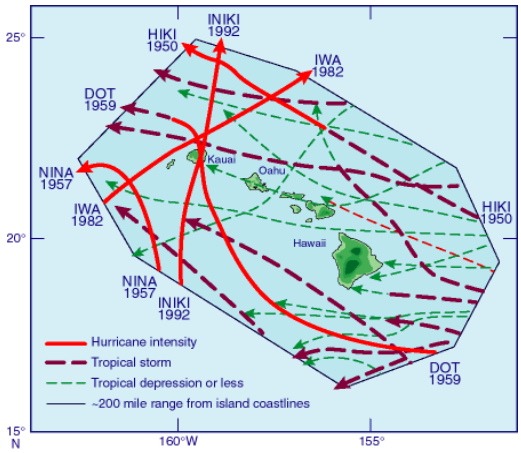
3.4.2 Existing Conditions

Although uncommon, a variety of natural hazards can affect Hawai'i, including 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 mph. Tropical storms are similar to hurricanes, except that the sustained winds are below 74 mph. These events can also produce torrential rains. The Central Pacific Hurricane season runs from June 1 to November 30.

True hurricanes are very rare in Hawai'i, demonstrated by the fact that only five have affected the islands over the last 50 years



Hurricanes Located Within 200 Miles of Hawai'i, 1949–1997 (Businger, 1998)

(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, 2009). No hurricane or tropical storm has ever made landfall on Maui.

3.4.2.2 Tsunamis

Tsunamis are large, rapidly moving ocean waves triggered both by disturbances around the Pacific Rim (i.e., teletsunamis) and earthquakes and landslides near Hawai'i (i.e., local tsunamis). No portion of the project area is within the Civil Defense Tsunami Evacuation Zone (Hawai'i State Civil Defense, 2008).

3.4.2.3 Volcanic Eruptions

Haleakala is the only active volcano in Hawai`i outside the Big Island. The last eruption of Haleakala is believed to have occurred around 1790, along the lower southwest rift zone. Recent geologic mapping suggests that this rift zone may have erupted as many as five times in the last 900 years, resulting in a total of 8.7 square miles of lava flows (USGS, 1996).

Lava-flow hazards are rated on a scale of one through nine, with one being the zone of highest hazard and nine being the zone of lowest hazard. The steep, downslope areas of the Kanai'o and Kahikinui ahupua'a,[1] which occur on either side of the proposed wind farm site, are rated as Hazard Zone 4 (USGS, 1996).

3.4.2.4 Earthquakes and Seismicity

Earthquakes in Hawai`i are linked with volcanic activity (USGS, 2001). Since 1868, at least nine tectonic earthquakes, with magnitudes ranging from 6.0 to 8.0, have occurred in Hawai'i, all generally centered on the Big Island (USGS, 2001). Studies by the University of Hawai'i suggest that Maui County can expect a magnitude 3 to 5 earthquake to occur approximately every 2 to 5 years, and a magnitude 7 earthquake to happen approximately every 250 years. (USGS, 1996).

Site seismicity was evaluated as part of the preliminary geotechnical investigation. Based on the ground motion parameters, the majority of the project site can be classified as Seismic Design Site Class B (Black & Veatch, 2008), which indicates the specific design criteria for the project.

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, the Flood Zone Designation for the project area is Flood Zone X. Zone X is assigned to those areas that are determined to be outside the 1 percent annual chance floodplain (FEMA, 2008).

3.4.2.6 Wildfire

Wildfire occurs on all of the major Hawaiian Islands, with human activity as the primary cause (Pacific Disaster Center, 2008). Hawai'i's native ecosystems are not adaptive to wildfire; therefore, wildfire can result in extinction of native species and increased coverage of nonnative, invasive species. Other effects include soil erosion, increased runoff and water

[1] Ahupua'a are traditional Hawaiian subdivisions of land and typically encompass a slice of land from the top of the mountains down to the shoreline.

quality. In Maui County, between 1972 and 1999, there were 1,291 brush fires that burned 64,248 acres of land. The number of wildfires increased from 118 in 2000 to 271 in 2003 (Pacific Disaster Center, 2008).

3.4.3 Potential Impacts and Mitigation Measures

Neither construction nor operation of the proposed project is expected to affect the incidence rate of a natural hazard, with the exception of the possibility 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. The mitigation measures may include preparation of a Fire Management Plan.

3.5 Hydrology and Water Resources

3.5.1 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.

3.5.2 Existing Conditions

The western half of the proposed wind farm is within the Kanaiʻo watershed and the eastern half is within the Kipapa watershed. The transmission line spans the Kanaiʻo and Wailea watersheds, with the boundary located along the southwest rift zone. Papaka Road crosses through the Kanaiʻo, Ahihi Kinau, Mooloa and Wailea watersheds . The general characteristics of these watersheds are presented in Table 4.

TABLE 4
Characteristics of Watersheds Within the Proposed Project Area

Watershed Name	Watershed area (acres)	Perennial Streams	Range of Annual Rainfall (inches)
Ahihi Kinau	2986.7	None	15.75—29.53
Kanaiʻo	18409.9	None	15.75—39.37
Kipapa	20743.4	None	19.69—39.37
Mooloa	1212.6	None	9.84—29.53
Wailea	21985.5	None	9.84—39.37

Source: Hawaiʻi Institute of Marine Biology. 2006. Hawaiʻi Coral Reef Assessment & Monitoring Program. December 18. Available online at: http://cramp.wcc.hawaii.edu/tables/maui.htm. Accessed in December 2009.

There are no wetlands or other perennial surface water features present within the proposed project area. An unnamed intermittent drainage is present along the western edge of the wind farm area, but would not be impacted by the proposed project. This drainage feature originates north of Pi'ilani Highway and captures storm runoff from the southwestern slopes of Haleakala. There is no evidence of perennial or seasonal flows, and it is believed to only carry storm runoff. It is generally a poorly defined channel with widely varying width and depth, characterized by an exposed rocky substrate, with evidence of channel incision in some areas. There are no wetland plants or riparian habitat present along any portion of its length (Guinther, 2008). The transmission line crosses the upper portion of this drainage feature, north of Pi'ilani Highway, but the transmission line facilities would be sited such that the line would span the drainage and no disturbance would occur. In addition, several broad drainage swales are present along Papaka Road. The swales are generally grass-dominated features with no defined bed and bank feature, and convey storm runoff and drain to upland areas.

The wind farm site is located in the Lualailua hydrologic subunit (aquifer code 60603) of the Kahikinui hydrologic unit (Aquifer Code 606), which has sustainable yields of 11 and 36 million gallons per day (MGD), respectively. The transmission line and Papaka Road both cross into the Kamaole subunit (Aquifer code 60304) of the Central hydrologic unit (Aquifer Code 603), which have sustainable yields of 11 and 27 MGD, respectively (Commission on Water Resources Management [CWRM], 2008). Given the steep terrain and lack of surface water features, it is believed that the groundwater levels are significantly below the ground surface throughout the project site and vicinity. No groundwater was encountered in the borings (ranging from 32 to 41 feet in depth) conducted during the geotechnical investigation (Black & Veatch, 2008).

3.5.3 Potential Impacts and Mitigation Measures

3.5.3.1 Construction

Because groundwater levels within the proposed project area are believed to be significantly below the ground surface, construction of the proposed project is not expected to affect groundwater quality or supply. In the event a temporary well is required to support construction activities (as opposed to trucking in water), impacts will be discussed in the Draft EIS. No perennial or seasonal streams, floodplains, wetlands, or other surface water features are present within the proposed project area. However, construction of the proposed project would require excavation and grading activities, which could affect adjacent drainage. 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; and/or (3) cause substantial erosion or downstream sedimentation. Mitigation measures that would be implemented to minimize or avoid impacts to these resources would also be presented.

3.5.3.2 Operation

Operation of the proposed project is not expected to affect hydrology or water resources; therefore, no mitigation measures are proposed at this time.

3.6 Biological Resources

3.6.1 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 United States Code [U.S.C.] §§ 1531-1544) as amended. Species listed as threatened or endangered by the State of Hawai'i are protected in accordance with Hawai'i state law (HRS § 195D-4).

3.6.2 Existing Conditions

3.6.2.1 Flora

A botanical survey of the proposed project area was conducted by AECOS Consulting in June 2007. In general, the results of the survey indicate that the proposed project area consists of floristically degraded grass and shrublands used as cattle pasture, yet has scattered remnants of the native dryland forest and shrublands that historically occupied the area. The remaining pockets of native flora appear to be preserved as a result of the complex geology and the presence of the relatively young volcanic substrate along the southwest rift zone of Haleakala. No listed plant species were observed, or are expected to have the potential to occur within the project area.

A summary of the plant communities that occur within the proposed project area is provided below, and a list of species observed during the botanical surveys will be included in the Draft EIS.

Wind Farm Site

The wind farm site is characterized by a combination of dry, rocky pastureland and scrub habitat on rugged lava flows. This area is heavily exposed to grazing by cattle and feral ungulates, and is generally dominated by non-native shrubs and other low-growing woody plants, though pockets of grassland or barren, rocky ground are also present. Dominant species include natal redtop (*Melinus repens*), glycine (*Neonotonia wightii*) and koa haole (*Leucaena leucocephala*). The most significant botanical resources are several, well-developed groves of wiliwili (*Erythrina sandwicensis*) and a few scattered native trees, such as hao (*Rauvolfia sandwicensis*) and naio (*Myoporum sandwicense*), the latter of which is of larger size. No threatened or endangered plant species were observed on the wind farm site.

Transmission Line Corridor

Heading mauka (inland) from the wind farm site, the transmission line corridor continues through dry scrubland habitat. Similar to the habitat within the wind farm site, the vegetation in this area is primarily comprised of introduced species and is subjected to grazing by cattle and feral ungulates. Dominant species include koa haole, glycine, lantana (*Lantana camara*), ʻäkia (*Wikstroemia oahuensis*), and buffel grass (*Cenchrus ciliaris*).

At approximately 2,800 feet ASL, the scrub habitat transitions to dryland forest, marked by an increased abundance of native plants, including ʻäkia, ʻohiʻa (*Metrosideros polymorpha*), and ʻülei (*Osteomeles anthyllidifolia*). The proposed transmission line route includes some uncommon native species such as hala pepe (*Pleomele auwahiensis*), olopua (*Nestegis*

sandwicensis), kauila (*Alphitonia ponderosa*), and ʻaiea (*Nothocestrum latifolium*). The most significant remaining dryland forest in the project vicinity is located within the adjacent State of Hawai'i, Kanai'o NAR, located west (but outside) of the transmission line corridor (between 2,600 feet and 4,200 feet ASL). Several threatened and endangered plant species are known to occur within the boundaries of this preserve, but were not found within the transmission line corridor.

Beyond the dryland forest, at approximately 4,000 to 4,200 feet ASL, the proposed transmission line crosses approximately 300 yards of the rugged lava flow on the southern face of Pu'u 'Ouli. This area is vegetated with native dryland scrub species, including 'a'ali'i (*Dodonea viscosa*), pukiawe (*Styphelia tameiameiae*), and 'ăla'a (*Pouteria sandwicensis*).

At approximately 4,200 feet ASL, west of Pu'u `Ouli, the line turns westward towards the southwest rift and enters high-elevation pastureland, which is dominated by kikuyu grass (*Pennisetum clandestinum*). The only botanically significant feature in this area is a lava flow located behind (northeast of) Keonehunehune (an eruption cone) along the southwest rift, which is dominated by native species. The transmission line corridor crosses approximately 300 feet (92 meters) of this lava flow.

The remainder of the transmission line corridor, from the ridgeline marking the southwest rift to the Wailea substation, is located entirely within pastureland. The grasses that dominate this pastureland change with elevation, influenced mostly by the corresponding rainfall gradient. The strictly grassland pasture of the upper slopes transitions to a savanna (grassland with scattered trees) below Kula Highway (at about 1,200 feet ASL), which remains the dominant vegetation type to the interconnection substation located at 400 feet (122 meters) ASL. The only tree species of notable quantity in this area is kiawe (*Prosopis pallia*), which steadily increases in density from 1,200 feet ASL down to 400 feet ASL (from 366 to 122 meters). Although limited occurrences of native lowland vegetation are known to occur in the vicinity (Altenberg, 2007), these populations appear to be limited to areas precluded from ongoing cattle grazing, unlike the parcels within the transmission line corridor.

