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STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621  
HONOLULU, HAWAII 96809

JAN 26 2012

TO: Gary Hooser, Director  
Office of Environmental Quality Control

FROM: William J. Aila, Jr., Chairperson *WJA*  
Board of Land and Natural Resources

SUBJECT: Environmental Impact Statement Preparation Notice for  
Ulupalukua Geothermal Mining Lease and Geothermal Resource Subzone  
Modification Application, Island of Maui  
TMKs: 2-1-009:001; 2-1-004:006, 016-029. 032-035, 049, 071, 106-107

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QUALITY CONTROL

We are transmitting, in hardcopy and on CD, the subject EISPN and OEQC Publication Form for publication in the Environmental Notice. These documents have been prepared for the Applicant, Ormat Technologies, Inc., by its consultant, Geometrician Associates.

Please publish the EISPN in the Environmental Notice at your earliest convenience.

If there are any questions, please call Alyson Yim of the Engineering Division, at 587-0259, or Ron Terry of Geometrician Associates, at 969-7090 (Hilo).

Attachments

- c: Land Division (w/o CD)  
Geometrician Associates (w/o attachments)

**OEQC Publication Form  
The Environmental Notice**

**Name of Project:** **Ulupalakua Geothermal Mining Lease and Geothermal Resource Subzone Modification Application**

**Applicable Law:** Chapter 343, HRS

**Type of Document:** FEA-EISPN

**Island:** Maui

**District:** Makawao

**TMK:** (2) 2-1-009:001; 2-1-004: 006, 016-029, 032-035, 049, 071, 106-107

**Permits Required:** Geothermal Resource Subzone Expansion, Mining (Geothermal) Lease of State Lands, Mining (Geothermal) Lease of Reserved Lands, Geothermal Exploration Permit

**Name of Applicant:** Ormat Technologies Inc., 6225 Neil Road, Reno, NV 89511. Contact: Bill Sherman, (775) 356-9029 Ext. 32232

Address  
City, State, Zip  
Contact and Phone

**Approving Agency:** Hawai'i State Board of Land and Natural Resources, P.O. Box 621, Honolulu, HI 96809. Contact: Carty Chang, (808) 587-0230

Address  
City, State, Zip  
Contact and Phone

**Consultant** Geometrician Associates, PO Box 396, Hilo, HI 96721. Contact: Ron Terry, (808) 969-7090

Address  
City, State, Zip  
Contact and Phone

**Project Summary:**

Ormat Technologies Inc. ("Ormat") is applying to the Hawai'i State Board of Land and Natural Resources) for (1) a geothermal mining lease of reserved lands occupied by Ulupalakua Ranch, Inc.; (2) a geothermal mining lease of State lands adjacent to Ulupalakua Ranch, and; (3) expansion of the Geothermal Resource Subzone (GRS) that currently includes part of the reserved lands and State lands. All subject parcels are occupied by Ulupalakua Ranch and used for grazing and related ranch activities, including the 800-acre State parcel. Ormat has agreements with Ulupalakua Ranch to conduct geothermal development activities on parts of the reserved lands and has received assignment of Ulupalakua Ranch's right to obtain a mining lease of the reserved lands. Certain areas of Ulupalakua Ranch and State lands would be "no surface occupancy" areas where no geothermal development activities would be conducted on the land's surface.

The EIS will provide an overview of the benefits and adverse impacts of geothermal development here to nearby communities and the island of Maui. Exploratory studies indicate there may be a commercially useable geothermal resource. If the State mining leases are obtained and the GRS is expanded, Ormat may seek permits/ approvals to conduct exploratory drilling and determine the number and location(s) of exploratory wells, preparing follow-up Chapter 343 documents to disclose environmental impacts related to the wells. If testing leads to discovery of a commercially useable geothermal resource, Ormat would determine the feasibility of constructing a plant to generate electricity and selling the electricity to an off-taker such as Maui Electric Company. Ormat would select a geothermal plant location that maximizes the efficiency of the operation and minimizes adverse impacts, preparing follow-up Chapter 343 documents to disclose environmental impacts related to construction and operation of the plant.

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**Environmental Impact Statement Preparation Notice**

**Ulupalakua Geothermal Mining Lease and  
Geothermal Resource Subzone Modification Application**

Island of Maui, State of Hawai‘i

TMKs: 2-1-009:001; 2-1-004: 006, 016-029, 032-035, 049, 071, 106-107

**Prepared for:**

Hawai‘i State Board of Land and Natural Resources

And

Ormat Technologies Inc.

**Prepared by:**

Geometrician Associates

February 2012

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## **Environmental Impact Statement Preparation Notice**

### **Ulupalakua Geothermal Mining Lease and Geothermal Resource Subzone Modification Application**

Island of Maui, State of Hawai‘i

TMKs: 2-1-009:001; 2-1-004: 006, 016-029, 032-035, 049, 071, 106-107

#### **Prepared for:**

Hawai‘i State Board of Land and Natural Resources

PO Box 621

Honolulu, HI 96809

And

Ormat Technologies Inc.

6225 Neil Road

Reno, NV 89511

#### **Prepared by:**

Geometrician Associates

PO Box 396

Hilo, HI 96721

This document is prepared pursuant to the Hawai‘i Environmental Protection Act,  
Chapter 343, Hawai‘i Revised Statutes (HRS), and  
Title 11, Chapter 200, Hawai‘i Department of Health Administrative Rules (HAR).

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**LIST OF ABBREVIATIONS**

ALISH	Agricultural Lands of Importance to the State of Hawai‘i
BLNR	Hawai‘i State Board of Land and Natural Resources
BMP	Best Management Practice
DLNR	Hawai‘i State Department of Land and Natural Resources
DOH	Hawai‘i State Department of Health
DPW	Maui County Department of Public Works
DWS	Maui County Department of Water Supply
EA	Environmental Assessment
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
GRP	Geothermal Resource Permit
GRS	Geothermal Resource Subzone
HDOH	Hawai‘i State Department of Health
HAR	Hawai‘i Administrative Rules
HEPA	Hawai‘i Environmental Policy Act
HRS	Hawai‘i Revised Statutes
MCGP	Maui County General Plan
MECO	Maui Electric Company
NSO	no surface occupancy
OEQC	Hawai‘i State Office of Environmental Quality Control
ROI	Region of Influence
SFHA	Special Flood Hazard Area
SHPD/O	State Historic Preservation Division/Officer
SMA	Special Management Area
TIAR	Traffic Impact Assessment Report
TMK	Tax Map Key
UH	University of Hawai‘i
USF&WS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USNRCS	U.S. Natural Resources Conservation Service

**SUMMARY**

**PROJECT NAME:** Ulupalakua Geothermal Mining Lease and Geothermal Resource Subzone Modification Application

**APPLICANT:** Ormat Technologies Inc.

**LOCATION:** Ulupalakua Ranch, Island of Maui

**TAX MAP KEY** TMKs: 2-1-009:001; 2-1-004: 006, 016-029, 032-035, 049, 071, 106-107

**LAND OWNERSHIP:** Ulupalakua Ranch, Inc. and State of Hawai‘i

**CLASS OF ACTION:** Use of State Lands

**DETERMINATION:** Environmental Impact Statement Required (State EIS)

**PROPOSED ACTION:** Issuance of Geothermal Mining Leases of State and Reserved Lands and modification (expansion) of existing Geothermal Resource Subzone

**STATE LAND USE DISTRICT:** Agricultural

**PERMITS SOUGHT PURSUANT TO CURRENT REQUEST:** Geothermal Resource Subzone Expansion, Mining (Geothermal) Lease of State Lands, Mining (Geothermal) Lease of Reserved Lands

**ACCEPTING AUTHORITY:** Hawai‘i State Board of Land and Natural Resources

# 1 INTRODUCTION

## 1.1 Project Description, Location and Land Ownership

Ormat Technologies Inc. (“Ormat”) is applying to the Hawai‘i State Board of Land and Natural Resources (BLNR) for a geothermal mining lease of State lands adjacent to Ulupalakua Ranch, and modification (expansion) of an existing Geothermal Resource Subzone (GRS) currently including portions of both the reserved lands and the State lands. Ormat will also be applying for a geothermal mining lease to develop geothermal resources on reserved lands owned by Ulupalakua Ranch, Inc.<sup>1</sup>

The leases and GRS would include portions of the following properties denoted as Tax Map Key (TMK): 2-1-009:001; 2-1-004: 006, 016-035, 038, 040-041, 049, 071, 106-107; (the “project area”) TMKs: 2-1-009:001; 2-1-004: 006, 016-029, 032-035, 049, 071, 106-107 (see Figures 1-3). All of these parcels are reserved lands occupied by Ulupalakua Ranch and used for grazing and related ranch activities except TMK 2-1-004-049, which is State land currently used by Ulupalakua Ranch for grazing.

Ormat has entered into an agreement with Ulupalakua Ranch that would allow Ormat to engage in geothermal development activities on certain portions of the reserved lands in the project area and Ormat has received assignment of Ulupalakua Ranch’s right to obtaining a mining lease of the reserved lands. As further discussed in this document and elsewhere in the lease and GRS modification applications, certain areas of the reserved lands and State lands (specifically, TMKs 2-1-004: 019, 020, 024, & 027) would be “no surface occupancy” (“NSO”) areas where Ormat would conduct no geothermal development activities on the land’s surface.

The Environmental Impact Statement (EIS) under preparation will provide an overview analysis of the benefits and adverse impacts of geothermal development activities in the project area to the island of Maui and to communities in the vicinity.