Construction Access Road (Papaka Road)

The eastern half of Papaka Road, between Pi'ilani Highway and the existing small quarry at approximately 780 feet ASL, is characterized by a combination of dry, rocky pastureland and scrub habitat. Species including koa haole, indigo (*Indigofera suffruticosa*), 'akia (*Wikstroemia oahuensis*), 'a'ali'i, glycine, air plant (*Kalanchoë pinnata*), and 'uhaloa (*Waltheria indica*) are common to abundant. A relatively recent lava flow located along the west side of the Pu'u Naio cinder cones supports floristically distinct vegetation community, including a number of native species. Species that commonly occur in this area include: natal redtop, 'a'ali'i, common sword fern (*Nephrolepis multiflora*), and lantana (*Lantana camara*). Downslope from the quarry, the vegetation changes gradually to a kiawe/buffel grass (Prosopis/Cenchrus) association, which is the dominant vegetation near the coast. In areas, this plant community is mixed with stands of wiliwili, and associated species such as 'ilima (*Sida fallax*), 'uhaloa, and natal redtop.

3.6.2.2 Fauna

A variety of wildlife surveys have been conducted within the project area including:

- an avian and terrestrial mammalian survey, Rana Productions, Ltd., June 2007.
- radar surveys for threatened and endangered bird and bat species, Hamer Environmental, L.P., July and October 2006.
- an invertebrate survey, Dr. Steve Montgomery, March 2008.

During the course of the avian and terrestrial mammalian surveys eleven mammalian species and 25 avian species were detected (Table 5). All species documented are common and alien to the Hawai'ian Islands, with the exception of the short-eared owl which is an endemic subspecies.

TABLE 5
Species Detected During the Avian and Terrestrial Mammal Surveys at the Auwahi Wind Project

Species	
Birds	
African Silverbill (*Lonchura cantans*)	Java Sparrow (*Padda oryzivora*)
Barn Owl (*Tyto alba*)	Mourning Dove (*Zenaida macroura*)
Black Francolin (*Francolinus francolinus*)	Northern Cardinal (*Cardinalis cardinalis*)
California Quail (*Callipepla californica*)	Northern Mockingbird (*Mimus polyglottos*)
Cattle Egret (*Bubulcus ibis*)	Nutmeg Mannikin (*Lonchura punctulata*)
Chukar (*Alectoris chukar*)	Red Junglefowl (*Gallus gallus*)
Common Myna (*Acridotheres tristis*)	Red-crested Cardinal (*Paroaria coronata*)
Common Peafowl (*Pavo cristatus*)	Ring-necked Pheasant (*Phasianus colchicus*)
Gray Francolin (*Francolinus pondicerianus*)	Short-eared Owl (*Asio flammeus sandwichensis*)
House Finch (*Carpodacus mexicanus*)	Sky Lark (*Alauda arvensis*)
Japanese Bush-Warbler (*Cettia diphone*)	Spotted Dove (*Streptopelia chinensis*)
Japanese Quail (*Coturnix japonica*)	Zebra Dove (*Geopelia striata*)
Japanese White-eye (*Zosterops japonicus*)	
Mammals	
cat (*Felis catus*)	house mouse (*Mus musculus domesticus*)
cattle (*Bos taurus*)	pig (*Sus s. scrofa*)
dog (*Canis f. familiaris*)	roof rat (*Rattus r. rattus*)
goat (*Capra h. hircus*)	small Indian mongoose (*Herpestes a. auropunctatus*)
horse (*Equus c. caballus*)	

Radar surveys were designed to specifically identify passage rates and flight heights of two federally and state listed pelagic seabird species, Hawaiian Petrel (*Pterodroma sandwichensis*) and Newell's Shearwater (*Puffinus auricularis newelli*), as well as the Hawaiian hoary bat (*Lasiurus cinereus semotus*). These surveys recorded passage rates of Hawaiian Petrel and Newell's Shearwater above the site.

The results of the invertebrate studies indicate that the project area supports a variety of native mollusks, and native and adventives arthropod species, including the federally and state listed Blackburn's sphinx moth (*Manduca blackburnii*). The Draft EIS will discuss the invertebrate species observed within the project area. The Blackburn's sphinx moth is further discussed below.

3.6.2.3 Threatened or Endangered Species

Based on the results of the surveys described above, four state and federally listed wildlife species are known to occur, or could potentially occur, within the project area (Table 6). No listed plant species have been observed within the project area.

TABLE 6
Threatened and Endangered Species Potentially Occurring in the Vicinity of the Auwahi Wind Project

Species	Status[1]	Habitat Association	Known Distribution	Potential Occurrence in the Auwahi Project Area
Hawaiian Hoary Bat[2]	SE, FE	Roosts in vegetation, including both native and alien plant species; moist, forested areas; however, little is known about its exact distribution and habitat use on Maui (Day and Cooper 2004).	Documented on the islands of Hawai'i, Maui, Oahu, Kaua'i, and Moloka'i; one unconfirmed observation on Kaho'olawe (Hawai'i Natural Heritage Program, 1992). Largest populations are thought to occur on Kaua'i and Hawai'i (Kepler and Scott, 1990; Tomich, 1974 and 1986)	Incidental observations in the vicinity of Ulupalakua Ranch (Erdman, 2009.); no designated critical habitat in the project area
Hawaiian Petrel	SE, FE	Breeds in remote, inland habitats; nesting habitat on Maui above 8,200 feet ASL in xeric habitats with very sparse vegetation; require suitable substrates for burrowing or crevices in lava (Division of Forestry and Wildlife [DOFAW], 2005).	Known to breed on Maui, Hawai'i, Lana'i and Kaua'i and possibly on Moloka'i. Documented nesting colony on Maui (approximately 1,800 birds; Simons and Hodges, 1998); suspected nesting on West Maui.	Radar study recorded petrels/shearwater targets within the wind farm site; no designated critical habitat in the project area
Newell's Shearwater	ST, FT	Remote, mountainous nesting;	Currently known to breed on Kaua'i, Hawai'i, and Moloka'i (Ainley et al., 1997; Reynolds and Richotte, 1997; Reynolds et al., 1997). Recent radar work suggests nesting may occur on Maui (Cooper and Day 2004)	(same as above)

TABLE 6
Threatened and Endangered Species Potentially Occurring in the Vicinity of the Auwahi Wind Project

Species	Status[1]	Habitat Association	Known Distribution	Potential Occurrence in the Auwahi Project Area
Blackburn's sphinx moth	SE, FE	Coastal, lowland and dryland forests with less than 50 inches of annual precipitation; larvae feed on native `aiea trees (*Nothocestrum* sp.) and other plants in the nightshade family; non-native species, including tree tobacco (*Nicotiana glauca*), commonly used as host plants	Currently known to occur on Maui, Kaho'olawe, and the island of Hawai'i	Non-native host species occur in the project area; species observed several times during the invertebrate study within the wind farm site; designated critical habitat is located on either side of the Auwahi parcel.

NOTES:
[1/]SE=state endangered; FE=federally endangered; ST=state threatened; FT=federally threatened
[2/]The Hawaiian hoary bat is the only endemic land mammal in Hawai'i

The endangered Nene (*Branta sandvicensis*) is present on the island of Maui, but is not known to occur in the vicinity of the proposed project. The Nene is found primarily within the boundaries of Haleakala National Park at elevations between 6,300 and 7,700 feet (1,920 and 2,347 meters) (Banko et al. 1999), as well as in West Maui Mountains, and around the towns of Lahaina, and Wailuku (U.S. Fish and Wildlife Service [USFWS], 2004).

3.6.3 Potential Impacts and Mitigation Measures

3.6.3.1 Flora

A follow-up botanical survey will be conducted within the footprint of the proposed facilities within the wind farm site, transmission line corridor, point of interconnection, and Papaka Road because the project design was not finalized at the time of the 2007 survey. The Draft EIS will report the results of the follow-up botanical survey, 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 (e.g., wiliwili) will be presented in the Draft EIS.

3.6.3.2 Fauna

Four state and federally listed wildlife species have the potential to occur within the project area and have the potential to be affected by construction or operation of the project. In compliance with Section 10 of the ESA and HRS § 195D-4(g), the Applicant intends to prepare a Habitat Conservation Plan (HCP) and apply for an Incidental Take Permit and Incidental Take License from the USFWS and DOFAW, respectively.

In addition to discussing the potential for "take" of a threatened or endangered species, as defined by the ESA, the Draft 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.

3.7 Cultural Resources

3.7.1 Definition of Resource

HRS Chapter 6E 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 § 6E-2).

3.7.2 Existing Conditions

Pursuant to HAR § 13-276-4, an inventory survey is required for all portions of a project area that have not previously been adequately surveyed, to identify and document the archaeological historic properties, and gather information to evaluate significance of the properties. The data gathering component requires field investigations, which consist of pedestrian surveys, evaluations, and test excavations. To date, a pedestrian-level survey, the first of a two phase effort to complete the required inventory survey, has been conducted within the wind farm site, along the transmission line and along Papaka Road. In addition, a cultural impact assessment was conducted, pursuant to HRS Chapter 6E, to identify the effects of the Proposed Action on the cultural practices of the community and State. The results of these studies are described below.

3.7.2.1 Archival Research

Before the initiation of field studies, a review of published literature and archival sources was conducted to determine if any previously known prehistoric, historic, or ethnographic resources were documented within the project area. This research revealed that while many studies have been conducted to the east or west of the wind farm site, little work has been undertaken within the Auwahi ahupua'a. During his 1931 survey of the coast, Winslow Walker recorded a heiau[2] within the coastal village of Makee. In 1997, Patrick Kirch (personal communication) completed the detailed mapping and limited test excavation of a large habitation/ritual complex on the Auwahi coast at "Ranch Beach." To the east of the project area Hammett and Folk (1994) completed a helicopter survey of fifteen areas throughout Kahikinui; they noted 41 numbered sites and site complexes. Far more extensive work was completed by Dixon (2000), Kirch (1997), Coil (2004), and Holm (2006) in the ahupua'a of Lualaʻilua, Alena, Kipapa, Nakaʻohu, Nakaʻaha, Mahamenui, and Manawainui. To the west of the project area, much work has been conducted in the Kanaiʻo ahupua'a. This included studies by Eblé and Cleghorn (1997), Eblé and Tolleson (1999), Jackson (1997), Major (1993), Ness and Williams (1996), and Parks (2003).

[2] A heiau is a Hawaiian temple.

3.7.2.2 Pedestrian Survey

For the purposes of the pedestrian survey, the concept of archaeological feature was used as the basic unit of recording. An archaeological feature is a spatially discrete unit, made up of two or more single architectural components such as pavements or free-standing walls. When one or more features are contiguous, as in a multi-chambered structure, it is referred to as a compound structure. Frequently, a number of individual features and compound structures may be found spatially clustered together; these clustered features are usually assumed to be temporally and/or functionally related, and hence such groupings are referred to as feature complexes.

The most common feature types observed in the project area are:

- **Stone mound**: a heap or mound of artificially placed stones, often size-sorted, and typically ranging between 0.5 and 2.0 meters in diameter. The functions of such mounds are difficult to determine based on surface survey alone, but many of these could potentially indicate human burials.
- **Free-standing wall**: a stacked or core-filled wall not otherwise part of a structure, often running for some distance over the landscape. Many such walls were constructed during the cattle-ranching period beginning in the later 1800s.
- **Terrace**: A level surface, usually rectangular in plan view, constructed on sloping terrain with retaining walls on the front and sides. Terraces may be either stone-filled or earth–filled and their functions were variable, encompassing agricultural, residential, and ritual activities.
- **Platform**: A level surface, usually square or rectangular in plan view, constructed with four free-standing retaining walls and filled with cobble or pebble-sized stones. Typically, platforms were used as formal burials or occasionally as boundary or territorial markers.
- **Shelter**: This is perhaps the most prevalent feature category, encompassing considerable variation in architectural style. Shelters have constructed stone walls (either stacked or core-filled) defining at least one side, but are typically less formal in plan view than enclosures (see below). In Auwahi, as elsewhere in Kahikinui, common types of shelters include C-shapes, L-shapes, and linear shelters (usually adjoining a terrace). Their functions are most commonly residential, and several shelters are often found together making up a residential or feature complex.
- **Enclosure**: These structures are defined by enclosing walls on at least three and usually four sides; they may or may not incorporate a formal entryway ("doorway"). Their plan views include rectangular, square, circular, and U-shaped varieties. Most often, such features are of residential function, although they can include agricultural and ritual functions as well.

Wind Farm Site

The pedestrian survey was conducted of a large block area containing the wind farm site between May 7, 2007, and June 3, 2007, and resulted in the discovery of 553 cultural resources. This information was used in the layout of the roadways and turbine locations so

that most of these resources could be avoided. Currently, only 79 resources appear to be potentially affected by this project (Table 7). Based upon previous research and test excavations previously conducted in the project vicinity (e.g., central and eastern Kahikinui), the probable function of many of these resources could be inferred based on their morphology, size, position in the landscape, and relation to other features. By examining those variables, 48 percent of the resources recorded in the wind farm site could be interpreted as permanent or temporary residential features.

TABLE 7
Type of Archaeological Resources Identified Within the Wind Farm Site

Type of Archaeological Resource	Number	Percent of Total
Single architectural component	12	15%
Feature	41	52%
Compound structure	4	5%
Site complex	22	28%
Total Recorded	**79**	**100%**

Transmission Line

The pedestrian survey was conducted along the transmission line on May 21-22, 2007, and resulted in the discovery of 29 resources (Table 8). Of those resources that could be associated with a probable function, the majority (approximately 21 percent) again comprised habitation or residential features.

TABLE 8
Type of Archaeological Resources Identified Along the Transmission Line

Type of Archaeological Resource	Number	Percent of Total
Single architectural component	10	34%
Feature	14	48%
Compound structure	0	0%
Site complex	5	17%
Total Recorded	**29**	**100%**

Papaka Road

The pedestrian survey was conducted along Papaka Road on January 28-30, 2008, and resulted in the discovery of 21 resources along either side of the existing road (Table 9).

TABLE 9
Type of Archaeological Resources Identified Along Papaka Road

Type of Archaeological Resource	Number	Percent of Total
Single architectural component	14	66%
Feature	4	19%
Compound structure	2	10%
Site complex	1	5%
Total Recorded	**21**	**100%**

3.7.2.3 Cultural Impact Assessment

The cultural impact assessment was conducted from April 16 to 26, 2007. To gather information about the Auwahi parcel and the surrounding area, background research was undertaken and interviews were conducted with people knowledgeable about the site, including cultural practitioners and residents/former residents of the area.

The results of the assessment indicate that no one was living in Auwahi by the 1930s. The residents of Kanai'o would venture into Auwahi to fish from the coast or to gather salt from the salt pans. Since the 1960s, access to the lands of Auwahi have been limited to Ulupalakua Ranch employees, many of whom hunted, fished, and collected shell fish from this area.

3.7.3 Potential Impacts and Mitigation Measures

Given the location and extent of the findings documented during the pedestrian survey, there is the potential for significant project related effects on cultural resources. Using the results of the pedestrian survey, the current project design avoids and minimizes impacts to archaeological resources to the extent practicable. A detailed recording and evaluation will be conducted to comply with the requirements of HAR § 13-276-4 in consultation with SHPD. The results of these studies will be provided to SHPD as part of the formal review process. The Draft EIS will present the findings of the detailed recording and evaluation, and will evaluate the project's impacts to archaeological resources. Given the location and extent of the findings documented during the pedestrian survey, it is anticipated that the project-related impacts to cultural resources would be significant. Based on these findings, the Draft EIS will also include specific measures to minimize impacts to archaeological resources, including any measures identified during the SHPD review process.

The results of the cultural impact assessment indicate that the only traditional cultural practices currently taking place at Auwahi are being practiced by Ulupalakua Ranch employees. These activities include hunting, fishing, and shell fish gathering. As long as access to the coast is maintained for Ranch employees, the proposed wind farm project would not be expected to negatively affect traditional cultural practices in the proposed project area.

3.8 Transportation and Traffic

3.8.1 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.

3.8.2 Existing Conditions

3.8.2.1 Harbors

Kahului Harbor is Maui's only commercial port and the only harbor large enough to accommodate the equipment and materials required for construction of a wind farm. Kahului Harbor lies on Kahului Bay, and is located on the northern shore of the isthmus connecting East and West Maui. The harbor occupies the eastern area of Kahului Bay and is generally bordered by the east breakwater, Hobron Avenue, Kaahumanu Avenue, and Pu'unene Avenue. Congestion within the commercial harbor is localized and dependent on the vessel arrival, type of cargo or passengers, and volume. The major areas of congestion are at Pier 1 because of the cruise ship traffic and unloading of the overseas cargo vessels, and at Pier 2 during the unloading and loading of the inter-island barge.

Materials and equipment for the proposed project would be offloaded from the cargo ships and either loaded directly into waiting trucks, or placed in a designated temporary staging area within the harbor. From the harbor, the materials and equipment would be loaded on trucks and hauled to the project site. Because the area available at the harbor for staging is limited, it is likely that the shipments of turbine components would be staggered to minimize congestion. Alternately, it may be necessary to have an offsite temporary storage yard for the turbine components. This area has to be determined and will be discussed further in the Draft EIS, if required for construction staging.

3.8.2.2 Roadways

The project area is served by a network of state, county, and privately owned roadways, including the designated construction access route from Kahului Harbor to the wind farm site, as described in Section 2.2.2.3. These roads range from multi-lane highways with paved shoulders to privately owned dirt roads. The existing conditions along each of the nine defined segments of the proposed construction access route will be described and evaluated in the Draft EIS. The only dirt roads within the proposed project area are privately owned.

3.8.2.3 Airports

The proposed wind farm would be located approximately 20 miles southeast of Kahului International Airport, approximately 22 miles southwest of the Hana Airport, approximately 32 miles southwest of Kapulua West Maui Airport, and approximately 31 miles southeast of the Hyatt Regency Maui Hotel (HI50) Airport. No other privately or publicly owned runways are known to exist on Maui.

3.8.3 Potential Impacts and Mitigation Measures

3.8.3.1 Construction

Construction of the proposed project would require increased use of the harbor and roadways along the construction access route. To facilitate the transport of oversized equipment, modifications of overhead transmission lines or traffic lights may also be necessary along the construction access route. The Draft EIS will evaluate impacts to this transportation infrastructure. In addition, the Draft EIS will present mitigation measures that would be implemented to minimize any transportation-related impacts. Based on the impact assessment, mitigation measures could include preparation of a Traffic Management Plan, which would identify measures to avoid hazards from the increased truck traffic and to minimize impact to traffic flow on local public roads and highways.

3.8.3.2 Operation

Operation of the proposed project is expected to result in very infrequent use of the harbor to deliver replacement equipment. The existing state and county roadways would be used on a regular basis for travel of operations and maintenance personnel to the proposed wind farm site. Papaka Road would not be used during operations, except for infrequent delivery of replacement equipment. Based on the location of the known runways, the project is not expected to result in an obstruction of airspace. However, in accordance with Federal Aviation Administration (FAA) Federal Aviation Regulations, a Notice of Proposed Construction or Alteration will be filed with the FAA before construction. Based on this information, operation of the proposed project is not expected to impact the harbor or roadway infrastructure.

3.9 Hazardous Materials

3.9.1 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.

3.9.2 Existing Conditions

The Auwahi parcel has been owned by Ulupalakua Ranch and actively managed as part of its ranching operation for more than 40 years. Previous owners also used the land for a combination of agriculture and ranching, with documented land use dating back more than 150 years. There have been no activities conducted that were known to generate hazardous waste, nor have any hazardous materials been disposed of within this area. To confirm the absence of hazardous materials within the proposed project area, a Phase I Environmental Site Assessment was conducted in 2007. The Phase I assessment addressed potential environmental conditions including the presence of ASTs and USTs; hazardous materials or hazardous wastes; operational contamination; landfills; potable water; wastewater; asbestos;

lead-based paint; and polychlorinated biphenyls (PCBs). No known or suspected recognized environmental conditions were identified during the Phase I assessment (Tetra Tech, 2008).

3.9.3 Potential Impacts and Mitigation Measures

3.9.3.1 Construction

Because no hazardous wastes presently occur within the proposed 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, as well as the installation of various facilities including a temporary concrete batch plant. Various hazardous materials, such as oil, diesel and lubricants, would be present during these activities. The Draft EIS will provide a detailed evaluation of the potential impacts associated with these construction activities relative to hazardous materials, and outline the measures that would be implemented to avoid and minimize those impacts.

3.9.3.2 Operation

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, lubricants, 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 Draft EIS will outline the measures that would be implemented to avoid and minimize those impacts.

3.10 Noise

3.10.1 Definition of Resource

Acoustics is the study of sound, and noise is defined as unwanted sound. Some land uses are considered more sensitive to intrusive noise than others due to the type of activities involved at the receptor location. Specifically, sensitive human noise receptors normally include residences, schools, libraries, religious institutions, hospitals and nursing homes, daycare centers, and other businesses in the vicinity of the wind farm.

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978 [42 USC §§ 4901-4918]), delegates the authority to regulate environmental noise to each state. HAR § 11- 46 ("Community Noise Control") sets 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 are established in the Community Noise Control Rules.

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.

3.10.2 Existing Conditions

The project site is a rural area with generally low ambient noise levels. There is very little development in the project vicinity, and only two homes are located within one mile of the wind farm site. Sources of ambient noise in the project area include passing vehicles on nearby roads, ranching activities (for example, off-road vehicles), rustling of vegetation, wind, rain, and wildlife.

3.10.3 Potential Impacts and Mitigation Measures

3.10.3.1 Construction

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 aboveground 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.

3.10.3.2 Operation

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

3.11 Air Quality

3.11.1 Definition of Resource

Under the authority of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (USEPA) 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, nitrogen dioxide (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).

Based on measurements of ambient criteria pollutant data, USEPA 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.

3.11.2 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 USEPA 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, 2008).

The closest air quality monitoring station to the Proposed Action area is the Kihei Station, located in the Hale Pi'ilani subdivision of upper Kihei, approximately 12 miles northwest of the proposed wind farm site. The areas surrounding this station are predominantly residential and agricultural land (primarily sugar cane). The only measurements collected at the Kihei Station are $PM_{2.5}$ and PM_{10}.

The most recent measurements reported by HDOH were recorded in 2008 (HDOH, 2008). The 24-hour PM_{10} readings in 2008 ranged between 9 and 78 micrograms per cubic meter ($\mu g/m^3$). The 24-hour $PM_{2.5}$ readings ranged between 1 and 16 $\mu g/m^3$.[3] The annual averages of PM_{10} and $PM_{2.5}$ reported at the Kihei Station for 2008 were 20 $\mu g/m^3$ and 5.5 $\mu g/m^3$, respectively. These measurements are all below the federal and state standards (HDOH, 2008).

In general, the existing air quality in this part of Maui is considered to be relatively good because of the low levels of development and automobile emissions, and exposure to consistently strong winds which help to disperse any accumulation of emissions. Because the proposed project site is undeveloped, the only sources of pollutant air emissions within or directly adjacent to the site are associated with fuel combustion emissions from vehicles on Pi'ilani Highway or ranching vehicles on Ulupalakua Ranch. This area is currently in attainment of all criteria pollutants established by the Clean Air Act and the State of Hawai'i Air Quality Standards.

3.11.3 Potential Impacts and Mitigation Measures

3.11.3.1 Construction

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. These activities could have a temporary minor impact on overall air quality at the site. Construction equipment would be a source of greenhouse gas emissions, primarily from engine fuel combustion. The major greenhouse gases for fuel combustion sources are carbon dioxide, methane, and nitrous oxide. The operation of heavy construction equipment and its associated exhaust would increase diesel exhaust emissions and would suspend dust and other construction-related particles in the air. The Draft EIS will provide a detailed evaluation of the potential air quality impacts associated with these construction activities, including a comparison to the

[3] The 30 $\mu g/m^3$ reading was flagged by HDOH because of fireworks; the next highest reading was 10 $\mu g/m^3$

established federal and state air quality standards. In addition, the EIS will outline the measures that would be implemented to minimize air quality impacts, pursuant to the provisions of HAR 11-60.1 "Air Pollution Control."

3.11.3.2 Operation

Service vehicles would be routinely used onsite, causing a relatively small negative impact on local air quality. However, on the whole, operation of the project is expected to benefit regional air quality by providing clean energy that does not require combustion of fossil fuels.