Ormat’s initial exploratory studies indicate the potential for a commercially useable geothermal resource in the project area. If Ormat is successful in acquiring State mining leases and in expanding the GRS, Ormat may then seek permits and other approvals from State and County authorities necessary to conduct exploratory drilling in the project area. Ormat would then determine the number and location(s) of exploratory wells, and would prepare an Environmental Assessment (EA) or other follow-up documentation as may be required by Chapter 343, HRS,

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<sup>1</sup> This document uses the terms “State lands,” “reserved lands,” and “occupier” consistent with the definitions found in HRS § 182-1. The term “State lands” refers to public lands where the State of Hawai‘i or one of its agencies owns or controls the land, including the surface of the land. The term “reserved lands” refers to those lands where a private party owns, leases, or otherwise occupies the surface of the land and where the State or its predecessor in interest has reserved the minerals beneath the land, including geothermal resources. The term “occupier” refers to a party who owns, leases, or otherwise occupies the surface of reserved lands.

# Project Location on the Island of Maui



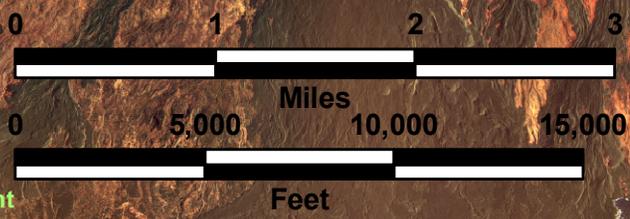
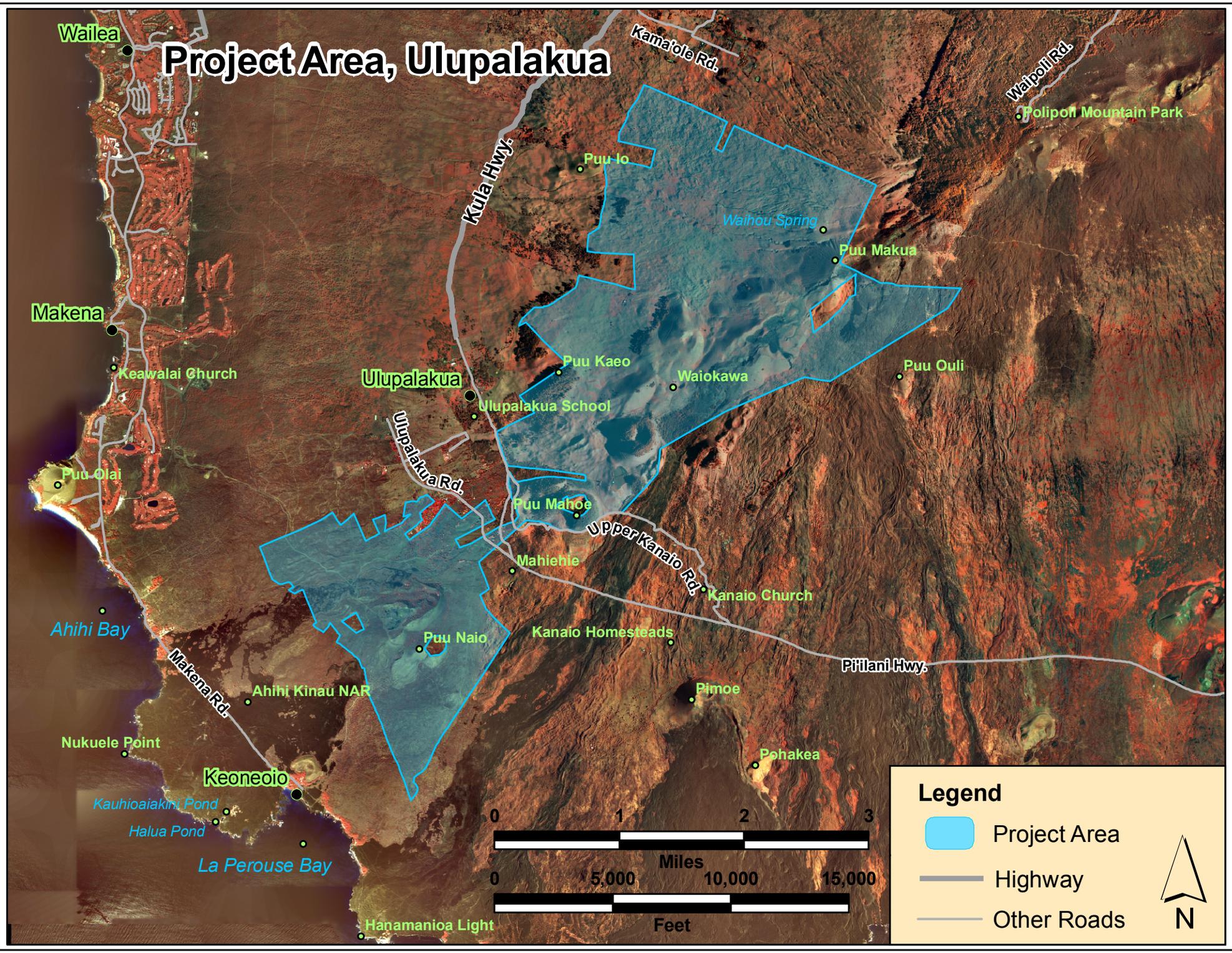
Pacific  
Ocean

## Legend

-  Project Area
-  Highways
-  Other Roads



# Project Area, Ulupalakua

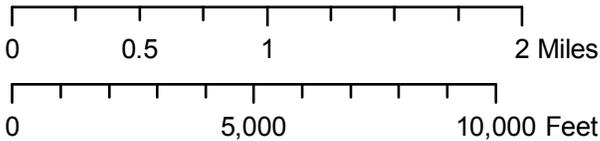
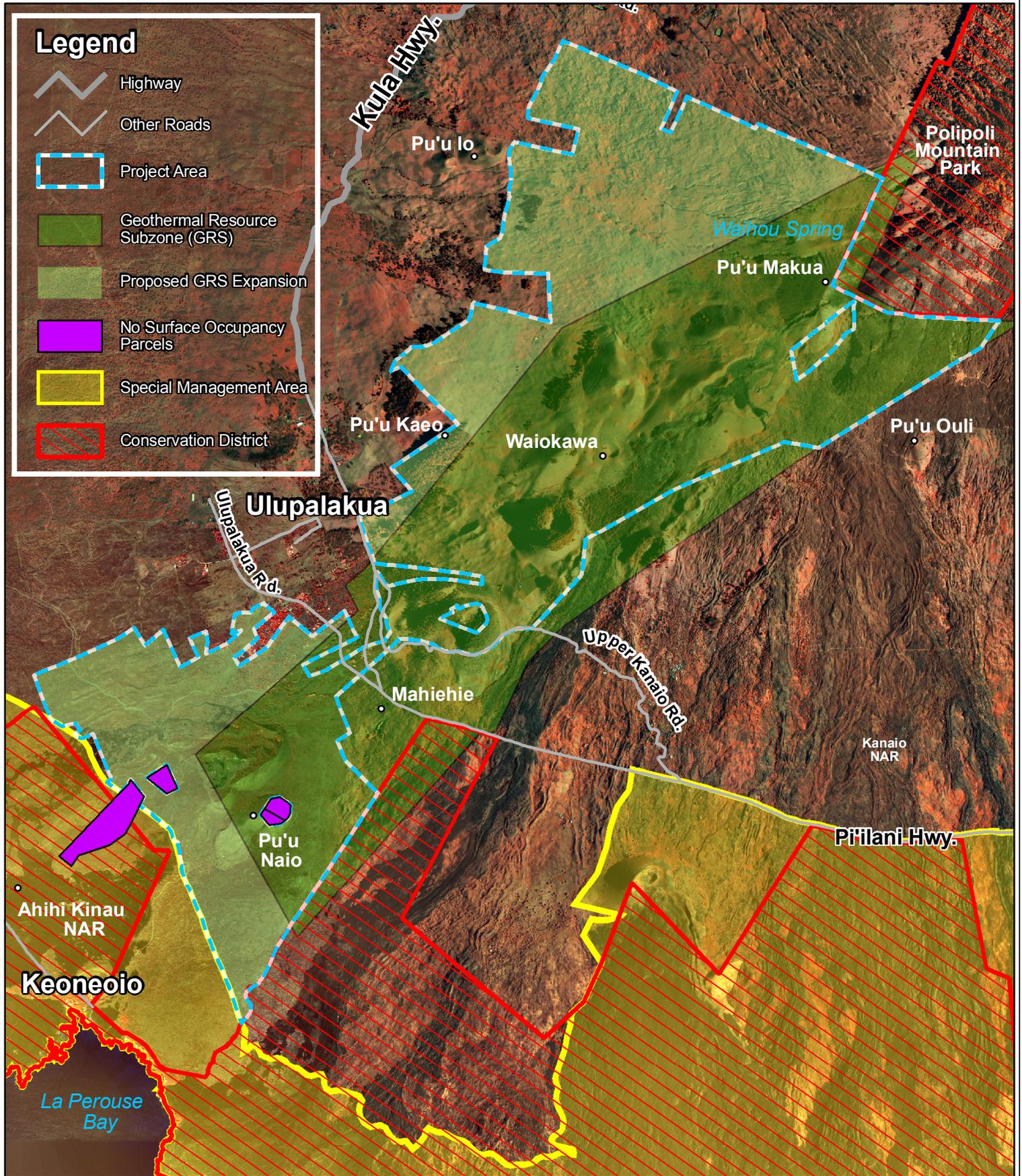


**Legend**

-  Project Area
-  Highway
-  Other Roads



Figure 3. Selected Project Area Land Use Designations and Restrictions



**Ulupalakua, Island of Maui**

Datum / Projection: NAD 1983 / UTM Zone 4 North  
 Primary Data Source: <http://hawaii.gov/dbedt/gis/download.htm>, 2011  
 Base Map: USDA-FSA-APFO Maui Digital Orthophoto Mosaic, 2003

**Figure 4 – Project Area Photos**



Mauka area landscape ▲ ▼ Makai area landscape



and other regulatory requirements, to disclose environmental impacts related to the drilling of these wells.