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

3.12.2.1 Wind Farm Site

The proposed wind farm would be located within the Auwahi parcel of Ulupalakua Ranch, which is actively operated as a cattle ranch. The proposed wind farm site is located entirely within the S**pecial Management Area** (SMA), a designated subset of land adjacent to the shoreline within which the County is authorized to place restrictions on development as a means to protect coastal resources. It is bordered by Pi'ilani Highway to the north, an undeveloped parcel to the west, and Department of Hawaiian Home Lands to the east. The southern edge of the project site is located approximately 1,000 feet from the Pacific Ocean.

The project site is characterized by a relatively steep north-south gradient and is vegetated with degraded pastureland with a few remnant trees from the native dryland forest. The only structures currently on the project site are water tanks used for the ranching operation. There are fewer than 10 residences scattered in the vicinity of the project site, with only two homes being located within a mile of the wind farm site. The Ulupalakua Ranch headquarters, general store and winery are located to the west of the wind farm site. Aside from the scattered homesteads and the ranch, there are no residential or commercial developments in the project vicinity.

The only public road in the wind farm vicinity is Pi'ilani Highway. A minimal amount of traffic occurs along this portion of the highway because portions of the road east of the project site are unpaved or not well maintained.

As discussed in Section 3.7, various cultural resources occur within the project site and in an ancient fishing village just south of the project site, referred to as "Ranch Beach." In

addition, the Hoapili Trail, an ancient fishing trail that is currently a lightly used hiking trail, passes along the coast directly south of the wind farm site.

3.12.2.2 Transmission Line Corridor

The transmission line corridor would extend approximately eight miles north and west of the wind farm project site to connect with the Wailea-Kealahou line just outside of Wailea. The transmission structures would consist of wooden poles.

The transmission line would pass through Ulupalakua Ranch pastureland, crossing both Pi'ilani Highway and Kula Highway. It would pass immediately west of the Auwahi Reforestation Project site and east of the Kanai'o NAR, which is open to the public for hiking. The transmission route would then extend west down the mountains that form the backdrop to the resort towns Wailea and Makena, which are considered important tourist destinations. Wailea contains several exclusive resort hotels, golf courses, and notable beaches. Wailea is bigger than Makena and contains numerous residences. However, Wailea already contains the Wailea-Kealahou line, which is similar in appearance to the proposed line.

3.12.2.3 Construction Access Route

The construction access route is comprised entirely of existing state and county roadways, with the exception of Papaka Road, which is comprised of approximately 4.6 miles of privately owned pastoral roads. Papaka Road crosses privately and publicly owned parcels which are either rural residential or undeveloped land. Several rural residences are in the vicinity of Papaka Road. Papaka Road is currently gated and is used only for access to the Ranch and other adjacent privately owned parcels. The west end of Papaka Road is located in Makena, a tourist destination. The western portion of the road is also within the SMA.

Papaka Road is the only portion of the construction access route that will require modification to allow for transport of project equipment during the construction phase. Modification of the road is necessary because much of the eastern portion is narrow, unpaved, deteriorated, or contains slopes or curves that do not conform to the transportation specifications for the turbines and other construction equipment. Modifications to Papaka Road would result in slope cutting, grading, or fill. Following the construction of the project, Papaka Road would only be used for infrequent transport of equipment, and would not be used as the primary access to the project site.

3.12.3 3.12.3 Analysis Approach and Methodology

3.12.3.1 Project Visibility and Appearance

Since turbines are the most prominent feature of a wind farm, a viewshed analysis will be conducted using the Arc Info geographic information system (GIS) program to determine the extent to which they could potentially be visible. The analysis will cover the areas extending 10 miles from the proposed wind farm, the distance recommended by the National Research Council (2007) for the analysis of the visual effects of wind energy projects. The viewshed analysis will be conservative in that the areas of potential visibility include areas in which any part of a turbine, including just the tip of the blade, may be visible. Key Observation Points (KOP) will be selected from the closest public viewpoint and photographs will be taken from these locations to characterize the existing conditions and to provide the basis for preparing simulations of the views as they would appear with the

turbines in place. Digital visual simulation images will be produced on computer renderings of a 3-D model combined with high-resolution digital base photographs.

3.12.4 Potential Impacts and Mitigation Measures

The degree to which the wind farm, the transmission line corridor and the construction access route could potentially result in a visual impact will be examined in detail in the Draft EIS, given the prominence of a wind farm in the landscape and the quality of the scenic views in this portion of Maui. In addition, the Draft EIS will describe any mitigation measures that would be implemented to reduce visual impacts from the wind farm.

Modification of Papaka Road could result in slope cutting, fill, or road widening. The Draft EIS will provide a detailed evaluation of any potential visual impacts associated with the modification to Papaka Road during the construction and operational phases. In addition, the EIS will outline measures that would mitigate the visual impacts from these activities.

3.13 Land Use

3.13.1 Definition of Resource

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.

3.13.2 Existing Conditions

The wind farm site is currently grazed pastureland, used as part of Ulupalakua Ranch's active ranching operation. The area immediately west of the wind farm site is comprised of vacant land owned by the State of Hawai'i, and the Kanai'o NAR. The north edge of the wind farm site is bounded by Pi'ilani Highway, with additional pastureland beyond. The land to the east of the wind farm site is owned by the Department of Hawaiian Home Lands (DHHL) and supports two homesteads. The Hoapili trail runs along the coastline, just south of the wind farm site.

The proposed transmission line right-of-way is also comprised entirely of grazed pasturelands, with the exception of the aerial crossings over Pi'ilani Highway and Kula Highway. The areas surrounding the transmission line right-of-way are also all grazed pasturelands, with the exception of the Kanai'o NAR and the Auwahi Reforestation Project site.

The existing portions of Papaka Road are currently used as an access road for both the Ranch, as well as for the adjacent privately owned parcels. The undeveloped portions of Papaka Road are part of the Ranch's active ranching operation. The land surrounding Papaka Road consists of a combination of privately owned and state-owned parcels used as either rural residential or undeveloped land. The west end of Papaka Road is located in the town of Makena.

The proposed project is located entirely within the State agricultural land use district and County agricultural zoning boundaries, with the exception of either end of Papaka Road.

The easternmost 2,000 feet of the roadway is located in the State conservation district and the westernmost 1,960 feet of the roadway is located in the State urban district. The portion within the State conservation district is not within the County zoning jurisdiction.

The entire wind farm site, including the portion of the transmission line that occurs within the footprint of the wind farm site, falls within the SMA. In addition, approximately 1,500 feet of the westernmost portion of Papaka Road is located within the SMA. With the exception of the portion that falls within the proposed wind farm site, the transmission line corridor is not within the SMA.

The southern extent of the wind farm site is more than 1,000 feet from the shoreline, and the western extent of Papaka Road is approximately 1300 feet from the shoreline. As such, no portion of the proposed project is located within the Shoreline Setback Area.

In November 2009, Ulupalakua Ranch made the decision to preserve in perpetuity two-thirds of the 18,000 Upcountry acres as agricultural lands. They did so formally with a donation easement to the Maui Coastal Land Trust. Ranch operations won't change, however, the deal, which is the largest of its kind in Hawai'i history, will preclude future generations from selling off the Ulupalakua land to developers.

3.13.3 Potential Impacts and Mitigation Measures

Wind farm facilities are widely recognized as being a compatible use of land with active ranch and farmlands, as operation of the wind farm does not inhibit continued ranching and/or farming activities. While not only maintaining active cattle ranching operations and preserving the livelihood of Ulupalakua Ranch's employees, implementation of the project is actually expected to increase the efficiency and productivity of ranching operations (through the use of new access roads within the wind farm site). In addition, development and operation of the wind farm would allow the majority of the Auwahi parcel to remain as open space.

Under the State regulations (HRS § 205), permitted uses on lands with agricultural productivity ratings of C, D, E, or U include "*wind machines and wind farms*" and "*wind generated energy production for public, private, and commercial use*". Pursuant to Chapter 19.30A.060(F) of the Maui County Code, the proposed project meets the definition of a major utility facility and is therefore considered a Special Use. An application for a County Special Use permit will be submitted to the County, in compliance with the requirements of the Maui County Code.

Because the proposed project would be compatible with Ulupalakua's ongoing ranching activities and is consistent with the State and County regulations, it would not be expected to affect land use. Therefore, no mitigation measures will be proposed.

3.14 Public Safety

3.14.1 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 since 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. Other potential safety concerns associated with the proposed project include electric and magnetic fields (EMF).

3.14.1.1 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 do occur 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.

3.14.1.2 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). 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.

3.14.1.3 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 laydown area, and the O&M building.

3.14.1.4 Lightning Strikes

Because of their height and metal/carbon components, wind turbines are susceptible to lightning strikes. Comprehensive 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).

3.14.1.5 Electric and Magnetic Fields

Power lines, like the energized components of electrical motors, home wiring, lighting, and all other electrical appliances, produce electric and magnetic fields, commonly referred to as

EMF. The EMF produced by the alternating current electrical power system in the United States has a frequency of 60 Hertz (Hz), meaning that the intensity and orientation of the field changes 60 times per second. Power line fields of 60 Hz are considered to be extremely low frequency.

Electric fields around transmission power lines are produced by electrical charges on the energized conductor. Electric field strength increases in strength with the line voltage and decreases as one moves farther away. The strength of the electric field is measured in kilovolts per meter (kV/m).

Magnetic fields around transmission power lines are produced by the amount of current flow, measured in terms of amperes, through the conductors. The magnetic field strength also increases as current flow increases and diminishes as one moves farther from the conductors. Magnetic fields are measured in milligauss (mG).

3.14.2 Existing Conditions

The proposed project area is currently comprised of open pastureland utilized for Ulupalakua Ranch's active ranching operation. Most of the proposed construction activities will occur in remote areas that are not readily accessible or visible by the public. Fencing currently surrounds the project area and public access is restricted. There are no significant public safety hazards associated with the existing pastureland or ranching operation.

3.14.3 Potential Impacts and Mitigation Measures

3.14.3.1 Construction

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.

3.14.3.2 Operation

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, lightning strikes, and EMF. 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.

3.15 Socioeconomic Characteristics

3.15.1 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. The number and type of housing units, ownership, and vacancy rate can be indicators of the regional quality of life. The region of influence (ROI), or geographic area that was selected as the basis on

which socioeconomic impacts of the project will be analyzed, is the two census blocks within which the project is located. The ROI includes areas within the Hana, Makawao-Pukalani-Kula, and Kihei-Makena communities, as defined by the Maui Community Plans.

3.15.2 Existing Conditions

This section describes the following socioeconomic conditions within the ROI.

3.15.2.1 Population

The island of Maui has experienced a dramatic population increase since the 1970s, and its population is projected to increase further by approximately 50 percent from 117,644 in 2000 to 176,687 people in 2030 (County of Maui Planning Department, 2009). Collectively, the population in the communities of Hana, Makawao-Pukalani-Kula, and Kihei-Makena is projected to increase by approximately 48 percent, from 46,308 to 68,553 people.

3.15.2.2 Economy

Regional Quality of Life

The proposed project is located in a rural area known for its open space, cattle ranching, sugar cane, vegetable and flower exports, and luxury residential use. Industrial earnings are strong with a Gross County Product of $4.7 billion, projected to increase to $17.9 billion in 2030 (Maui County, 2008).

Of the four counties in the State, Maui's economy is most reliant on tourism. The majority of Maui firms are small businesses with a significant number of self-employed workers representing the labor force (approximately 30 percent). The Draft Maui Island Plan (2009) includes goals to attract high-technology industries, support the expansion of agriculture and potential growth sectors of agriculture, sports and recreation, healthcare, film and entertainment, and renewable energy production.

Employment

The Makawao-Pukalani-Kula Community Plan (Maui County Council, 1996) states that the welfare of this region depends on the County as a whole because residents often work outside their community. The greatest number of salary jobs are in the fields of accommodation and food services, trade, government, "other services," business and professional services, and health services. The number of agricultural jobs continues to decline as plantations close or become more efficient. There were 3,700 agricultural jobs in 1984 and only 1,600 jobs in 2005, totaling only 2.3 percent of all jobs in Maui County. The Maui Island Plan (2008) states that a large proportion of jobs in Maui County are low-wage jobs, often tourism-related which requires most households to support themselves with two or more jobs, given the high cost of living and housing.