If exploratory drilling and testing lead to discovery of a commercially useable geothermal resource, Ormat would then determine the feasibility of constructing a plant to generate electricity using the resource and selling the electricity to an offtaker such as Maui Electric Company. Ormat would select an optimum location for a geothermal plant that maximizes the efficiency of the operation and minimizes adverse impacts. Ormat would finalize details of the plant's size, interconnection to the Maui Electric Company grid, and other characteristics, and would prepare follow-up documentation as may be required by Chapter 343, HRS, and other regulatory requirements, that addresses the construction and operation of the plant, including road use.

## **1.2 Project Background and Purpose**

The energy policy of the State of Hawai'i seeks to ensure dependable, efficient, and economical energy; increased energy self-sufficiency; greater energy security; and reduction of greenhouse gas emissions (Hawai'i State DBEDT: <http://hawaii.gov/dbedt/info/energy/Document.2010-03-01.1302>). Lacking internal fossil fuel resources, Hawai'i is highly dependent on imported energy. Currently, over 95 percent of Hawai'i's primary energy is derived from imported fossil fuels such as petroleum and coal (Ibid). Hawai'i's remote location, dispersed population and relatively small market leads to very high energy prices and makes the State vulnerable to energy supply fluctuations. In response to this situation, the State passed legislation that requires Hawaii Electric Company and its affiliates, including Maui Electric Co, to generate renewable energy equivalent to 10 percent of their net electricity sales by 2010, 15 percent by 2015, 25 percent by 2020, and 40 percent by 2030. Act 234, Hawai'i's Global Warming Solutions Act of 2007, requires Hawai'i to reduce its statewide greenhouse gas emissions to 1990 levels by January 1, 2020. Hawai'i also signed the Hawai'i Clean Energy Initiative, which involves a Memorandum of Understanding with the federal Department of Energy (DOE) for a roadmap to achieve 70 percent clean energy by 2030, with 30 percent to come from efficiency measures, and 40 percent from locally generated renewable sources.

With the approval of the Public Utilities Commission, Maui Electric Company plans to seek up to 50MW of firm capacity to accommodate anticipated load growth and to maintain generating system reliability. Currently, it is specified that the first 25 MW will need to be in service by 2015 to accommodate the anticipated loss of generating capacity. The next 25 MW will need to be in service by 2018 to accommodate load growth. The capacity need dates may change due to unforeseen conditions.

Electrical energy can be derived from internal heat of the Earth by extracting hot water or steam from underground reservoirs and using it to power generators. Sometimes this process also produces opportunities for direct use to heat and cool buildings, or to provide heat for agricultural and other commercial processes. Geothermal energy has a long history in Hawai'i, as ancient Hawaiians used the abundant steam resources of Puna for cooking. King David Kalakaua inquired of Thomas Edison in 1881 about making geothermal electricity on the Big Island and transporting it to O'ahu through an undersea cable. Actual exploration on the Big

Island commenced in the 1960s and a geothermal well was powering a pilot electricity plant near Pahoia by 1982. About 20 percent of the Big Island's energy needs are now supplied by the Puna Geothermal Venture 30 megawatt (MW) geothermal power plant. Although Puna still has the only commercially demonstrated resource in the State, it is possible that Hualalai Volcano, Mauna Loa Volcano and Haleakala Volcano also contain viable resources.

Ormat Technologies Inc. is a world leader in the geothermal energy sector. Ormat has over four decades of experience in designing, manufacturing, building, owning, and operating state-of-the-art geothermal power plants. Ormat has developed or supplied more than 1,200 MW of geothermal power plants in 19 countries worldwide. Ormat currently owns and operates 500 MW of geothermal projects worldwide, with 382 MW of generating capacity in the US, including the 30 MW Puna power plant on the Big Island. Ormat employs over 1,000 people worldwide, including 499 in the US and 30 at the Puna facility.

Ormat's power plants are based on the patented Ormat Energy Converter (OEC). The OEC is a state-of-the-art implementation of Organic Rankine Cycle technology, which uses an organic motive fluid to turn a turbine after the motive fluid is heated by the geothermal resource. Ormat also constructs combined cycle geothermal plants in which steam first produces power in a steam turbine and is subsequently condensed to produce additional power using Organic Rankine Cycle technology. After the geothermal resource is used to generate electricity, Ormat injects the resource back into the geothermal reservoir, so that the geothermal resource can be used sustainably.

Leasing reserved and State lands and expanding the GRS are the first steps in the process of exploring for geothermal resources in the project area. The BLNR's approval of Ormat's leasing and zoning applications would not, of itself, authorize any geothermal development activity. Well drilling is required to confirm the existence of a commercially viable geothermal resource and Ormat would be required to obtain a County of Maui Geothermal Resource Permit to drill such well or wells. Additional, site-specific environmental analysis would be required to obtain such a permit. Ormat's goal in requesting these and other regulatory approvals is to assess the commercial viability of the potential geothermal resource in the project area and, if feasible, to provide clean, renewable geothermal energy for the island of Maui.

If Ormat were to discover a commercial geothermal resource, Ormat would then assess the feasibility of constructing a power plant to generate electricity using the resource and interconnecting the plant with the Maui Electric Company electrical grid. These steps would require additional regulatory approvals.

### **1.3 Alternatives**

The proposed action under current consideration consists of government approvals to allow Ormat to perform more detailed physical and economic investigation of the feasibility of producing commercially viable geothermal electricity in the southwest rift zone of Haleakala within a limited area of a working ranch. Ormat, as the proponent, is a geothermal power producer. Ormat has no plans to perform investigations of different alternative energy sources on Maui such as solar, wind, tidal power, or biomass, and does not have the ability to utilize other

locations. Therefore, the only serious alternative to the proposal approvals is the No Action Alternative. Under this scenario, no geothermal energy would be produced at Ulupalakua, but a variety of other new actions could conceivably occur on the land, including farming, tourism, or even energy production from other alternative sources. These would depend on many factors including the market, the initiatives of the landowner and others and government permitting. For the purposes of the EIS, however, the No Action Alternative will consider mainly the consequences of the status quo, which is ranching use. This provides a useful baseline for comparison of impacts with the proposed action, and it will be actively considered throughout the EIS as required by Hawai'i State EIS rules.

#### **1.4 Consistency with Government Plans and Policies**

The Draft EIS will discuss consistency with government plans and policies in details. Listed below are applicable government plans and policies and an initial outline of issues related to consistency.

##### *Hawai'i State Plan and Hawai'i State Functional Plans*

The Hawai'i State Plan was adopted in 1978. It was revised in 1986 and again in 1991 (Hawai'i Revised Statutes, Chapter 226, as amended). This plan establishes a set of goals, objectives and policies that are meant to guide the State's long-run growth and development activities. The proposed project will be analyzed for consistency with State goals and objectives that call for environmental protection, self-sufficiency, social and economic mobility, community and social well being, and a growing, diversified economic base extending to the neighbor islands. The *Hawai'i State Plan* also specifies specific objectives and policies related to energy, including, among others:

- Dependable, efficient, and economical statewide energy systems;
- Increased energy self-sufficiency and greater energy security;
- Accelerating research and development of new energy-related industries based on wind, solar, ocean, and underground resources and solid waste;
- Reduction, avoidance, or sequestration of greenhouse gas emissions from energy use;
- Supporting research and development and promoting the use of renewable energy sources;
- Basing decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits;
- Adoption of energy-efficient practices and technologies; and
- Promoting alternate fuels and energy efficiency by encouraging diversification of transportation modes and infrastructure.

Furthermore, the *Hawai'i State Plan* provides for the preparation of Functional Plans, with objectives, policies, and implementing actions, by the State agencies responsible for certain program areas. Twelve Functional Plans cover agriculture, transportation, conservation lands, housing, tourism, historic preservation, energy, recreation, education, health, human services and employment. Of particular relevance is the Energy Functional Plan, which expresses the goals,

objectives and objectives contained in the *Hawai‘i State Plan*.

#### *Hawai‘i State Land Use Law*

All land in the State of Hawai‘i is classified into one of four land use districts – Urban, Rural, Agricultural, or Conservation – by the State Land Use Commission, pursuant to Chapter 205, HRS. Regardless of State Land Use District designation, geothermal development activities are permitted only in areas designated as a GRS, and a GRS may be established in any of the four land use districts (HRS § 205-5.1(a)). For Conservation District lands within a GRS, geothermal development activities are regulated by the Board of Land and Natural Resources (“BLNR”) and would be authorized under a Conservation District Use Permit (HRS § 205-5.1(c)). For Agricultural District lands within a GRS, geothermal development activities are regulated by the appropriate county planning commission in the absence of provisions in the county general plan and zoning ordinances specifically relating to the use and location of geothermal activities within Agricultural District lands (HRS § 205-5.1(a)).

Because the Maui County General Plan and zoning ordinances do not specifically identify the use and location of geothermal development activities in the State Land Use Districts, and because the project is located within the State Land Use Agricultural District, geothermal development activities in the project area would be regulated by Maui County and authorized under a Geothermal Resource Permit (“GRP”). The Maui County Planning Commission is currently in the process of promulgating administrative rules to allow processing of GRP applications.

The proposed GRS modification is intended to allow better GRS coverage of the proposed lease area. The proposed modification would expand the GRS to cover additional Agricultural District lands but would not expand the GRS into Conservation District lands.

#### *Maui County General Plan*

The Maui County General Plan is a long-term, comprehensive blueprint for the physical, economic, environmental development and cultural identity of Maui County. The 1990 Update of the General Plan, as amended by Ordinance 2234, on April 23, 1993, is currently the effective General Plan. The Maui County General Plan 2030 is presently in draft. On March 24, 2010, the County adopted the Countywide Policy Plan, which provides broad goals, objectives, policies, and implementing actions that portray the desired direction of the County’s future and provides the policy framework for the development of the Maui Island Plan and the nine Community Plans.

According to the Department of Planning, the Maui Island Plan will establish a pro-active planning process by establishing urban and rural growth areas that indicate where development is intended and will be supported. Growth areas will provide for less costly services, reduced commuting, protection of community character and the preservation of agriculture, open space and cultural and natural resources. The Maui Island Plan will comprise goals, policies, programs and actions based on an assessment of current and future needs and available resources. Once it

has been adopted, the document becomes the principal tool for the County and its citizens to use when evaluating public and private projects and their impacts on land use, the economy, environment, infrastructure, and cultural resources. This plan may be adopted by the time the Draft EIS is prepared.

Community plans are more specific, and each provides recommendations concerning land use, density and design, transportation, community facilities, infrastructure, visitor accommodations, commercial and residential areas and other matters related to development that are specific to the region of the plan. The currently adopted community plan for the geothermal project area is the *Makawao-Pukalani-Kula Community Plan*, dated July 1996. This plan includes the statement that:

“The Upcountry region contains the only designated geothermal subzone in the County. While the potential benefits of geothermal development would accrue to the entire island, the environmental impacts would be primarily borne by the communities of Ulupalakua and Kanaio. For this reason, and in respect to Native Hawaiian sensitivities, a policy prohibiting geothermal development that impacts adversely on Upcountry communities or culturally sensitive resources has been adopted.”

The Draft EIS will consider whether it is possible for geothermal to be developed without adversely impacting Upcountry communities.

## **2 ENVIRONMENTAL IMPACT STATEMENT PROCESS**

### **2.1 Applicant and Accepting Authority**

This document is formal notification that Ormat Technologies Inc., the Applicant, has begun preparation of an Environmental Impact Statement (EIS) for (1) a geothermal mining lease of reserved lands occupied by Ulupalakua Ranch, Inc.; (2) a geothermal mining lease of State lands adjacent to Ulupalakua Ranch, and; (3) modification (expansion) of an existing Geothermal Resource Subzone (GRS). The use of State lands triggers the environmental review requirements under Chapter 343, Hawai‘i Revised Statutes. The Accepting Authority to determine the adequacy of the Final EIS is the Hawai‘i State Board of Land and Natural Resources.

HEPA was enacted by the Hawai‘i State Legislature to require State and County agencies to consider the environmental impacts of various actions as part of the decision-making process. Agencies are required to conduct an investigation and evaluation of alternatives as part of the environmental impact analysis process, prior to making decisions that may impact the environment. The implementing regulations for HEPA are contained in Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR).

Impacts are evaluated for significance according to thirteen specific criteria as presented in HAR 11-200-12. If no significant impacts are expected, then a Final EA with a Finding of No Significant Impact (FONSI) may be issued. The EIS is being prepared because the Applicant, in consultation with the State of Hawai‘i Department of Land and Natural Resources, has determined that the development of geothermal energy may have significant effects on the environment, and therefore preparation of an EIS is appropriate.

### **2.2 Environmental Impact Statement Process**

The three phases of every Environmental Impact Statement (EIS) development are described below.

*Scoping.* The preparation of an Environmental Impact Statement (EIS) begins with the scoping process. The purpose of scoping is to notify the public of the proposed action, identify issues and assess the relative significance of these issues, determine the alternatives for study, allocate the proper resources for environmental investigation, and plan a schedule for the EIS. The scoping process for this project includes small group meetings and the publication of this Environmental Impact Statement Preparation Notice (EISPN) document in the *Environmental Notice* of the Hawai‘i State Office of Environmental Quality Control (OEQC).

A key element in scoping is public participation. The public is invited to provide written comments upon reviewing the EISPN. Ideally, the comments should identify concerns or issues that should be addressed in the EIS, suggest resource persons or references that could provide useful information, confirm the accuracy of information presented in the EISPN, suggest alternatives, or identify persons or organizations who should be contacted because they may be affected by the project.

In addition to the opportunity for formal public review during the EISPN process, Ormat and its representatives have met and will continue to meet with the general public, as well as community organizations, business groups, environmental organizations, and cultural organizations that have special concerns. These meetings are meant to offer an informal setting for soliciting concerns and gathering information. To date, a number of meetings have occurred, and these will be documented and discussed in detail in the EIS.

*Draft EIS.* The Draft EIS will include a summary of the issues raised during the EISPN comment period and at meetings. It will also include analysis of the environmental impacts of the proposed project and the No Action Alternative. The public will have a 45-day period to review the Draft EIS and provide comments. Two public meetings in different locations in Maui will be conducted during this period.

*Final EIS.* Ormat will review and respond to the comments received on the Draft EIS in consultation with DLNR. The Final EIS will incorporate the comments, and include copies of the comments and responses. The Final EIS will include the decision on which alternative is selected for implementation. The Hawai‘i State Board of Land and Natural Resources, in consultation with the State Office of Environmental Quality Control, will decide whether the Final EIS meets the EIS requirements of the State of Hawai‘i.

### **2.3 Consultation of Agencies and Organizations**

The following agencies and organizations have received a copy of the EISPN and/or a notice of the availability of the EISPN online and have been formally invited to be consulted as part of the EIS process:

#### *Federal*

- Environmental Protection Agency
- Department of Energy
- Fish and Wildlife Service
- National Park Service

#### *State*

- Department of Business, Economic Development, and Tourism, Energy Resources and Technology Division
- Department of Hawaiian Home Lands
- Department of Health
- Department of Land and Natural Resources (DLNR), Land Division
- DLNR, Division of Forestry and Wildlife
- DLNR, State Historic Preservation Division
- DLNR, Division of Aquatic Resources
- DLNR, Engineering Division
- Department of Transportation

- Office of Environmental Quality Control
- Office of Hawaiian Affairs
- University of Hawai‘i, Environmental Center
- University of Hawai‘i, Maui Community College
- State Senators Shan S. Tsutsui, Rosalyn H. Baker and J. Kalani English
- State Representatives Joseph M. Souki, Gilbert S.C. Keith-Agaran, Angus M.L. McKelvey, George R. Fontaine, Kyle T. Yamashita, and Mele Carroll

*County*

- County Council
- County Energy Coordinator
- Department of Civil Defense
- Department of Environmental Management
- Department of Fire and Public Safety
- Department of Management
- Department of Planning
- Department of Public Works
- Department of Transportation
- Department of Water Supply
- Office of the Mayor

*Organizations (partial list)*

- A&B Wailea
- ATC Makena
- Carpenters Union
- Hawaiian Islands Land Trust
- Honua‘ula Partners
- IBEW
- ILWU
- Kihei Community Association
- Kula Community Association
- Makena Community Association
- Maui Chamber of Commerce
- Maui Contractors Association
- Maui Cultural Lands
- Maui Economic Development Board
- Maui Meadows Homeowners Association
- Maui Native Hawaiian Chamber of Commerce
- Maui Tomorrow
- Operating Engineers Union
- Pacific Resource Partnership
- Plumbers and Fitters Union
- Sempra Wind Energy

- Sierra Club
- Wailea Community Association
- Wailea Golf

The EISPN will also be provided to an extensive list of individual e-mail recipients who have expressed interest to Ormat in receiving communications on the subject. The above list is a preliminary identification of parties with interests at stake or who may have pertinent information. The applicant welcomes and appreciates any assistance in identifying others who have special information or might be impacted by the proposed project, and who should therefore be consulted in the process of preparing the Draft EIS.

The EISPN has also been made available at all Maui public libraries, has been sent to the *Maui News*, *Honolulu Star-Advertiser*, and *Environment Hawai'i* and to a number of other libraries statewide, and has been placed on the OEQC website: (<http://hawaii.gov/health/environmental/oeqc/index.html>),

### 3 ENVIRONMENTAL SETTING AND IMPACTS

This section provides a basic introduction to the environmental conditions associated with the project location on a resource by resource basis, along with an outline of the probable impacts of the proposed action. For some resources, preliminary mitigation measures designed to reduce or eliminate adverse environmental impacts are listed. The Draft EIS will present the results of studies that are being initiated to address these resources and will have greater detail concerning the action and the project area.

#### *Basic Geographic Setting*

Figure 1 depicts the location of the project area in Maui, Figure 2 depicts its boundaries in Ulupalakua area, and Figure 3 shows selected land use designations and restrictions. Figure 4 consists of two photographs of the areas *mauka* and *makai* of Pi'ilani Highway (Maui County Route 31), which roughly divides the project area in two. The project area consists of much of the property within TMKs: 2-1-009:001; 2-1-004: 006, 016-029, 032-035, 049, 071, 106-107 that is outside both the Conservation District and the Special Management Area (which have been excluded for reasons of potential land sensitivity), and inside the current Haleakala Southwest Rift Geothermal Resource Subzone (GRS), where geothermal activities can potentially be permitted.