Although U.S. Census figures indicate a very low unemployment rate for Maui (2.7 percent), the Maui County Data Book (2008) indicates a 4.6 percent unemployment rate in 2005. Overall, employment rates for Maui Island are forecasted to remain steady, closely tracking the statewide average.

The project site is located in a designated Enterprise Zone, which is part of a joint state-county effort to stimulate certain types of business activity, job preservation, and job creation in areas where they are most appropriate or most needed. The program is headed

by the DBEDT. Businesses in certain industries, including wind energy, get tax and other incentives if they meet certain hiring requirements.

Housing and Income

Hawai'i's housing stock is very expensive compared to national averages, and housing prices on Maui are even higher than the State average. Home ownership on Maui is on par with the rest of the State; however, the resale cost of a single-family home rose 87 percent from 2002 to 2007.

The median household income in Hawai'i is 45 percent greater than the national average, but housing units are approximately 185 percent more expensive. The overall homeownership rate for Maui is approximately 57 percent, which is nearly the same for the rest of the State, but lower than the U.S. average of 66.2 percent (Maui County, 2008 and U.S. Census, 2004). The housing vacancy rate for homeowners is very low in Maui (1.6 percent), but rental housing vacancy rates are high (14 percent) compared to Hawaiian and U.S. averages. Over a third of Maui's housing units are contained in multi-unit structures.

3.15.2.3 Environmental Justice

Environmental Justice Guidance Under the National Environmental Policy Act (Council on Environmental Quality [CEQ], 1997) defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, or Hispanic. According to the guidance, a minority population should be identified where the minority population of the affected area either exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population.

Low-income populations are identified using the Census Bureau's statistical poverty threshold, which varies by household size and number of children. Nationwide, the proportion of people in poverty was 13.3 percent in 2006 (U.S. Census Bureau, 2006). The Census Bureau defines a "poverty area" as a census tract or block numbering area where 20 percent or more of the residents have incomes below the poverty threshold. An "extreme poverty area" is defined as one where 40 percent or more of the residents are living below the poverty level (U.S. Census Bureau, 1995).

The population of the ROI has a lower percentage of minority population than Maui County and the State of Hawai'i, and the proportion of the ROI minority population is less than the 50 percent threshold.

The ROI has a poverty level below the State of Hawai'i's rate of 9.3 percent and the U.S. individual poverty rate of 13.3 percent, and therefore does not meet the 20 percent definition of a poverty area.

3.15.2.4 Protection of Children

Children are not expected to be routinely present in the vicinity of the proposed wind farm. The closest elementary school is in Kula and the closest middle and high school are located in Makawao and Pukalani, respectively. The project area does not contain day care centers or recreational areas and parks.

As of 2006, there were 754 children (under 18) living in the ROI, including 179 under the age of five (U.S. Census Bureau, 2006). Although population projections are increasing, the Maui

County Department of Planning forecasts the population is aging because the Maui County median age increased from 33.5 to 36.8 years between 1990 and 2000. This is similar to trends found in the rest of the United States.

3.15.3 Potential Impacts and Mitigation Measures

3.15.3.1 Population

The project does not conflict with any general plan goals that are intended to account for population growth because the Auwahi parcel is not designated for future housing. Housing and infrastructure needed to accommodate the projected population growth for the ROI would still be achieved according to the policies of the Maui Island Plan and local community General Plans. The proposed project is not expected to affect the population; therefore, no mitigation measures are proposed at this time.

3.15.3.2 Economy

The project is expected to generate approximately 50 short-term construction jobs. There would only be a handful of full-time employment opportunities for skilled operators to operate the wind farm and maintain the turbines and transmission lines when the project is in full operation. The proposed project is expected to result in small, beneficial impacts related to employment; as such, no mitigation measures are proposed at this time.

3.15.3.3 Environmental Justice and Protection of Children

The project would not disproportionately impact low-income or minority populations because the ROI is not a poverty area and does not have a larger minority population than the greater Maui Island population. Children are not routinely present in daycares, schools or parks in the vicinity of the proposed project.

3.16 Public Infrastructure and Services

3.16.1 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.

3.16.2 Existing Conditions

3.16.2.1 Electric

MECO is the sole electrical utility provider in Maui County. MECO has two plants on Maui, with a total generating capacity of 2,328 MW. The plant located closest to the project site is in Ma`alaea and the substation located closest to the project site is in Wailea. Seventy-nine percent of Maui County's electric power comes from imported oil, with the remainder generated from alternative energy sources including biomass, wind, and hydropower.

3.16.2.2 Solid Waste

Solid waste service is not currently available at the proposed project site. Non-recyclable waste would be transported from the project site to either the Central Maui Sanitary Landfill in Pu'unene or the Maui Construction & Demolition (C&D) Landfill in Kihei. Scrap metal

would be transported to a commercial recycler. Cleared brush would be transported to a composting facility.

3.16.2.3 Water and Waste Water

Water supply services for most areas of Maui County are provided by the County of Maui Department of Water Supply. In 2007, Maui County supplied 14.7 billion gallons of water . Groundwater pumped from underground aquifers is the main source of water for Central Maui, East Maui, Moloka'i, and supplements the Lahaina and Upcountry water systems. Treated surface water is the primary source of water for upcountry and Lahaina.

The County of Maui Department of Environmental Management has three wastewater reclamation facilities located on Maui in Kihei, Wailuku-Kahului, and Lahaina, with a design capacity of 6.0, 6.8 and 8.0 MGD, respectively. The wastewater processed at each facility is 5.4, 6.0 and 6.7 MGD, respectively (Maui Economic Development Board, 2008).

The proposed project site does not currently receive water or waste water services.

3.16.2.4 Police and Fire Protection Services

The proposed project site is located in an area that has been designated as a Maui County Fire Department primary response area. In these areas, the Maui County Fire Department has the primary responsibility for responding to fires, but under specific circumstances,) they can request assistance from DOFAW. The main fire station on Maui is located in Kahului. The closest fire station to the project site is located in Kula, with an additional station located in Makawao.

The Maui Police Headquarters are located in Wailuku, and the closest police station to the proposed project site is located in Kihei.

3.16.2.5 Health Care Facilities and Emergency Medical Services

The nearest hospital to the proposed project site is the Kula Hospital, located in Kula approximately seven miles north of the wind farm site. Kula Hospital is a "critical access hospital" and does not receive ambulances. Ambulances are directed to Maui Memorial Hospital in Wailuku. Air ambulance service is available in the proposed project area.

3.16.2.6 Education Facilities

There are no public schools or facilities located within or adjacent to the project area. The closest elementary school is Kula Elementary, located approximately 12 miles north (by car). Kula Elementary serves approximately 450 students from the Omaopio area up to the Crater Road area, including Ulupalakua Ranch.

There are no public intermediate or high schools located in the vicinity of the project site. The nearest intermediate school is Samuel Enoka Kalama Intermediate School, located in Makawao, approximately 19 miles north of the wind farm site. The closest high school is King Kekaulike High School, located in Pukalani, approximately 17 miles north of the wind farm site.

3.16.2.7 Recreation Facilities

There are several recreational facilities in the proposed project vicinity. Haleakala National Park is located on Haleakala summit, approximately eight miles northeast of the proposed

wind farm site. Kula Forest Reserve, which includes several hiking trails, is located approximately four miles north of the proposed wind farm site. The Kanaiʻo NAR is adjacent to the proposed wind farm and transmission line sites. The 5.5-mile Hoapili Trail, part of the State of Hawaiʻi Trail and Access Program "Na Ala Hele," is located immediately south of the wind farm site.

The Makena-Wailea coastline, west of the proposed project site contains several resort hotels, golf courses, Makena State Park, Ahihi-Kinau NAR, and notable beaches. The beaches offer swimming, surfing, boating, and shore fishing opportunities.

3.16.3 Potential Impacts and Mitigation Measures

3.16.3.1 Construction

Fire, police, and emergency services are all available in the proposed project area, and implementation of the proposed project would not be expected to significantly impact the current service levels. The proposed project would also not be expected to affect education or recreational opportunities.

Although not available onsite, utility resources (e.g., water, solid waste disposal) are available elsewhere on Maui to support the construction component of the Proposed Action. Construction water would be from either an onsite well or transported to the wind farm site via trucks and stored in onsite tanks. Waste water (sewage), vegetative debris, C&D waste, and solid waste would be transported by truck to the appropriate local disposal facility for reclamation or landfill. Hazardous materials associated with the operation of heavy equipment and construction vehicles (e.g., oil, diesel, and lubricants) would be properly disposed of at an appropriate facility. Because the proposed project is expected to have adequate access to the necessary utility services, and would not be expected to significantly affect the existing infrastructure or service levels, no significant impacts are anticipated. Therefore, no mitigation measures are proposed at this time.

3.16.3.2 Operation

O&M of the facility could generate small amounts of solid waste, waste water, and hazardous materials, 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. Therefore, no mitigation measures are proposed at this time.

This page was intentionally left blank.

4.0 Regulatory Context

The proposed project would be subject to a variety of federal, state and local regulations and policies, each of which is briefly described below. In addition, Section 4.4 includes a list of the permits and approvals that would be obtained pursuant to those regulations and policies.

4.1 Federal Regulations

4.1.1 Endangered Species Act

Species that are federally listed as threatened or endangered, and areas that have been designated as "critical habitat" are protected under the ESA (16 U.S.C. §§ 1531-1544), as amended. Section 10(a)(1)(B) of the ESA allows private applicants to obtain an "incidental take permit" that permits otherwise prohibited impacts to protected species. To obtain a permit, the applicant must develop an HCP that analyzes the potential impacts to the listed species and details the measures that would be implemented to mitigate those impacts.

As detailed in Section 3.6, four state and federally listed wildlife species were identified within the project area. The Applicant intends to prepare an HCP and apply for an Incidental Take Permit, in accordance with the requirements of Section 10 of the ESA.

4.1.2 Clean Water Act

The Clean Water Act's (CWA) purpose is to "restore and maintain the chemical, physical and biological integrity of the nation's waters" (33 U.S.C. § 1251(a)). Section 404 of the CWA prohibits the discharge of dredged or fill material into "waters of the United States" without a permit from the U.S. Army Corps of Engineers (USACE). The definition of waters of the United States includes rivers, streams, estuaries, the territorial seas, ponds, lakes, and wetlands. Substantial impacts to waters of the United States may require an individual permit. Projects that only minimally affect jurisdictional habitat may meet the conditions of one of the existing Nationwide Permits.

The proposed wind farm site includes an intermittent drainage along the western boundary which may be subject to jurisdiction under Section 404 of the CWA, However, the current project design avoids this intermittent drainage.

4.1.3 Clean Air Act

Under the authority of the CAA, the USEPA has established nationwide air quality standards to protect public health and welfare (42 U.S.C. § 7409). These federal standards, known as NAAQS, represent the maximum allowable atmospheric concentrations for six criteria pollutants: ozone, NO_2, carbon monoxide, SO_2, lead, and PM_{10} and $PM_{2.5}$. The Clean Air Branch of the HDOH is responsible for implementing air pollution control in the state and has established HAAQS.

Based on measurements of ambient criteria pollutant data, USEPA 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. The necessary air permit(s), as required by HAR § 11-60.1, would be obtained prior to construction.

4.1.4 Federal Aviation Regulations

Part 77 of the FAA Federal Aviation Regulations (14 CFR Part 77) applies to objects that may obstruct navigable airspace. A person must file a "Notice of Proposed Construction or Alteration" with the FAA before construction of an object whose height is 200 feet above ground level. The Applicant will file the Notice after the turbine layout is final and prior to the initiation of turbine construction activities.

4.2 State Regulations

4.2.1 Hawai'i's Environmental Impact Review Law (HRS Chapter 343)

HRS Chapter 343 is designed to "establish a system of environmental review which will ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations." The regulations identify nine specific activities that trigger the need for preparation of an EA. The purpose of an EA is to evaluate whether a proposed action would result in a significant impact on the environment, in which case preparation of an EIS would be required. The determination of whether an action would have a significant impact is based on an evaluation of the expected consequences of the proposed action, including the cumulative and overall effects, relative to a set of established significant criteria, as defined in HAR § 11-200-12. If a significant impact is anticipated from start of the project, a Final EA, such as this document, may be prepared to serve as a mechanism for public comment and scoping.