Certain areas within these TMKs have been reserved for no surface occupancy by Ulupalakua Ranch, and these are also excluded from the project area (see Figure 3). The project area also consists of an area outside the current GRS which is being requested for addition to the GRS (see Figure 3). The approximately 5,315-acre project area under study consists almost entirely of ranching land uses including pastures, corrals, access roads, and watering facilities such as reservoirs, troughs and pipelines. There are also a number of telecommunication facilities, including towers for cellular, radio/TV, and civil defense signaling, sited on prominent hills. Elevation ranges from about 200 to 5,400 feet above sea level. The Draft EIS will present detailed maps of TMK boundaries, State Land Use Districts, the Special Management Area boundary, current and requested future GRS boundaries, and other features.

For many environmental variables, the impacts of the proposed action will be restricted to the property entirely within the project area, in limited spots on and immediately surrounding the geothermal infrastructure, including the wells, power plant, and supporting roads and utility lines. For others, it is necessary to define a broader area that encompasses all the area that would experience direct or indirect impacts. The term Region of Influence (ROI) will be defined on a resource by resource basis to ensure that the full zone of influence is described.

### 3.1 Physical Environment

#### 3.1.1 Geology, Hazards, and Soils

##### *Existing Environment*

The project area is along the southwest rift zone of Haleakala Volcano. The surface geology consists of lava flows, cinder cones and associated extrusive features from the volcano. The ages of these surfaces are primarily late Pleistocene, from 10,000 years to 150,000 years BP, with some more recent, Holocene ages (Sherrod et al 2007).

According to the U.S. Geological Survey (USGS), there is a moderate risk of lava flow inundation on Haleakala Volcano ([http://hvo.wr.usgs.gov/volcanowatch/1996/96\\_11\\_27.html](http://hvo.wr.usgs.gov/volcanowatch/1996/96_11_27.html)). Although lava flow hazard zones have not been formally mapped, preliminary mapping by the USGS in 1983 rated various areas of Haleakala on a scale of one through nine, the same as used for the island of Hawai‘i. The summit and southwest rift zone of Haleakala, which is the project area, were rated as Hazard Zone 3, similar to the town of Hilo on the Big Island. The steep, downslope areas of Kanaio and Kahikinui Ahupua‘a and the area north of Hana were rated as Hazard Zone 4, similar to Kailua-Kona on the Big Island. The remaining parts of Haleakala had ratings of Hazard Zones 7 and 9, comparable to the Big Island’s Mauna Kea and Kohala. As such, there is at least some risk of lava inundation over human time scales in the project area.

In terms of seismic risk, the entire Island of Maui is rated Zone 2B Seismic Hazard (<http://hvo.wr.usgs.gov/earthquakes/hazards/>). Zone 2B has a moderate chance of experiencing severe shaking in any given 50-year period. The USGS reported that two magnitude 7 (M7) earthquakes have occurred offshore of Maui in the last 200 years, and that University of Hawai‘i studies indicate that Maui County experiences an M3 to M5 earthquake every 2 to 5 years on average ([http://hvo.wr.usgs.gov/volcanowatch/1996/96\\_11\\_27.html](http://hvo.wr.usgs.gov/volcanowatch/1996/96_11_27.html)).

Lava tubes and other caves in Hawai‘i may have value as historic sites, burial locations, recreation areas, as unique geological features, or for other reasons. Lava tubes are more frequent in pahoehoe rather than ‘a‘a lava, and they are more vulnerable to disturbance when lava flows lie at the surface rather than below deep layers or ash or soil.

The steep slopes found on the sides of cinder cones and certain lava features may be subject to mass wasting, including landslides, rockfalls and soil creep. In the lower southwest rift zone of Haleakala, highly unstable zones are restricted to relatively small areas.

##### *Impacts and Issues*

The geologic setting of the project area in the southwest rift zone of Haleakala provides the resource for the proposed geothermal project, which by necessity must be located nearby. In areas of lava flow hazard, Ormat develops contingency plans such as special wellhead designs in case of lava flows, which will be described in the Draft EIS. In general, because there are large portions of the project area that appear geotechnically suitable for geothermal wells, roads,

power plants and other infrastructure, geologic conditions do not appear at this time to impose any overriding constraints on the project. Areas of steep or unstable soil would not be considered suitable locations for geothermal infrastructure and would not be affected. The Draft EIS will examine the potential hazards associated with the project area, including eruptions, seismic events, and mass wasting, and propose avoidance and mitigation measures to minimize impacts. The ROI under consideration will be all areas in which geothermal infrastructure could potentially be placed, along with appropriate buffers, particularly areas immediately uphill or downhill, around these infrastructure areas with the potential to be affected by project activities.

The Draft EIS will discuss Special Contract Requirements that will be incorporated into the construction contract documents requiring contingency plans in case a previously undetected lava tube is breached during construction.

### **3.1.2 Water Resources, Floodplains and Water Quality**

#### *Existing Environment*

Aside from artificial reservoirs for cattle, no surface water bodies such as streams or lakes exist in the area. Poorly developed erosional gullies are present in some locations, but no permanent or intermittent streams appear to be present. Several springs are present in the *mauka* edge of the project area, notably Waihou and Waikaalu Springs. Other springs are present along the coast, *makai* of the project area. No wetlands mapped by the U.S. Fish and Wildlife Service appear to be present, and initial field reconnaissance indicated no unmapped wetlands in the project area.

The Federal Emergency Management Agency (FEMA) has not produced Flood Insurance Rate Maps (FIRM) for the project area, indicating that the area is in Flood Zone X, outside the 100-year floodplain.

#### *Impacts and Issues*

The ROI under consideration will be all areas in which geothermal infrastructure could potentially be placed, along with appropriate buffers, particularly downstream for any drainages, around these infrastructure areas with the potential to be affected by project activities. The Ormat geothermal process is a closed-loop system that does not involve the use of natural surface waters for either water sources or disposal areas. Surface waters would therefore not be directly impacted. Although geothermal energy projects utilize water or steam contained thousands of feet below the surface in a closed-loop system, there is often community concern regarding the potential to impact subsurface water features including aquifers and springs. The Draft EIS will investigate this issue in the specific context of the underground hydrology of the project area, with an expanded ROI that considers all aquifers and springs in the area.

Geothermal energy project infrastructure such as wells, roads, and power plants tend to involve only a small amount of paved surface but have at least some potential to add to the area of impermeable surface. This would not be expected to adversely affect drainage. In any project, uncontrolled excess sediment from soil erosion during and after excavation and construction has

the potential to impact natural watercourses, water quality and flooding. Contaminants associated with heavy equipment and other sources during construction have the potential to impact surface water and groundwater if not mitigated effectively, although such potential in this site is limited because of the absence of surface water bodies, the great depth to water table and the filtering action of the intervening aerated rock.

Because the total disturbed area for infrastructure would be larger than one acre, a National Pollution Discharge Elimination System (NPDES) permit would be obtained and implemented by the contractor. This would likely occur during well pad/access road construction and again during construction of the power plant and associated infrastructure. The Draft EIS will identify a preliminary set of soil erosion and sediment control Best Management Practices (BMPs). The project's erosion and sedimentation control plan would further be regulated through review, revision and approval by the Engineering Division of the Maui County Department of Public Works (DPW) to ensure compliance with standards related to storm water runoff containment.

### **3.1.3 Climate and Air Quality**

#### *Existing Environment*

The location of the project area straddling the lower elevations of the southwest rift of Haleakala is a transition area for several climatic variables. Wind patterns on the southeast side of the rift are predominantly easterly trade winds; on the northwest side of the rift, northwest (upslope) winds predominate in the daytime, with nighttime drainage winds. Rainfall increases to the east and also increases upslope, producing a clear gradient from very dry average annual rainfall of about 25 inches in the lowest part of the project area to about 40 inches at Pu'u Maku at the top (UH Hilo Dept. of Geography 1998:55-56). The ambient temperature lapse of about 3 degrees per thousand feet of elevation and the tendency for more cloudiness with elevation and fog above 2,500 feet enhances the distinction between the cool, moist foggy uplands and dry, hot lowlands. Normal weather patterns are periodically disrupted by "kona" storms and cold fronts, particularly in the winter, as well as very occasional tropical storms. Hurricanes, which by definition have sustained winds over 74 miles per hour, are very unusual but not unknown in the Hawaiian Islands; Kaua'i was struck in 1982 and again 1992 by destructive storms. Maui has not experienced a hurricane in at least a century, and according to a *Maui News* article of May 25, 2009, the last hurricane occurred in the 1870s.

Air quality in the area is relatively good but is occasionally affected by volcanic emissions of sulfur dioxide from Kilauea Volcano on the Island of Hawai'i, which convert into particulate sulfate and produce a volcanic haze (vog) that can affect the entire Hawaiian Island chain during episodes of southerly winds. Human sources of air pollution in this sparsely populated area are minimal, aside from occasional localized impacts from agricultural sources. There are very little air quality monitoring data available from the Hawai'i Department of Health for the island of Maui, but the limited data that are available suggest that concentrations are generally within State and national air quality standards, except for occasional high concentrations of particulate matter due to agricultural tilling operations and/or brush fires. Smoke from sugarcane burning operations may also affect air quality at times.

### *Impacts and Issues*

Construction of geothermal infrastructure, without mitigation, has the potential to produce localized and temporary fugitive dust emissions. A dust control plan would be implemented for construction activities with potential to generate substantial dust.

As part of operation of the power plant, the fluids drawn from the deep earth carry a mixture of gases, notably carbon dioxide (CO<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), methane (CH<sub>4</sub>), and ammonia (NH<sub>3</sub>). These pollutants contribute to global warming, acid rain, and noxious smells if released. The release of these pollutants would be reduced by using emission-control systems in accordance to the Clean Air Act, Section 111, Standards of Performance for New Stationary Sources. The Draft EIS will discuss construction and operational air quality impacts, including emissions of hydrogen sulfide emissions during plant operations or upset events, and will recommend both management practices and BMPs for mitigation of these issues. The scope and sequence of formal air quality studies will be discussed in the Draft EIS.

#### **3.1.4 Noise**

##### *Existing Environment*

Noise levels in the area site are currently low and are derived mainly from ranching activities. Currently, sensitive noise receptors such as residences, schools, and parks in the Ulupalakua Ranch area are present but few and widely scattered.

##### *Impacts and Issues*

Drilling for wells and construction of access roads, utility lines and the power plant could elevate noise levels periodically over the course of several years. The Department of Health (DOH) will be consulted, and if appropriate, the contractor will be required to obtain a permit per Title 11, Chapter 46, HAR (Community Noise Control) prior to construction. DOH would review the proposed activity, location, equipment, project purpose, and timetable in order to decide upon conditions and mitigation measures, such as restriction of equipment type, maintenance requirements, restricted hours, and portable noise barriers.

The Draft EIS will also discuss noise produced from daily operations of the geothermal wells and power plant, the strategies to reduce noise through road, well and plant location, design and topographic shielding, and the possibility of additional sound reducing mitigation, if warranted. It is important to note the actual existence or locations of the wells and the power plant will not be known until after the geophysical and well data are fully analyzed.

### 3.1.5 Scenic Value

#### *Existing Environment*

The Ulupalakua area is highly scenic, as illustrated in the photographs in Figure 4. Major scenic elements include near vistas with the contrast between misty pastures and forests, cinder cones, and elegant individual trees or groves, as well as sweeping, far vistas of the shoreline, West Maui and the central valley, and the islands of Kahoolawe, Molokini, Lana‘i and Moloka‘i.

The *Makawao-Pukalani-Kula Community Plan* contains discussions of the region’s unique natural beauty and serenity as well as standards related to building height.

#### *Impacts and Issues*

Geothermal energy project infrastructure such as wells, roads, and power plants have the potential to be visible and adversely affect scenery in an ROI that includes all areas from which this infrastructure may be visible. The Draft EIS will discuss the visual characteristics of this infrastructure and strategies to reduce noise through road, well and plant location, design and topographic shielding, and the possibility of additional visual mitigation (e.g., landscaping), if warranted.

### 3.1.6 Hazardous Substances

#### *Existing Environment*

The term *recognized environmental conditions* means the presence or likely presence of any hazardous substances or petroleum products on the property under conditions that indicate an existing release, a past release, or a material threat of a release into structures on the property or into the ground, groundwater, or surface water of the property. Although a Phase I Environmental Site Assessment has not been performed for the areas that could conceivably be used and affected by geothermal infrastructure project, no recognized environmental conditions are known to be present in areas that would likely be utilized in the geothermal project.

A few areas of concern exist within the broader area, including airplane wreckage near Pu‘u Naio and an abandoned vehicle within the old quarry area. North of Kula Highway, at three different locations within the study area, are towers for cellular, radio/TV, and civil defense signaling. All of these areas have backup generators that require a fuel source, which are accessed for maintenance purposes approximately weekly. Several pole mounted transformers, 55-gallon drums and abandoned shacks are present throughout the general area. Maintenance area remnants also exist within the vicinity of the former strawberry fields, along with other abandoned farm equipment and automobiles. South of Kula Highway, a small abandoned vehicle lot and junkyard are present. Further south, bullet fragments can easily be observed from the shooting range that is still operational within Pu‘u Naio.

## *Impacts and Issues*

Development of a geothermal resource for power production involves three basic phases: exploratory drilling, resource testing and field development drilling, and construction of the resource gathering system (production and injection pipelines), power plant, and electricity interconnection infrastructure (substation and power lines to interconnect with the electricity grid).

Drilling geothermal wells involves the transport, storage and use of diesel fuel, lubricants, hydraulic fluids and drilling chemicals (drilling mud, caustic soda, barite, etc.). Well construction uses water for drilling fluid and for cementing the casing in place (Argonne National Laboratory 2011). During the drilling process, fluids or muds are used to lubricate and cool the drill bit, to maintain downhole hydrostatic pressure, and to convey drill cuttings from the bottom of the hole to the surface. Drilling muds contain chemicals and constituents to control factors such as density and viscosity and to reduce fluid loss. The muds must be appropriately contained and disposed of in compliance with all local, State, and federal regulation.

Uncontrolled releases of geothermal fluids are rare occurrences during well drilling and can result in the release of drilling fluids as well as hydrogen sulfide (H<sub>2</sub>S) gas from the geothermal resources. Such events may also release geothermal fluids and steam containing heavy metals and toxic chemicals such as mercury, arsenic, boron, and antimony, acids, mineral deposits, and other pollutants (Kagel et al 2007). These components are essentially the same materials that have been naturally and continuously released by the eruptions on Kilauea since 1983. If such an event occurs, drilling fluids can be reclaimed using a sumpless drilling method that leaves behind only solids that are disposed of according to local, state and federal requirements. A containment system such as sumps lined with impervious materials to prevent leaching could be used to prevent runoff of drilling fluids. The containment system could also be used to store the solid material collected in the sumpless drilling method. There is also potential for leakage of petroleum-based fluids from drilling rigs or other heavy equipment. All on-site equipment needs to be frequently monitored for leaks and receive preventive maintenance to reduce the chance of leakage. If any leaking equipment is observed, drip pans or absorbent materials must be placed under the equipment. Petroleum-based products must be stored in tightly-sealed containers with clearly readable labeling, and spill kits must be available in the area.

Construction of a power plant would require the use of heavy equipment, fuel, lubricants, oil, paints, paint wash solvents, emulsified asphalt, prime/tact coat, etc. To prevent spills or releases of chemicals or petroleum-based fluids from heavy construction equipment during construction activities, preparation of Best Management Practices (BMPs) associated with spill response and materials handling are required. Material management practices are used to reduce the risk of spills or other accidental exposure of materials and substances. All materials stored on-site must be kept in a neat, orderly manner in their appropriate containers and as required, under a roof or other enclosure. Products must be retained in their original containers with the original manufacturer's label, the recommendations for proper use and disposal of which must be followed. Construction could generate small quantities of hazardous waste, which would be disposed of off-site at existing commercial facilities. Even though construction would contribute

to waste volumes, neither construction nor operational geothermal plant wastes would likely result in any new impacts to off-site waste treatment, storage, or disposal facilities. In addition to the gases discussed in Section 3.1.3, above, hot water from geothermal sources may hold in solution trace amounts of toxic chemicals such as mercury, arsenic, boron, and antimony. These chemicals precipitate as the water cools, and can cause environmental damage if released. However, these naturally occurring elements are dealt with by injecting cooled geothermal fluids back into the Earth. Solid wastes discharged from geothermal power plants are non-hazardous under the federal Resource Conservation and Recovery Act (RCRA) (Kagel et al 2007).

All phases of the project must conform to both federal and State requirements for handling and storing hazardous materials. The Draft EIS will discuss the plans for further assessing areas for hazardous materials if and when drilling and construction of a geothermal power plant occur. It will also discuss the types and quantities of hazardous materials involved and the measures that geothermal power plants implement, including the development of a hazardous material spill and disposal contingency plan which would describe the methods for cleanup and abatement of any petroleum hydrocarbon or other hazardous material spill. Relevant laws and regulations will be listed and explained.

### **3.2 Biological Environment**

#### *Existing Environment: Flora*

Important subjects of concern for flora are plant species listed by the U.S. Fish and Wildlife Service (USFWS) and DLNR as threatened or endangered (16 U.S.C. § 1531-1544; HRS § 195D-4); rare plants; and areas of intact native vegetation, which may also serve as habitat for native fauna.

The project area is entirely on lands that have been extensively grazed and which continue to be used by Ulupalakua Ranch for cattle ranching. The natural vegetation of the project area varies greatly with elevation, the increase of which is correlated with greater rainfall, humidity and cloudiness and colder temperatures. The higher elevations support a Koa/‘Ohi‘a Montane Mesic Forest and lower areas were diverse Dry Forests (Gagne and Cuddihy 1990). These original communities, however, have been destroyed or heavily degraded throughout much of the project area and the surrounding region by centuries of agriculture, deforestation and grazing. The current vegetation mostly consists of pasture grasses associated with ranching (principally *Pennisetum clandestinum* in the uplands and *Panicum maximum* lower down), forests dominated by non-native species such as eucalyptus (*Eucalyptus* spp.), black wattle (*Acacia mearnsii*), tree poppy (*Bocconia frutescens*), kiawe (*Prosopis pallida*) and koa haole (*Leucaena leucocephala*), as well as cultivated crops, roadside weeds and ornamental vegetation.