The Proposed Action involves three activities that are triggers for compliance with HRS Chapter 343: (1) use of state land, (2) use of county land, and (3) use of land classified as conservation district land. The project would also require approval from the County Planning Commission/County Planning Department for a Special Use Permit and an SMA permit, which represent the early, major approvals for the project. For the SMA permit application, the County requires that an EA/EIS be submitted if it is required to comply with Chapter 343. Based on agreement between the various agencies, the County of Maui Planning Commission/Planning Department has been identified as the "accepting agency" for purposes of compliance with Chapter 343.

4.2.2 State Land Use Law (HRS Chapter 205)

The State Land Use Law (HRS Chapter 205) established the State Land Use Commission (LUC), which has the authority to designate all state lands into one of four districts: urban, rural, agricultural, or conservation. The proposed project is located within the state

agricultural district, except for two portions of Papaka Road, one of which is located in the urban district and the other in the conservation district.

Pursuant to HRS § 205-4.5(c) lands with productivity ratings of C, D, E, or U are restricted to the uses permitted for agricultural districts as set forth in HRS § 205-5(b), which in turn permits activities compatible with those listed in HRS § 205-2, with the provision that those activities may be further defined by the County. HRS § 205-2(d)(4) includes "wind generated energy production for public, private, and commercial use" and HRS § 205-2(d)(7) includes "wind machines and wind farms". Therefore, the proposed project is a permissible use and a State Special Use Permit is not required.

4.2.3 State Conservation District Law (HRS Chapter 183C)

Land uses within the State conservation district are under the sole jurisdiction of the State and are governed by HRS § 183C and the rules of the Department of Land and Natural Resources (HAR § 13-5). The conservation district was created to protect "important natural resources essential to the preservation of the state's fragile natural ecosystems and the sustainability of the state's water supply." Conservation districts are further divided into five subzones: protective, limited, resource, and general, and a "special" subzone to accommodate unique projects (HRS § 183C-4). Identified land uses within each subzone are defined by HAR § 13-5, and require a discretionary permit from DLNR. Therefore, a Conservation District Use Permit will be sought for the small portion of Papaka Road that is located within the Conservation district.

4.2.4 State Endangered Species Act (HRS § 195D-4)

Any species of aquatic life, wildlife, or land plant that has been determined to be threatened or endangered species pursuant to the Endangered Species Act is also considered to be threatened or endangered under the State Law, and subject to the conditions of HRS § 195D-4. In addition, any indigenous species may be determined by DLNR to be threatened or endangered based on the following factors:

- The present or threatened destruction, modification, or curtailment of its habitat or range;
- Overutilization for commercial, sporting, scientific, educational, or other purposes;
- Disease or predation;
- The inadequacy of existing regulatory mechanisms; or
- Other natural or artificial factors affecting its continued existence within Hawai'i.

An Incidental Take License may be obtained to allow a take of a threatened or endangered species provided that (1) take impacts are minimized and mitigated; (2) the mitigation plan increases the likelihood that the species will survive and recover; (3) the project provides net environmental benefits; and (4) the take is not likely to cause the loss of genetic representation of an affected population of any endangered, threatened, proposed, or candidate plant species. As detailed in Section 3.6, four state and federally listed wildlife species have been identified within the project area, and therefore, the Applicant intends to apply for an Incidental Take License.

4.2.5 Coastal Zone Management Act (HRS Chapter 205A)

All land within the State of Hawai'i is subject to the Hawai'i Coastal Zone Management Act of 1977 (CZMA) (HRS § 205A), as amended, which complies with the Federal Coastal Zone Management Act of 1972 (16 U.S.C. §§ 1451-1456). This is because all lands of Hawai'i are considered to be within the coastal zone as defined by HRS § 205A. The Hawai'i Coastal Zone Management Program integrates decisions made by state and county agencies such as the Land Use Commission, DLNR, Department of Health, Department of Transportation, and Department of Agriculture to provide greater coordination and compliance with existing laws and rules.

The Hawai'i CZMA provides Maui County with regulatory control over development within the SMA and Shoreline Setback Area (SSA) of the coastal zone, as discussed below.

4.3 Local Regulations

4.3.1 County Zoning

Under Chapter 19.30A.060(F) of the Maui County Code, the proposed project is considered a Special Use, as it meets the definition of a major utility facility (Chapter 19.04.040):

> *"…uses or structures which provide utility services which have potential major impact, by virtue of their appearance, noise, size, traffic generation, or other operational characteristics which include, but which are not limited to, forty-six kilovolt transmission substations, power plants, base yards, water and wastewater treatment facilities, but not including private, individual cesspools, septic tanks, or individual household waters supplies."*

Therefore, the proposed project requires a County Special Use Permit from the County Planning Commission.

4.3.2 Special Management Area and Shoreline Setback Area

The SMA is a subset of the coastal zone and is regulated to ensure that permitted activities are consistent with the objectives and policies of the CZMA and SMA guidelines. The SMA extends inland from the shoreline, generally by a minimum of 100 yards. Within the SMA, the potential impacts of proposed development are scrutinized with respect to drainage, view planes, historic and cultural artifacts, coastal erosion, and shoreline access. The proposed wind farm site and approximately 1,500 feet of the western-most portion of Papaka Road are located within the SMA. Except for the portion that falls within the footprint of the wind farm site, the proposed transmission line corridor is located outside the SMA. Therefore, an SMA Use permit will be requested from the County for the development of the proposed wind farm and a portion of Papaka Road.

The Shoreline Setback Area is a subset of the SMA. The minimum setback ranges from 25 feet to 150 feet from the shoreline. No portion of the proposed project is located within the Shoreline Setback Area. The southern boundary of the wind farm site is more than 1,000 feet from the shoreline and the westernmost stretch of Papaka Road is approximately 1,300 feet from the shoreline. Therefore, the proposed project is not subject to the Shoreline Setback Rules, as defined by the County.

4.3.3 Maui General Plan

The Maui County General Plan was adopted in 1980 and was updated in 1990 (Maui County, 1980; 1990). Major themes of the general plan include the use of county land for the social and economic betterment of residents, protecting environmental resources, preserving agricultural land, making the county more self-sufficient in energy use, providing public utilities that meet community needs, and improving the quality of public facilities. The plan is now being revised as the 2030 Draft Plan. Themes of the amendment include making Maui County more self-sufficient by limiting the amount of non-renewable energy used. The project's compliance with the specific goals, policies, and objectives of the Maui General Plan will be addressed in the EIS.

4.3.4 Community Plans

4.3.4.1 Hana Community Plan

The wind farm site is located within the area covered by the Hana Community Plan (Maui County Council, 1994). The community plan contains goals that express the long-term vision of the Hana community. The goals are supported by objectives and policies that specify general steps to achieve those goals. The plan also contains implementing actions that identify specific programs, project requirements, and activities necessary to achieve the goals. The plan emphasizes the preservation of the natural beauty, cultural resources and practices, and the character of the Hana community, but also focuses on the land use and environmental resources of the entire district. The goals outlined in the plan aim to preserve Hana's unique resources while providing its residents with economic opportunities. The project's compliance with the specific goals, policies, and objectives in the Hana Community Plan will be addressed in the EIS.

4.3.4.2 Makawao-Pukalani-Kula Community Plan

The majority of the transmission line and Papaka Road would be located within the area covered by the Makawao-Pukalani-Kula Community Plan (Maui County Council, 1996). Like the plans for the surrounding communities, the Makawao-Pukalani-Kula Plan contains goals that express the long-term vision of the community. The goals are supported by objectives and policies that specify steps to achieve the goals. The plan also contains implementing actions that identify specific programs, project requirements, and activities necessary to achieve the goals. The overall plan seeks to balance future growth and development in a manner reflective of the rural/agricultural character of the region. In particular, it stresses the protection of the region's open space and the character of the various communities. The project's compliance with the specific goals, policies, and objectives in the Makawao-Pukalani-Kula Community Plan will be addressed in the EIS.

4.3.4.3 Kihei-Makena Community Plan

A small portion of the transmission line and Papaka Road would be located within the area covered by the Kihei-Makena Community Plan (Maui City Council, 1998). Like the plans of neighboring communities, the Kihei-Makena Community Plan expresses the goals of the community. The plan goals are supported by objectives and policies that specify steps to achieve the goals. The plan also contains implementing actions that identify specific programs, project requirements, and activities necessary to achieve the goals. The community plan stresses three planning themes: (1) the provision of needed public facilities

and infrastructure, (2) the preservation and enhancement of significant natural resources, and (3) the enhancement of neighborhoods. The project's compliance with the specific goals, policies, and objectives in the Kihei-Makena Community Plan will be addressed in the EIS.

4.4 Required Permits for Project Development

The permits or approvals that are expected to be required, or could potentially be required for the proposed project are presented in Table 10.

TABLE 10
Permits and Approvals Required for the Auwahi Wind Farm Project

Permit/Approval	Responsible Agency	Status
Chapter 343 EA/EIS	Maui County Planning Department/Planning Commission	In progress
National Environmental Policy Act (NEPA) Compliance[1]	U.S. Fish and Wildlife Service	To be completed
Conservation District Use Permit	State of Hawai'i, DLNR, Office of Conservation and Coastal Lands (OCCL)	To be completed
National Historic Preservation Act Section 106 Compliance	State of Hawai'i, DLNR, State Historic Preservation Division	To be completed
Clean Water Act Compliance (Sections 401/402/404)	State of Hawai'I, Department of Health, Clean Water Branch / U.S. Army Corps of Engineers	To be completed
Special Management Area Use Permit	Maui County Planning Department/Planning Commission	To be completed
Shoreline Setback Assessment/Activity Assessment	Maui County Planning Department/Planning Commission	Complete
Maui County Special Use Permit	Maui County Planning Department/Planning Commission	To be completed
Request for Use of State Lands	State of Hawai'i, DLNR, Land Management Division	To be completed
Incidental Take Permit	U.S. Fish and Wildlife Service	To be completed
Incidental Take License	State of Hawai'i, DLNR, DOFAW	To be completed
Use and Occupancy Agreement	HDOT	To be completed
County Right-of-Way Approval	County of Maui, Department of Public Works	To be completed
PUC Approval of Power Purchase Agreement	Public Utilities Commission	To be completed
Notice of Proposed Construction of Alteration	Federal Aviation Administration	To be completed
Grading/Building and Other Construction Permits	Various	To be completed

NOTES:

[1] NEPA compliance is triggered by a federal action, which in the case of this project would be the issuance of an Incidental Take Permit by the U.S. Fish and Wildlife Service.

5.0 Findings and Anticipated Determination

5.1 Significance Criteria

Pursuant to Section 11-200-12 of the Hawai'i Administrative Rules, the determination of whether an action would have a significant impact on the environment should be based on an evaluation of the expected consequences of the proposed action, including the cumulative and overall effects, using the listed significance criteria. Each of these significance criteria are presented below, and are discussed in the context of the proposed project.

Subparagraph B of HAR § 11-200-12 states that "in most instances, an action shall be determined to have a significant effect on the environment if it":

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Curtails the range of beneficial uses of the environment;
- Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revision thereof and amendments thereto, court decisions, or executive orders;
- Substantially affects the economic and social welfare of the community or state;
- Substantially affects public health;
- Involves substantial secondary impacts such as population changes or effects on public facilities;
- Involves a substantial degradation of environmental quality;
- Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;
- Substantially affects a rare, threatened, or endangered species, or its habitat;
- Detrimentally affects air or water quality or ambient noise levels;
- Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;
- Substantially affects scenic vistas and viewplanes identified in county or state plans or studies; or
- Requires substantial energy consumption.

5.2 Anticipated Determination

Based on the established significance criteria and the description of the proposed project, as presented in Section 3 of this EA, 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 Chapter 343 and HAR § 11-200, the Applicant intends to prepare an EIS to evaluate the impacts associated with the proposed project.

6.0 Consulted Parties

6.1 Consultation

The list of parties consulted before and during the development of the EISPN/EA is presented below in Table 11.

TABLE 11
Agencies and Other Parties Consulted During Development of the Final EA

Agency/Entity	Contact Name	Date of Consultation
USFWS	Mr. Bill Standley	October 24, 2007 November 10, 2009
USACE	Mr. Farley Watanabe	July 2, 2007
FAA	Stacey Kaopuiki, Kahului Airport Tower Manager Cheryl Tsutsuse, Honolulu Airports District Office Representative Flight Standards District Office	June 6, 2008
DLNR	Ms. Laura Thielen, Chairperson Mr. Russell Tsuji, Deputy Director	November 19, 2007
OCCL	Mr. Sam Lemmo, Administrator Mr. Michael Cain, Planner	February 14, 2007
	Ms. K. Tiger Mills, Planner	July 12, 2007
	Mr. Sam Lemmo, Administrator Mr. Michael Cain, Planner	November 19, 2007
	Mr. Sam Lemmo, Administrator	November 10, 2009
State of Hawai‘i, DLNR, Land Division	Ms. Charlene Unoki Mr. Daniel Ornellas	July 12, 2007
	Mr. Gary Martin	November 19, 2007
	Mr. Daniel Ornellas	November 12, 2009
State of Hawai‘i, DLNR, DOFAW	Mr. Scott Fretz	October 24, 2007
	Mr. Paul Conry Mr. Scott Fretz	November 19, 2007
	Ms. Lauren Goodmiller	November 10, 2009
State of Hawai‘i, DLNR, Historic Preservation Division	Ms. Melissa Kirkendall	February 13, 2007
	Ms. Jenny Pickett Ms. Patti Conte	November 19, 2007 November 12, 2009
State of Hawai‘i, DLNR, Commission on Water Resource Management	Mr. Ken Kawahara, Deputy Director Ms. Lenore Ohye, Hydrologist	November 19, 2007
State of Hawai‘i, DLNR, Division of State Parks	Ms. Lauren Tanaka Mr. Dan Quinn	November 19, 2007

TABLE 11
Agencies and Other Parties Consulted During Development of the Final EA

Agency/Entity	Contact Name	Date of Consultation
State of Hawai'i, DBEDT	Mr. Bill Parks Mr. Maurice Kaya Ms. Maria Tome	November 19, 2007
State of Hawai'i, DBEDT, Land Use Commission	Mr. Tony Ching, Executive Officer	February 14, 2007
	Mr. Tony Ching, Executive Officer	November 19, 2007
	Mr. Dan Davidson, Executive Officer	August 28, 2008
	Mr. Josh Strikler Ms. Malama Minn	November 10, 2009
HDOT	Mr. Dean Yogi, Right-of-Way Manager	May 11, 2007 September 4, 2007
DHHL	Mr. Micah Kane Mr. Todd Gray Ms. Noel Akamu Ms. Julie-Ann Cachola	April 14, 2008
County of Maui, Department of Planning	Ms. Robyn Loudermilk, Planner Mr. Clayton Yoshida, Planning Program Administrator	February 13, 2007
	Mr. Paul Fasi Ms. Ann Cua Mr. Jeff Hunt Mr. Francis Huriso Ms. Kathleen Ross Aoki	November 12, 2009
County of Maui, Office of Economic Development	Ms. Deidre Tegarden, Economic Development Coordinator Mr. Victor Reyes, Energy Commissioner	February 13, 2007
County of Maui, Department of Management	Mr. Kalvin Kobayashi, Energy Coordinator	February 13, 2007
County of Maui, Zoning Administration and Enforcement Division	Mr. Aaron Shinmoto, Planning Program Administrator Mr. Frances Cerezo, Planner	February 13, 2007
County of Maui, Public Works	Ms. Leslie Otani	May 7, 2007
Neighbors and Ranch Employees		April 17, 2007
		April 14, 2008

7.0 List of Preparers

Name	Primary Responsibilities
George Redpath: Tetra Tech	EIS Lead, Senior Review
Alicia Oller; Tetra Tech	Project Manager, Senior Review
Connie Farmer, Tetra Tech	Senior Review
Brita Woeck; Tetra Tech	Biological Resources
Anna Mallon: Tetra Tech	Senior Planner

This draft EISPN was prepared using documentation provided to Tetra Tech by Sempra. These materials were obtained from Shell Wind and were prepared by Shell Wind consultants including Black & Veatch and CH2M Hill and their sub-consultants. The bulk of this EISPN is derived from the Draft Environmental Assessment (EA) prepared by CH2M HILL for Shell Wind dated October 9, 2008. Technical studies used to prepare the Draft EA were provided by various sub-consultants to CH2M Hill. Portions of the Draft EA are incorporated in this EISPN in whole or in part. Tetra Tech has updated information where new data are readily available, weather statistics being one example. However, no additional studies or field work were conducted by Tetra Tech in preparing this EISPN. Notwithstanding anything to the contrary included in the contract documents, Tetra Tech EC shall be entitled to rely, without independent verification, on the accuracy and currency of information supplied by Sempra or by any of Sempra's contractors, vendors, or consultants, or available from generally accepted reputable sources. However, all data and studies will be further reviewed and updated as necessary for the EIS.

This page was intentionally left blank.

8.0 References

Ainley, D. G., T. C. Telfer, and M. H. Reynolds. 1997. Townsend's and Newell's Shearwater (*Puffins auricularis*). In A. Poole and F. Gill (eds.). The birds of North America, No. 297. Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, DC. 20pp.

Altenberg. L. 2007. Remnant wiliwili forest habitat at Wailea 670, Maui, Hawai'i. Special Report, Maui Ecosystems at Risk. http://www.santafe.edu/~altenber/DISTRIB/Wailea670.v1.pdf. Accessed September 5, 2007.

Banko, P.C., J.M. Black, and W. E. Banko. 1999. Hawai'i Goose (nene). The Birds of North America, No. 434

Black & Veatch. 2007. *Cost Estimate, Site Layout and Transport Review Report, Auwahi South Wind Energy Project.* January.

Black & Veatch. 2008. *Preliminary Geotechnical Investigation Report. Auwahi Wind Project, Kanai'o, Hawai'i.* Prepared for Shell WindEnergy Inc. March.

Brandt, C. A., J. K. Parish, and C. N. Hodges. 1995. Predictive approaches to habitat quantification: Dark-rumped Petrels on Haleakala, Maui. Auk 112:571-579.

Buhyoff, G. J., P. A. Miller, J. W. Roach, D. Zhou, and L. G. Fuller. 1994. An AI Methodology for Landscape Visual Assessments. AI Applications. Vol. 8, No. 1., pp. 1-13.

Businger, Steven. 1998. *Hurricanes in Hawai'i*. University of Hawai'i, Department of Meteorology. September 25. http://www.soest.Hawai'i.edu/MET/Faculty/businger/poster/hurricane/. Accessed on March 24, 2008.

Businger, Steven. 1998. Hurricanes in Hawai'i. University of Hawai'i, Department of Meteorology. September 25. Available online at: http://www.soest.Hawai'i.edu/MET/Faculty/businger/poster/hurricane/Fig2_tracks.gif.

Coil, J. 2004. The Beauty that Was: Archaeological Investigations of Ancient Hawaiian Agriculture and Environmental Change in Kahikinui, Maui, Hawaiian Islands. Unpublished Ph.D. dissertation on file at the University of California, Berkeley.

Commission on Water Resources Management (CWRM). 2008. Hawai'i Water Plan, Water Resource Protection Plan. Prepared for State of Hawai'i Commission on Water Resource Management. Prepared by Wilson Okamoto Corporation. http://hawaii.gov/dlnr/cwrm/planning_wrpp.htm Accessed December 13, 2009.

Council on Environmental Quality (CEQ). Environmental Justice Guidance Under the National Environmental Policy Act. 1997. http://www.epa.gov/compliance/resources/policies/ej/ej_guidance_nepa_ceq1297.pdf Accessed May 21, 2008.

County of Maui, Department of Planning. 2009. Draft Maui Island Plan. December. http://www.co.maui.hi.us/departments/Planning/gp2030/. Accessed December 18, 2009.

County of Maui, Office of Economic Development. 2008 Maui County Data Book. March 2009. http://www.hbrl-sbdc.org/mcdb/2008.htm. Accessed December 9, 2009.

David, Reginald E. and Eric Guinther. 2010. *A Survey of Botanical, Avian and Terrestrial Mammalian Resources for the Sempra Energy, Auwahi Wind Generation Project, 'Ulupalakua Ranch, Island of Maui*. Prepared by Rana Productions, Ltd. and AECOS Consultants. Revised January 10, 2010.

Department of Land and Natural Resources (DNLR), Division of Forestry and Wildlife (DOFAW). 2005. Hawai'i's Comprehensive Wildlife Conservation Strategy. October 1. http://www.state.hi.us/dlnr/dofaw/cwcs/files/NAAT%20final%20CWCS/Chapters/Terrestrial%20Fact%20Sheets/Seabirds/Hawaiian%20petrel%20NAAT%20final%20!.pdf

Dixon, B., P.J. Conte, V. Nagahara, and W. K. Hodgins. 2000. Kahikinui Mauka: Archaeological Research in the Lowland Dry Forest of Leeward East Maui. Prepared for the Department of Hawaiian Home Lands by the Historic Preservation Division Department of Land and Natural Resources.

Duvall, F. and R. Gassmann-Duvall. 1991. *No bats on Maui? Look again.* 'Elepaio 51 (3): 1-2.

Eblé, F. and W. Tolleson. 1999. Report of Archaeological Monitoring and Survey Conducted During Explosive Ordnance Removal on a 293 Acre Parcel at the Hawai'i Army National Guard Kanai'o Training Area, Kanai'o, Maui, State of Hawai'i. TMK: 2-1-02. Prepared for Goodfellow Brothers, Inc., Kīhei, Hawai'i.

Eblé, F., P. Cleghorn, and P. V. Kirch. 1997. Final Report of Archaeological Reconnaissance Survey Conducted at the Hawai'i National Guard Kanai'o Training Area, on the Island of Maui, State of Hawai'i. Submitted to U.S. Army Engineer District, Fort Shafter, Hawai'i, by Garcia and Associates, Honolulu, Hawai'i.

Erdman, Sumner. 2009. Personal communication between Sumner Erdman and Reggie David.

Federal Emergency Management Agency (FEMA). 2008. *Map Service Center*. http://www.msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA%20Flood%20Zone%20Designations. Accessed on March 25, 2008.

Foote, D. E., E. L. Hill, S. Nakamura, and F. Stephens. 1972. *Soil Survey of the Islands of Kaua`i, O`ahu, Maui, Moloka`i, and Lana`i, State of Hawai`i.* US Department of Agriculture, Soil

Conservation Service, in Cooperation with the University of Hawai`i Agricultural Experiment Station. August 1972.

Freedman, Carl. 2007 *Maui County Water Use and Development Plan Draft. Water Use and Demand Department of Water Supply Systems.* Haiku Design & Analysis. May 1. http://mauiwater.org/WUDPdraftDemand.pdf Accessed May 29, 2008.

Global Energy Concepts, LLC. 2006. A Catalog of Potential Sites for Renewable Energy in Hawai'i, Produced for the State of Hawai'i Department of Land and Natural Resources and the Department of Business, Economic Development, and Tourism, In response to Act 95, Session Laws of Hawai'i 2004. December. http://Hawai'i.gov/dbedt/info/energy/publications/cpsre07.pdf.

Guinther, Rick. 2008. Personal communication between Rick Guinther and CH2M Hill.

Hamer Environmental L.P. 2010. *Endangered Bird and Bat Surveys at the South Auwahi Wind Resource Area, Maui, Hawaii*. Draft Report. Revised January 6, 2010.

Hammatt, H. and W. Folk. 1994. Archaeological Reconnaissance of an 8, 300-Acre Project Area, Kahikinui, Maui. TMK: 1-9-01:3. Prepared for R.M. Towill Corporation by Cultural Surveys, Hawai'i.

Hawai'i Department of Health (HDOH), State of. 2008. Annual Air Summary – Hawai'i Air Quality Data. http://hawaii.gov/health/environmental/environmental/air/cab/cabmaps/pdf/2008_aqbook.pdf.

Hawai'i Department of Health (HDOH), State of. 2007c. *Clean Air Branch, Ambient Air Quality Standards*. Accessed October, 19, 2007. http://www.Hawai'i.gov/health/environmental/air/chart.pdf.

Hawai'i Institute of Marine Biology. 2006. Hawai'i Coral Reef Assessment & Monitoring Program. September 30. http://cramp.wcc.Hawaii.edu/tables/maui.htm. Accessed December 18,, 2009.