Initial reconnaissance of the project area has revealed that there are nonetheless several pockets of intact native vegetation and also zones with widespread native species amidst non-native vegetation. Most notable are a several-acre remnant of a highly diverse mesic forest within a gulch on Pu‘u Makua, a small area of early successional phase lava flow vegetation in the northeastern corner of the project area, and the numerous *wiliwili* (*Erythrina sandwicensis*) trees

scattered or clustered in the entire *makai* half of the project area below the main highway. The mesic forest remnant is dominated by ‘*ōhi ‘a* (*Metrosideros polymorpha*) and *koa* (*Acacia koa*) and also contained *papala* (*Charpentiera obovata*), *olapa* (*Cheirodendron trigynum*), *cyrtandra* (*Cyrtandra* sp.), *kawau* (*Ilex anomala*), sandalwood (*Santalum haleakalae*), *opuhe* (*Urera glabra*) and *olomea* (*Perrottetia sandwicensis*).

Although not a listed species, *wiliwili* is endemic to Hawai‘i and is important for its keystone role in the dry forest ecosystem and also for the ethnobotanical uses of its lightweight wood and seeds (Neal 1965: 458). The U.S. Geological Survey estimates that its current range is only 10 percent of its original extent (USGS 2006). The rare shrub *maiapilo* (*Capparis sandwichiana*), important in traditional medicine, is also present in small numbers in the same area as *wiliwili*.

#### *Existing Environment: Fauna*

Of concern for fauna are common animal species, rare species, migratory bird species, and threatened and endangered species. In general, native vegetation provides the best habitat for native fauna such as birds and invertebrates. The Draft EIS will pay particular attention to migratory birds as defined in federal Migratory Bird Treaty Act (16 U.S.C. 703-712; § 128) and birds listed under the federal or State of Hawai‘i Endangered Species Act (16 U.S.C. § 1531-1544; HRS § 195D-4), as threatened or endangered.

Fauna surveys of nearby areas for the Auwahi Wind Farm (Tetra Tech 2011) found 11 mammal and 27 bird species. All mammals other than the Hawaiian hoary bat (*Lasiurus cinereus semotus*), discussed below, are not native to the Hawaiian Islands and are not of biodiversity concern. Of the birds, all but three species found in the wind farm survey were very common and not native to the Hawaiian Islands. The native species were the forest bird *Amakihi* (*Hemignathus virens*), the *Pueo* or Hawaiian Short-eared Owl (*Asio flammeus sandwichensis*) and the *Kolea* or Pacific Golden Plover (*Pluvialis fulva*), which is indigenous to Hawai‘i and a migrant that winters in coastal and upland areas of the main Hawaiian Islands.

The Auwahi Wind Farm EIS also reported on an invertebrate survey of an area whose boundaries were unspecified but reportedly much larger than the wind project area, likely including large portions of the geothermal project area (Montgomery 2008). The invertebrate survey indicated that the general area supports a variety of native terrestrial mollusks and native and non-native arthropod species. Of most interest were the federally and State listed Blackburn’s sphinx moth (*Manduca blackburnii*) and the yellow-faced bee (*Hylaeus spp.*).

Initial reconnaissance of the geothermal project area supports these findings. The project area is habitat for a variety of mostly non-native animals, including birds, mammals and invertebrates. There are no wetlands or other waterbodies that serve as habitat for waterbirds. All three native birds observed in the Auwahi survey – *Amakihi*, *Pueo*, and *Kolea* – were also seen in this reconnaissance.

The Auwahi Wind Farm EIS noted five State and federally listed animals that could potentially occur in the general area (Tetra Tech 2011). These are Hawaiian Petrel (‘*ua ‘u* or *Pterodroma*

*sandwichensis*), Newell's Shearwater (*a'o* or *Puffinus auricularis auricularis*), Hawaiian hoary bat (*'ōpe'ape'a* or *Lasiurus cinereus semotus*), Blackburn's sphinx moth (*Manduca blackburnii*), and *Nēnē* (Hawaiian Goose or *Branta sandvicensis*). Furthermore, there are several species of Hawaiian yellow-faced bee (*Hylaeus* spp.) being considered for federal listing. Given the similarity of habitat, it is likely that these same species (along with perhaps other threatened or endangered species) have the potential to occur in the geothermal project area as well. Although none were observed during initial reconnaissance, Hawaiian hoary bats have been observed in various places on Ulupalakua Ranch in low numbers (Ibid 3-58).

Most of Ulupalakua Ranch aside from the Auwahi Forest Restoration Project (east of the project area) is not prime native species habitat. There are no large, contiguous blocks of intact native vegetation that could be fragmented by geothermal project activities. However, it is important to note several semi-intact areas nearby, particularly the Kanaio Natural Area Reserve (NAR) and the Ahihi-Kinaiu NAR. Management goals include controlling land-based impacts areas upland of the NARs to prevent adverse impacts on the habitats, wildlife, and scenic resources.

### *Impacts and Issues*

The Draft EIS will provide an overview of biological resources in the project area using resource agency data, high-level project specific surveys, data from the Hawaiian Biodiversity and Mapping Program, and information from other environmental analyses, particularly those for the nearby Auwahi Wind Farm EIS (Tetra Tech 2011). As the actual locations for geothermal infrastructure such as wells, roads and power plants will not yet be able to be identified during the EIS process, the Draft EIS will focus on identifying areas in which disturbance should be avoided or minimized to reduce biological impacts.

The ROI for impacts to biology includes all portions of the project area in which geothermal infrastructure would be placed, as well as areas extending beyond this within which invasive species could spread or listed or migratory birds could be exposed to disturbance.

Potential impacts to biological resources include direct impacts such as removal or mortality of flora and fauna, as well as indirect impacts, including new or more widespread invasive species, noise and disturbance and habitat removal and fragmentation. The project proponents have identified minimizing impacts on native vegetation and habitat as one of the primary goals of the project. The Draft EIS will specify mitigation measures such as the following where appropriate:

- Well pads, power plant site, staging areas, roads and utility corridors will be sited in areas of non-sensitive vegetation avoiding rare plants to the greatest degree feasible;
- Because there is great flexibility in the location of geothermal infrastructure, which would occupy only a small fraction of the project area, surveys at the appropriate time would ensure that no threatened or endangered plant species were impacted. Any found in the area near construction could be identified, flagged, and if necessary, temporarily fenced in order to avoid them during construction.
- During construction and operation, truck and heavy-equipment traffic will be limited to existing disturbed areas as practical;

- The project will implement a plan to limit the effects of invasive species with BMPs such as cleaning and inspecting incoming equipment and replanting disturbed areas with approved native species or pasture grasses;
- The project will develop a fire-management plan suitable for the infrastructure location at the appropriate time; and
- A biologist will conduct a post-construction monitoring survey to identify and correct problems should they occur.

### **3.3 Socioeconomic**

#### **3.3.1 Social Factors and Community Identity**

##### *Existing Environment*

The geothermal project would occur within and around Ulupalakua, a small settlement at about 2,000 feet in elevation on the leeward slopes of Haleakala Volcano. The community is anchored by the 20,000-acre Ulupalakua Ranch, the second largest cattle ranch on Maui. Founded in 1845, the ranch was also the site of many farming ventures including sugar cane. While cattle ranching is still active, the spectacular scenic views, cool climate, and attractions such as Tedeschi Vineyards Winery attract many tourists. Many residents depend upon the ranch and associated tourism for their livelihoods. Directly adjacent is the small, rural community of Kanaio. The area is included within the Kula County Subdivision by the U.S. Census Bureau.

##### *Impacts and Issues*

The Draft EIS will present detailed information from the U.S. Census Bureau's Census of Population and American Community Survey concerning the community's makeup and will include 2010 population counts. The Draft EIS will identify whether low-income and minority populations are present, and whether there are environmental justice issues, i.e., whether such populations would experience disproportionately adverse impacts.

Given the policy expressed in the 1996 *Makawao-Pukalani-Kula Community Plan* prohibiting "geothermal development that impacts adversely on Upcountry communities or culturally sensitive resources," the Draft EIS will focus not only on impacts to Maui as a whole but more specifically to the Upcountry communities closest to the project area. It will discuss in detail community consultation regarding geothermal power, energy sustainability, industrial land uses in the Upcountry area, and changing community character.

Project construction and long-term operations will produce a number of jobs. The Draft EIS will estimate job numbers, including the mix of local employees versus positions that are more likely to be filled through interisland or mainland in-migration of skilled workers. The economic effects of local energy production will be investigated using data from similar-sized Ormat plants for construction employment income, expenditures on third-party vendors for drilling and plant construction, and operational payroll. The Draft EIS will also include a discussion of potential economic benefits and uses of royalty payments.

### **3.3.2 Public Services, Facilities and Utilities and Energy**

#### *Environmental Setting, Impacts and Issues*

Construction and operation of a geothermal power project in the Ulupalakua area would utilize temporary generators for drilling and construction. The limited amount of water necessary for drilling and construction would be obtained by a locally drilled well or by hauling water. The Draft EIS will include consideration of water extraction and/or hauling.

The Draft EIS will also inventory existing police, fire and emergency services as well as solid waste and wastewater facilities and determine the impacts the project may have on these, proposing mitigation measures to avoid, minimize or compensate for impacts. If the Draft EIS determines that the project will have effects of population numbers or distribution, effects of public facilities such as schools and recreational facilities will be discussed.

The Draft EIS will also consider the effects of the project on the profile of energy production and usage on Maui, including effects to the proportion of overall and baseload renewable energy and the net effects on greenhouse gas emissions.

### **3.3.3 Transportation**

#### *Environmental Setting, Impacts and Issues*

The project area is served by Pi'ilani Highway (Maui County Route 31). The project will require use of the County and State highway system, along with limited use of State harbors and airports, to move materials, employees and contractors during construction and operation of the wells, power plant and other infrastructure. The Draft EIS will include a Traffic Impact Assessment (TIAR) that will evaluate the access requirements of the project and the project's effect on traffic, making recommendations for any needed improvements. As the traffic impacts of the project are determined, an appropriate ROI will be developed. The TIAR will have a cumulative perspective and will take into account both current and reasonably foreseeable traffic and road conditions. This will include consideration of changes to Pi'ilani Highway and other roadways, including temporary or permanent roadway modifications, temporary relocations or adjustments to the overhead telephone lines, power lines, and traffic signal mast arms, that are expected to be undertaken as part of the offsite improvements for the Auwahi Wind Farm project (Tetra Tech 2011).

### **3.3.4 Cultural Resources and Historic Properties**

#### *Existing Environment*

The Ulupalakua area has a rich cultural history dating from the earliest days of Hawaiian settlement through the 19<sup>th</sup> century era of ranching into modern times. Physical remains of ancient agricultural features, settlement and resource use are found at various elevation zones. Archaeological studies of Ulupalakua, Kanaio, Auwahi, Kahikinui and other areas have

elucidated the Hawaiian techniques for living in an often harsh landscape in balance with delicate environmental variables.

The project area spans the traditional Hawaiian land divisions (*ahupua'a*) of Paeahu, Palauea, Keauhou, Onao, Kanahena, Kualapa, Kalihi, Papaka Kai, and Kanaio. Traditional residential and agricultural land use was extensive below approximately 3,000 feet in elevation. Higher elevation areas were utilized, but not on a permanent basis. Forests previously covered the uplands providing important resources including birds and a variety of plants. Archaeological evidence for this activity is very limited because it was transitory and left few traces. Owing to the orographic effect of Haleakala's southwestern flank, the zone of sufficient rainfall for traditional agriculture extended from the uplands all the way to the coast at La Perouse Bay in the southern *ahupua'a* from Onao to Kanaio. Habitation sites were present throughout this zone as were associated ritual and mortuary sites. The remaining land divisions of Paeahu, Palauea, and Keauhou likely had a bifurcated settlement pattern, with a coastal band of settlement, perhaps used on a temporary basis, separated by a relatively barren zone from the uplands between 1,500 feet and 3,000 feet in elevation, where year round agriculture and permanent residences was feasible.

Early historic documents including land claims, confirm the importance of traditional subsistence agriculture. Beginning in the 1840s the agricultural economy of the Ulupalakua area was rapidly transformed to a commercial one dominated by sugarcane production. In the 1840s and early 1850s Irish potatoes also were cultivated. By the 1860s over 1,000 acres were devoted to sugarcane production. Cattle ranching was ongoing throughout this period, and became the dominant commercial activity in the 1880s and continues today. It is likely that commercial agriculture destroyed evidence of prior traditional Hawaiian occupation because this activity was focused on the most arable portions of the project area.

Previous archaeological surveys have covered less than 5 percent of the project area. These studies identified more than 25 sites including traditional habitation, mortuary and agricultural sites, and sites from subsequent historic land use, primarily related to ranching. Most of these sites are situated in areas that were not farmed historically.

Just as significant as physical remains are geological and vegetational features. In traditional landscapes, features such as cinder cones, springs, caves and groves of trees often have names with genealogical associations that have been passed to the *kupuna* or elders of the current generation as sacred *ike* or knowledge. These names are remembered by current residents and passed on to younger generations, in part through the telling and re-telling of traditions about their origin, in which landscape features figure actively in stories of former humans and divine beings and have kinship relationships to modern Hawaiians. Although some traditions may sound fanciful to modern ears, they are in tune with a traditional Hawaiian view of the world in which the division between nature and culture is not firmly drawn. Within this traditional Hawaiian framework, legends of place encode not only the names of places and physical features, but the relationships among the people, plants and animals of those places.

## *Impacts and Issues*

The Draft EIS will provide an overview of cultural and historic resources in the project area using thorough literature review, community and cultural practitioner consultation, and high-level, project-specific surveys. The archaeological research will include examination of Land Commission Awards, *ahupua'a* records, historic maps, archival materials, archaeological reports, and other historical sources. The documentary research will be supplemented by field reconnaissance to survey sample portions of the project area and inspect selected previously identified sites. The reconnaissance work will delineate areas of prior land use with particular attention to uses affecting the potential for archaeological resources. Environmental factors potentially influencing the distribution of historic properties will also be evaluated. The resulting data will be analyzed to develop a general settlement pattern model for the area that helps estimate the likely types and distribution of historic properties. The potential significance and required treatment of expected historic properties also will be summarized. The goal of this work is to develop recommendations to assist with future infrastructure planning to minimize adverse effects upon historic properties. It is important to note that future Chapter 343 documents for wells and a power plant, if they go forward, would include site-specific archaeological surveys.

A separate cultural impact assessment will be prepared by a Maui cultural practitioner familiar with the project area. As the actual locations for geothermal infrastructure such as wells, roads and power plants will not yet be specified in the EIS process, the Draft EIS will focus on identifying areas in which disturbance should be avoided or minimized to reduce impacts to historic properties or culturally important features. The paramount goal will be to prevent impacts through avoidance of sensitive areas, and only if avoidance is not possible, mitigating for impacts.

The ROI for impacts to cultural resources and historic properties includes all portions of the project area in which geothermal infrastructure would be placed, as well as areas extending beyond the project area that have some potential to be exposed to disturbance. Potential impacts include destruction of physical remains or alterations of landscapes or viewplanes with cultural associations. Also considered will be opinions that have been offered by some concerning geothermal development in the Puna District of the Big Island: desecration of the sacred values of the island of Maui and/or Haleakala through puncture of the body of the island by wells and use of geothermal water or steam.

### **3.3.5 Agricultural Land**

#### *Existing Environment*

Consultation of maps from the U.S. Natural Resources Conservation Service (USNRCS) in the Hawai'i State Geographic Information System determined that parts of the project area are lands designated in the *Agricultural Lands of Importance to the State of Hawai'i* (ALISH) maps. Ranching takes place throughout the project area, with various areas having different functions and grazing regimes.

## *Impacts and Issues*

The Draft EIS will present maps relating to agricultural potential including soil types and ALISH and will discuss existing agricultural operations. The compatibility of the action with ranching and agriculture and any necessary mitigation measures will be evaluated through discussions with the ranch owner/manager of Ulupalakua Ranch and others and documented in the Draft EIS.

### **3.4 Cumulative and Secondary Impacts**

#### *Cumulative Impacts*

Cumulative impacts result when implementation of several projects that individually have minor impacts combine to produce more severe impacts or conflicts among mitigation measures. Most potential adverse impacts of geothermal development activities, including erosion, water quality, air quality, noise, historic sites, and most other areas of concern, can either be completely avoided during siting, or would be extremely restricted in geographic scale, negligible, and capable of mitigation through adherence to and proper enforcement of permit conditions. Other impacts such as traffic, scenic impacts and broad cultural impacts have at least some potential to accumulate with those of other past, present and future actions to produce more severe impacts. The Draft EIS will inventory and discuss past, present and future planned projects in the area in order to more accurately assess the potential for cumulative impacts, with special attention to air quality, noise, biological resources, traffic, and cultural values.

#### *Secondary Impacts*

Construction projects sometimes have the potential to induce secondary physical and social impacts that are only indirectly related to the project. For example, construction of a new recreation facility can lead to changes in traffic patterns that produce impacts to noise and air quality for a previously unimpacted neighborhood. The Draft EIS will evaluate secondary impacts on a resource by resource basis.

Growth-inducing impacts are a special category of secondary impacts. Analysis of growth-inducing impacts examines the potential for a project to induce unplanned development, substantially accelerate planned development, encourage shifts in growth from other areas in the region, or intensify growth beyond the levels anticipated and planned for without the project. Provision of needed infrastructure such as roads, water supply, and sewer facilities is often seen as growth-inducing. Of key importance is whether infrastructure fulfills existing demands/needs of planned growth, or whether it instead enables unplanned growth and/or diverts growth away from planned areas. The Draft EIS will examine the potential for the addition of energy capacity or a substantial reduction in energy costs to induce growth.

### 3.5 Required Permits and Approvals

The permits and approvals sought pursuant to the current request from the Hawai‘i Board of Land and Natural Resources are Geothermal Subzone Expansion, Geothermal Mining Lease of State Land, Geothermal Exploration Permit, and Geothermal Mining Lease of Reserved Land.

As explained in Section 1.1., if Ormat is successful in acquiring the above permits and approvals, it may then seek permits and other approvals from State and County authorities necessary to conduct exploratory drilling in the project area. If exploratory drilling and testing were to lead to discovery of a commercially useable geothermal resource, Ormat would then determine the feasibility of constructing a plant to generate electricity using the resource and of selling the electricity to an offtaker such as Maui Electric. The preliminary list of permits required later for any specific geothermal development activities includes the following.

*Maui County Department of Planning*

- Plan Approval
- Subdivision Approval

*Maui County Department of Public Works*

- Grading/Grubbing Permit
- Building Permit

*Hawai‘i State Department of Health*

- NPDES Permit
- Underground Injection Control Permit
- Noncovered Source Permit

*Hawai‘i State Department of Land and Natural Resources*

- State Historic Preservation Division Chapter 6E Concurrence
- Plan of Operation Approval

*EPA Federal Clean Water Branch Region 9*

- Underground Injection Control Permit

The Draft EIS will provide a full list of permits necessary for various stages of the project as determined through upcoming agency coordination.

## **4 DETERMINATION**

The Department of Land and Natural Resources has determined in consultation with the applicant that the project has the potential for significant impacts and that it is therefore necessary to prepare an Environmental Impact Statement.

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