Hawai'i State Civil Defense. 2008. Tsunami Hazard Map. http://www5.Hawai'i.gov/tsunami/maps.asp. Accessed on March 18, 2008.

Hawai'i Wind Working Group. 2004. Hawai'i's Windiest Locations. September 20. http://www.state.hi.us/dbedt/ert/wwg/windy.html. Accessed May 22, 2008.

Holm, L. 2006. The Archaeology and the 'Aina of Mahamenui and Manawainui, Kahikinui, Maui Island. Unpublished Ph.D. dissertation on file at the University of California, Berkeley.

Jackson, T. 1997. Final Historic Preservation Plan for Hawai'i Army National Guard Kanai'o Training Area, Island of Maui, Hawai'i. Submitted to U.S. Army Engineers Division, Fort Shafter, Hawai'i by Garcia and Associates, Honolulu, Hawai'i. Prepared by Pacific Legacy, Inc., Aptos, California.

Kepler, C.B. and M. Scott. 1990. Notes on distribution and behavior of the endangered Hawaiian Hoary Bat (*Lasiuris cinerus semotus*), 1964-1983. 'Elappaio 50:59-64.

Kirch, P.V. (editor). 1997. Na Mea Kahiko o Kahikinui: Studies in the Archaeology of Kahikinui, Maui. Oceanic Archaeology Laboratory, Archaeological Research Facility, University of California, Berkeley.

Land Study Bureau. 1967. Detailed Land Classification, Island of Maui.

Major, M. 1993. Preliminary Archaeological Reconnaissance at Kanai'o Ahupua`a, Maui, Hawai'i. Prepared for Nature Conservancy of Hawai'i, Honolulu, Hawai'i by Applied Research Group, Honolulu, Hawai'i. Manuscript No. 020893.

Maui County. 1980. The General Plan of the County of Maui. http://www.mauicounty.gov/departments/Planning/pdf/GenPlan1980.PDF. Accessed August 11, 2008.

Maui County. 1990. The General Plan of the County of Maui (Update). http://www.co.maui.hi.us/departments/Planning/generalPlan1990.htm. Accessed August 11, 2008.

Maui County Council. 1994. Hana Community Plan. http://www.co.maui.hi.us/departments/Planning/pdf/hana.pdf. Accessed May 22, 2008.

Maui County Council. 1996. Makawao-Pukalani-Kula Community Plan. July. http://www.co.maui.hi.us/departments/Planning/pdf/makawao.pdf. Accessed May 22, 2008.

Maui County Council. 1998. Kihei-Maken Community Plan. http://www.co.maui.hi.us/departments/Planning/pdf/kihei.pdf. Accessed June 5, 2008.

Maui Economic Development Board, Inc. 2008. Utilities. http://www.medb.org/communityprofile/utilities.cfm Accessed June 5, 2008.

National Research Council. 2007. Committee on Environmental Impacts of Wind Energy Projects. Natural Academies Press, Washington, D.C.

Nees, R. and S. Williams. 1996. Archaeological Inventory Survey of Four Impact Areas, HIARNG Kanai'o Impact Range, Kanai'o Ahupua`a, Makawao District, Maui Island. Submitted to Hawai'i National Guard, Honolulu, Hawai'i. Prepared by Ogden Environmental and Energy Services Co., Inc., Honolulu, Hawai'i.

NESH Working Group. 2005. Draft Newell's Shearwater Five-Year Workplan. October. http://www.state.hi.us/dlnr/dofaw/fbrp/docs/NESH_5yrPlan_Sept2005.pdf.

Pacific Disaster Center. 2008. *Harmful Effects of Wildfires in Hawai'i.* http://www.pdc.org/iweb/wildfire_effects.jsp?subg=1. Accessed on March 25, 2008.

Pacific Disaster Center. 2008. Hawai'i Tsunami Events. http://www.pdc.org/iweb/tsunami_history.jsp. Accessed on March 18, 2008.

Parks, V. 2003. Kanai'o Natural Area Reserve Ungulate Exclusion Fence Project: Cultural Resources Investigation. Prepared by U.S. Fish and Wildlife Service, Cultural Resources Team, Sherwood, Oregon.

Pyle, R. L. 1983. Hawaiian Islands Region (1 June-31 July 1983). American Birds 37:1028-1029.

Reynolds, M. H., and G. L. Richotte. 1997. Evidence of Newell's Shearwater breeding in the Puna District, Hawai'i. Journal of Field Ornithology 68:26-32.

Reynolds, M. H., B. A. Cooper, and R. H. Day. 1997. Radar study of seabirds and bats on windward Hawai'i. Pacific Science 51: 97-106.

Simons, T. R. and C. N. Hodges. 1998. Dark-rumped Petrel (Pterodromapheaopygia) In A. Poole and F. Gill (eds.). The birds of North America, No. 345. Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, DC. 24pp.

Simons, T.R. 1984. A population model of the endangered Hawaiian dark-rumped petrel. J. Wildl. Mgmt. 48(4): 1065-1076.

State Department of Agriculture. 1977. Agricultural Lands of Importance to the State of Hawai'i Revised. November. http://Hawai'i.gov/dbedt/gis/data/alish_n83.txt.

Stearns, H.T. 1966. *Geology of the State of Hawai'i*. Pacific Books Publishers. Palo Alto, California.

Tetra Tech. 2008. *Phase I Environmental Site Assessment, Proposed Wind Farm, Ulupalakua Ranch, Maui, Hawai'i.* February 20.

Tomich, P. Q. 1974. The Hoary Bat in Hawai'i: Daredevil of the volcanoes. Natl. Parks Conserv. Mag. 48:10-13.

Tomich, P. Q. 1986. Mammals in Hawai'i: A synopsis and notational bibliography. Rev. ed. Museum, Honolulu, HI. Spec. Publ.76 384pp.

U.S. Census Bureau. 1994. Census of Housing Historical Census of Housing Tables: Homeownership. Housing and Household Economic Statistics Division December. http://www.census.gov/hhes/www/housing/census/historic/owner.html. Accessed June 19, 2008.

U.S. Census Bureau. 1995. U.S. Statistical Brief: Poverty Areas. June. http://www.census.gov/apsd/www/statbrief/sb95_13.pdf. Accessed June 2, 2008.

U.S. Census Bureau. 2000. *Census 2000*. Available at: http://www.census.gov/main/www/cen2000.html Accessed June 2, 2008.

U.S. Census Bureau. 2006. *American FactFinder*. American Community Survey. http://factfinder.census.gov. Accessed on May 29, 2008.

U.S. Department of Agriculture Forest Service. 1995. Landscape Aesthetics: A Handbook for Scenery Management. Agriculture Handbook No. 701. December.

U.S. Department of Transportation Federal Highway Administration. 1988. Visual Impact Assessment for Highway Projects.

U.S. Fish and Wildlife Service. 2004. Draft revised recovery plan for the Nene or Hawaiian Goose (*Branta sandwicensis*). U.S. Fish and Wildlife Service, Portland, OR. 149 + xi pp.

U.S. Fish and Wildlife Service. 2008. Threatened and Endangered Animals in the Hawaiian Islands. http://www.fws.gov/pacificislands/wesa/hrybatindex.html. Accessed on April 17, 2008.

U.S. Geological Survey. 1996. Hawaiian Volcano Observatory. Volcano Watch. November 27. http://hvo.wr.usgs.gov/volcanowatch/1996/96_11_27.html. Accessed on March 18, 2008.

U.S. Geological Survey. 2001. Hawaiian Volcano Observatory. Earthquakes. June 18. http://hvo.wr.usgs.gov/earthquakes/. Accessed on March 24, 2008.

U.S. Geological Survey. 2008. Earthquake Hazards Program. January 25. http://earthquake.usgs.gov/learning/topics/canit.php. Accessed on March 18, 2008.

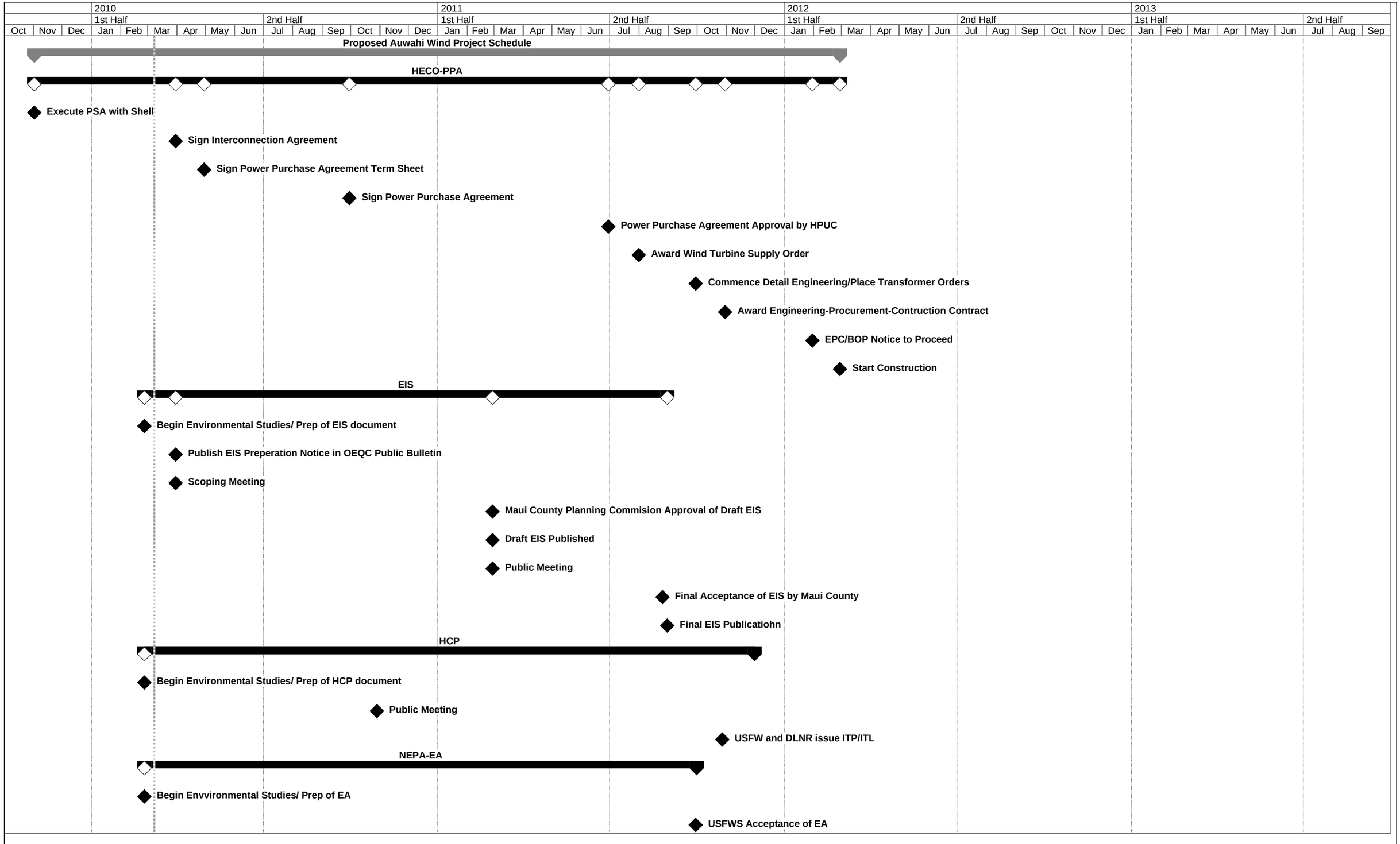
Uhler, W.J. 2007. Haleakala National Park. http://www.haleakala.national-park.com/. Accessed on March 18, 2008.

Western Regional Climate Center (WRCC). 2009a. *Climate of Hawai'i*. Climate Narrative of the States. Source: National Oceanic and Atmospheric Administration Narrative Summaries, Tables and Maps for Each State with Overview of State Climatologist Programs, Third Edition. Gale Research Company, 1985. http://www.wrcc.dri.edu/narratives/HAWAII.htm. Accessed on December 11, 2009.

Western Regional Climate Center (WRCC). 2009b. *Summary of Climate Data for the Island of Maui.* http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?hi8760.

APPENDIX A

PROJECT SCHEDULE



Project: Proposed Auwahi Wind Projec
Date: Mon 3/8/10

Milestone ◆ Summary ▬ Project Summary ▬